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Information Users and Services Research (Organized Version)

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Abstract

This book aims to provide a comprehensive introduction to the core content of information user and service research, encompassing the concept of information users, the significance of information services, and methodologies for enhancing service quality through scientific research approaches. The text elaborates in detail on the behavioral characteristics of information users and their evolving demands, as well as the adaptive strategies employed by information service institutions to offer innovative service models. Additionally, it examines the influence of information policies, laws, and regulations on information services, and underscores the critical role of information ethics within information user and service research. Through case study analysis, the book illustrates the practical application of these theories and methods in empirical research, thereby offering guidance for graduate students and researchers.

Full Text

Preamble

Information Users and Services Research by Gu Liping

Chapter 1: Introduction

Content Summary: This chapter introduces the core content of information user and services research, including fundamental concepts and definitions, the necessity of such research, and how to conduct it. Recommended teaching time: one class session.

Key Concepts: Information, user, information user, information service, user service.

Knowledge Focus: Understanding various information users and information services; recognizing that exploring information users is a way to create new

service models; understanding how to apply social science research methods to conduct related research.

Section 1: Basic Understanding of Information User and Services Research

1. Development Trends in Information User and Services Research

Information user and services research serves as the foundation for the development of documentation, intelligence, and publishing industries, the axis driving academic progress in the field, and the basis for scientific and technological information policies. Through the efforts of several generations, this research direction has become increasingly specialized, though overall standards and entry requirements continue to rise. Current leaders in the field typically possess the following characteristics: mastery of two or more foreign languages, online reading and discussion (to obtain and exchange industry information in a timely manner); proficiency in computer software and hardware for information management and data mining (organizing information and identifying patterns); passion for mathematical statistics theory for data analysis (judging the authenticity of information value); experience in social science research (scientific intuition) and familiarity with several philosophical classics (knowledge intuition). Currently, international frontiers are developing rapidly, and as social changes in our country generate new demands and transformations in knowledge services, this research direction continuously produces new topics and challenges, making it both exciting and worthy of dedicated effort.

2. Course Objectives for Information User and Services Research

This course is a core curriculum in library and information science. The teaching purpose is to enable students to understand information users at the center of the academic information exchange environment and the innovative information services that support their information behaviors and needs. Through course learning, students should be able to: (1) Familiarize themselves with classic works in information user and services research, master basic core content, and possess fundamental knowledge for analyzing and understanding information users; (2) Familiarize themselves with correct research methods in information user and services research, develop the ability to interpret and critically evaluate journal articles, possess operational capabilities for conducting user surveys, and the ability to express information service recommendations; (3) Familiarize themselves with various tasks that support information user behaviors and needs, enabling them to design research, organize independently, process and analyze data, write research reports, and conduct work presentations.

3. Learning Approaches for Information User and Services Research

Information user and services research must be learned through practice; practical experience is far more important than theoretical memorization. People don't learn to swim by reading a swimming manual, nor do they learn to drive by reading a driving handbook. Similarly, one cannot master information user and

services research simply by attending a few classes. Applied research requires real-world scenarios to produce substantive results.

4. Instructional Materials for Information User and Services Research

Although information user and services research must be learned through practice, thoroughly studying relevant instructional materials can help us quickly get up to speed, after which we can begin practical learning. Here we recommend Zhang Xiaolin' s *Research Methods in Information Management*, Earl Babbie' s *The Practice of Social Research*, and Chu Jingli' s *Library Development Transformation and Service Transition*. These three books respectively discuss principles and theories, methodological tools, and practical scenarios. Of course, there are many other excellent works available, but these three books basically provide sufficient depth and practicality to quickly help readers enter the so-called scenario and conduct their own information user and services research. As the instructor, I also recommend my own work *Introduction to User Types: Online User Behavior and Differentiated Service Strategies* as supplementary material. Additionally, this teaching 讲义 can serve as an important supplementary material.

Section 2: Innovative Approaches in Information User and Services Research

1. The Cutting-Edge Nature of Information Technology Changes

Currently, library science mainly faces the impact of the internet. A large number of new network technologies have brought enormous challenges to digital libraries and library information services, decisively influencing research on digital library technology. Accompanying innovations in network technology, the processing, analysis, and computation of massive amounts of information have become new topics in informetrics, bibliometrics, and scientometrics. Changes in information organization, information retrieval, and information needs have prompted changes in user behavior, moving away from traditional library science assumptions. Finally, the cumulative effect of these changes and impacts has caused fundamental changes in the nature of libraries, giving library science new directions and new topics. Therefore, contemporary researchers who can access and delve into information user and services research are truly living in an exciting time.

2. Research Characteristics Combining Theory and Practice

Modern information and intelligence analysis is increasingly complex, library services continue to increase, and digital library construction involves many participants with different skills. This poses many new requirements and challenges for the disciplinary background of knowledge service providers and their research work. Professionals must have a broad knowledge foundation across disciplines to generate unique insights and innovations into the actual library and intelligence work they engage in from a broad perspective. They must also start from extensive, novel, and even imaginative ideas, through literature reading and

discussion, combine them with practical work, and through rigorous scientific research processes, gradually focus on two or three specific frontier issues. After in-depth study, tackling key problems, and overcoming various difficulties, they can propose innovations and contributions.

3. Interdisciplinary Characteristics of Research Outcomes Regarding end-user behavior research, there are two basic approaches: (1) Starting from library science and combining it with other disciplines; (2) Using the practical foundations of other disciplines such as management, sociology, psychology, and economics as guides or introducing them as theoretical sources to solve difficulties in the development of library and intelligence undertakings, using content from other disciplines to establish hypotheses, using statistics or other methods for empirical investigation, solving current problems faced by libraries, and obtaining reliable conclusions.

Newly initiated research topics always face numerous difficulties. Before execution, there are imaginable difficulties; during execution, unexpected difficulties arise. Even after project completion, the truly important problems may only then be discovered. Therefore, information user and services research is a research direction that continuously absorbs experiences from other disciplines, implements them in application scenarios, and gradually explores and summarizes specific content.

4. Innovative Approaches to Problem Discovery and Solution Contemporary researchers no longer engage solely in theoretical review and writing. Due to the development of library and intelligence work, almost all disciplines regard “review” as “something that must be done” rather than “the only thing to do,” and view “innovation” as “something that must be achievable.” After long-term research and practical work experience, after careful 梳理, we believe that regardless of which subfield or specific topic one starts with, the innovation process still revolves around the following three aspects:

- (1) **Literature Review:** The main purpose is to discover unsolved problems. At this stage, one can attempt to use existing methods to solve newly encountered problems.
- (2) **Research Methods:** When old methods cannot solve or cannot effectively solve new problems, it becomes necessary to identify deficiencies in existing methods, thereby improving them to generate new methods.
- (3) **Research Results:** Regardless of the extent to which problems are solved, summarizing research results of new methods and new problems is highly likely to generate new fields.

These three aspects are interlinked, cycle repeatedly, and always aim toward solving business problems, always adhering to scientific research ethics and norms, always facing the essential core of problem-solving rather than flashy appearances that seem to solve problems. Only then can innovative research

be formed. Special attention must be paid: the proposal of new problems, new methods, and new fields must be based on empirical evidence, capable of being replicated or modified by other researchers.

Section 3: Research Methods in Information User and Services Research

1. Identifying Real Research Problems The coverage of information user and services research is extensive. Tracking through literature review and imitating predecessors' research to conduct similar work is one approach. If oriented toward specific business scenarios, finding user research questions that can improve services can be simply summarized into four methods: Formative, Summative, Objective, and Measuring.

Formative questions in information user and services research include: - What problems prevent users from completing work or make them inefficient? - What aspects make users feel good or frustrated? - What mistakes or errors do end users most frequently make? - Has information service improved after evaluation and iteration? - What other problems might exist in information services?

Summative questions include: - Has our information service met originally set requirements? - Is our information service usable overall? - How competitive is our information service compared to other services? - Has it improved compared to previous information services?

Objective questions include: - What are users' purposes for using our information service? - Do users use our service daily due to work tasks? - Do users use our service easily or habitually? - Do users choose our information service once or multiple times? - Do users merely want to complete a task or improve task completion efficiency? - Do users care about aesthetic design, emotional design, and tone of information services?

Measuring questions include: - Time for users to complete tasks? - Effort users expend to complete tests? - Number of errors users make? - Time for users to become proficient? - Proportion of users completing critical tasks? - What thoughts did users express at the end?

Real research problems certainly exist in real-world scenarios. The above four questioning methods merely serve as reminders to help everyone think about how to optimize information user and services research in practical contexts, spark discussion, arouse research enthusiasm, and find interesting research questions.

2. Developing Actionable Research Designs Research design is the first step in all information user and services research when facing practical problems. During overall design, adjustments can be made according to circumstances, but during actual execution, plans cannot be changed arbitrarily.

To ensure research plans are completed "on time and as agreed," when conducting research design, it is recommended to reference research reports and textbooks

from the same institution, field, and industry to establish some hard rules. For example, regarding the rigid processes of questionnaire surveys and interview surveys, key points include:

Specific steps for questionnaire surveys: 1. Determine questionnaire framework and main content 2. Design specific questions 3. Pilot test questionnaire on small scale 4. Revise questionnaire based on pilot test issues 5. Design distribution and collection methods 6. Distribute questionnaire 7. Respondents answer questionnaire 8. Collect questionnaires 9. Follow up on non-respondents 10. Organize questionnaires, eliminate invalid ones; code answers for processing and analysis

Specific steps for interview surveys: 1. Determine main interview content 2. Determine basic interview format 3. Design interview outline 4. Arrange interview process 5. Conduct interview 6. Organize interview records 7. Recall interview situation and reorganize records 8. Summarize interview results for processing and analysis

By fully considering every detail of research ethics and maintaining a firm and clear research attitude, under the condition of “just cause,” one can accurately assess the feasibility of research design and the efficiency of actual execution.

3. Planning Measurable Expected Outcomes Expected outcomes are possible scenarios already known in mind before conducting information user and services research. This preset ability represents the comprehensive performance of high-level intellectual activities. Information user and services research may involve terminal users, business personnel, management personnel, and even decision-makers in various real-world scenarios. Therefore, an important part of research design before implementation is the proposal of expected outcomes. Expected outcomes can simply include several aspects: (1) How do I plan to solve the research problem step by step, i.e., design steps; (2) How do I plan to find a portion of people for investigation, i.e., sampling steps; (3) How do I plan to measure user behavior, i.e., measurement types; (4) How do I plan to consider user types, i.e., user classification; (5) How do I plan to improve information services, i.e., competency levels.

Design steps include the following tasks: 1. Determine research questions 2. Design sampling plan 3. Design measurement scales 4. Implement survey 5. Analyze data 6. Write research report

Sampling steps include: 1. Determine survey population scope and sampling units 2. Determine sample extraction methods 3. Determine necessary sample size 4. Set requirements for sampling precision 5. Determine population parameter estimation methods 6. Develop overall implementation plan and steps

Measurement types include: 1. Task success: To what extent users can complete tasks 2. Time-on-task: How much time users need to complete tasks 3. Errors: Where users become confused or misunderstand 4. Efficiency: How

many steps users need to complete tasks 5. Learnability: Number of user contacts and familiarity level

User classification includes: 1. Usage frequency: Frequent and infrequent users 2. Prior experience: Those with or without prior/similar experience 3. Professional field: Lower or higher professional domain knowledge 4. Discipline 5. Age 6. Gender 7. Education level 8. Internet access level

Competency levels include: 1. Task completion: Needs help; doesn't need help 2. Partial task completion: Needs help; doesn't need help 3. Failure: User thinks they succeeded but actually didn't; user gives up

The above five consideration schemes for expected outcomes are possible options among various expected outcomes. Among them, design steps and sampling steps usually require rigorous consideration and serious execution, while measurement types, user classification, and competency levels are adopted partially or wholly according to real business scenario needs. On the other hand, measurement is not only about quantitative data but also includes mining text content collected from language communication. These will be introduced in advanced courses such as *Data Science Practice with R and Python*.

4. Adhering to Academic Ethics and Norms Information user and services research is a way to challenge one's own willpower and abilities. The closer one gets to actual field conditions, the clearer one's research purpose and direction become. Because scientific research itself is a practice of social culture, this inevitably involves the following questions: From what perspective? What issues are of concern? What conclusions are intended? Everyone has a vested interest in the results of a particular research endeavor. If researchers clearly recognize their own vested interests and the complex vested interests of all parties in the research project, they should ensure these interests do not affect research design and guard against research results being deliberately, intentionally, or unintentionally misled.

In fact, as long as one can think clearly about the question: How do researchers face their own and their institution's vested interests? Then people can actually easily find entry points and breakthroughs from their own research questions and others' research results. Research ethics is not a form of moral preaching but the most important key to all research. It is no exaggeration to say that a researcher's research ethics determine the height and contribution of their research.

The most basic requirements in academic ethics include the following aspects:
- **Voluntary participation principle:** Do not force respondents to participate; all participants are voluntary. - **No harm to respondents principle:** Research content does not involve personal evaluation of respondents, privacy, or attitudes of research units. - **Anonymity and confidentiality principle:** Use Solomon encryption for all respondent data and store it securely. - **Transparent research process principle:** Researchers disclose their names and

institutions; research questions do not involve special care or welfare policies for individual respondents by the institution. - **Neutral research report principle:** Researchers specifically point out the shortcomings of the research itself in reports.

Without these contents, they may not appear in research reports, papers, or other paper materials, but experienced scholars can detect and identify potential problems through the research content itself and conversations. Various difficulties in information user and services can actually be solved—for example, if one doesn't know statistical software, they can ask for guidance; if research design is improper, it can be redone or remedied; if research inference is poor, it can be improved. Only academic ethics exist in one's heart throughout the entire research process and must be handled with caution. Researchers should maintain the conscience that intellectuals should have and be vigilant against “predetermined conclusions determining the research process.”

5. Maintaining a Good Mindset Although information user and services research has different attributes, characteristics, and behaviors in various regions and institutions, and serves different job positions with different standpoints, having high sensitivity to user behavior enables quick entry into research frontiers or breakthrough market barriers, contributing one's abilities in various workplaces and making modest contributions to China's library and intelligence undertakings, scientific research and education, and social and economic development.

- (1) **Have strong research desire:** Personnel engaged in information user and services research cannot be intellectually lazy, cannot wait for others to give them topics, cannot expect teachers to provide answers—these are shortcuts, not the proper path. Reading literature and understanding predecessors' work is not about learning job skills but conducting high-level research. Although practical work experience can provide certain solution steps, we still need research desire to solve and overcome difficulties in current research problems; otherwise, core problems will repeatedly emerge.
- (2) **Practice diligently:** The so-called review includes two parts: a review report of one's own learning process, and a review report on research topics. The former is a stage summary of one's own learning process, while the latter is in-depth understanding of research problems. These two are inter-related: on one hand, one must clearly understand their learning content and know what types of problems their abilities can solve; on the other hand, one must understand predecessors' research and know what hasn't been done well and where solutions can be applied. A research paper's review cannot replace a research status review. To understand research status, besides reading literature on research problems in detail, extensively reading relevant knowledge, thinking carefully, one must also humbly seek advice from experts, teachers, and practitioners in other fields.

- (3) **Spirit of seeking truth from facts:** Besides literature research, deep understanding of actual conditions is needed. Research cannot be based solely on subjective consciousness or one's own ideas to ask questions and propose unrealistic solutions. Feasibility issues must be considered; it's not about applying a new term but actually solving practical problems. Studying for diplomas is not normal. Writing papers for the sake of writing papers won't improve research level, only repeating low-level imitation. One should accumulate deeply and release sparingly, deeply learning content, carefully thinking about what predecessors haven't done well, and finally solving problems within solvable scope.
- (4) **Do not groundlessly negate predecessors' works:** This is an information retrieval problem. The earliest use of discipline monitoring was to compensate for the gap of using only keyword retrieval. Using citation indexes is not for evaluation but for information retrieval analysis. The expansion part still requires extensive reading, not relying on single-issue search term queries. Therefore, relevant and irrelevant literature must be understood through extensive reading. Careful reading is needed; one cannot hastily draw conclusions about problems, and must value others' research achievements rather than negating others' achievements to affirm one's own.
- (5) **Seriously accept suggestions from experts and teachers:** Teachers grasp research content from a macro perspective. Although teachers don't directly operate our work, they are familiar with routines for research plans and content. If one ignores teachers' suggestions and stubbornly refuses to change, many things will exceed one's research content. Research comes before papers; having papers without research is nonsense. The 套路 and structure of papers exist because there is research first.
- (6) **Research must prove practice:** Don't just play with terms to fool people; start from practical perspectives. Whatever theory is proposed must be applicable in other library and intelligence work practices. Our research should serve as guidance for others, not use piles of text to create complex vocabulary that others cannot apply.
- (7) **Head toward problem-solving:** Don't exaggerate the existence of practical problems in academic reports, and don't minimize or ignore incomplete defects in the research process. Solve problems realistically and pragmatically.

Review Questions

Chapter 2: Meeting Users' Information Needs

Content Summary: This chapter focuses on introducing theories, patterns, and application methods of information-seeking behavior. Understanding

information-seeking behavior helps us reasonably select approaches and methods to meet user needs; mastering how to observe and analyze phenomena of information-seeking termination. Recommended teaching time: two class sessions.

Key Concepts: Information seeking, information-seeking behavior, information-seeking termination, information need, information behavior.

Knowledge Focus: Understanding classic theories of information-seeking behavior; understanding the boundaries and approaches of theories; understanding the different information needs of faculty, staff, and student groups and their reasons.

Section 1: Theories of Information-Seeking Behavior

1. User Needs Research in the Information Environment The current information environment is extremely rich, characterized by a surge in the number of information sources and providers, diversification of information access methods, and information redundancy resulting from diverse information sources. In this “overloaded” information environment, many information users easily experience anxiety due to information insufficiency. How people should navigate this complex information overload situation is an important frontier issue. Following this is how people evaluate whether discovered information meets their specific needs. In complex information environments, understanding how users choose information to meet their needs is an urgent matter.

By understanding how users seek information resources and how they select content to meet their needs, we can gain insights into users’ information behaviors. However, we also need to focus on how people judge how much information is sufficient to meet their needs or...

2. Expanding the Meaning of Information Users Information-seeking behavior research and search behavior research pay great attention to the utilization of information resources. The process of finding and searching for information has also received widespread attention from researchers, forming multiple models, many of which center on information-seeking and searching in academic or professional environments. Although these models describe processes, they cannot clearly understand how users identify what kind and how much information can achieve their goals. Therefore, if we expand the scope of information seeking, such as incorporating stages of searching, collecting, analyzing, and rethinking, including how and when individuals stop looking for information given a goal or task that creates an information need. Individuals actively seek information to meet their needs, situations of information surplus, and ways users manage information—these contents constitute the complete meaning of meeting user needs. As an information capability, users need to know how much information is sufficient to meet their information needs. This is both a research problem for information services and a problem for studying information users.

3. Application of Role Theory in Information User and Services Research

The term “role” originates from drama, where actors’ parts were written on scrolls that determined their behavior on stage. In the 1930s, this term began to be used in a technical sense when social scientists analogized the stage to social life and actors to people playing various social roles. A deeper meaning is that when people occupy social positions, their behavior is mainly determined by expectations of that position rather than by their own personal characteristics. Each social scientist tries to explain human social behavior from their different cognitive experiences and knowledge.

Understanding the social role of information seekers helps us understand how users in different roles look for information. However, role theory cannot explain differences among users playing the same role. Differences among different users in the same role may draw on rational choice theory. In the process of information-seeking behavior, the application and reference significance of this theory lie in its ability to reveal user behavior after being motivated, users’ subjective intentions, and users’ information choices.

4. Application of Rational Choice Theory in Information User and Services Research

Rational choice theory is commonly seen in individual economics research and is also frequently applied in anthropology, political science, psychology, consumer behavior research, and sociology. However, its origins can be traced back to logic, mathematics, and statistics.

Rational choice theory holds that individual choices or preferences are the best way to achieve their goals or pursue their interests, acting according to their own interests. Rational choice theory is based on complex social behavior as a premise, believing that the results of “choice” can be understood from basic individual behavior. Its basic assumption is: individual behavior is the basic unit of social life, so when facing multiple action plans, people usually choose the action they believe will have the best results. The basic assumptions of rational choice theory prevent it from specifying whether all individuals strive toward the same goals, nor does it indicate whether there are different evaluation methods and different calculations of so-called different costs and benefits for individuals. As objects of study, users in this theoretical framework evaluate costs and benefits according to their own preferences, values, or utilities, and finally make decisions and take actions (behavior).

According to this theory, users compare the expected benefits obtained from various actions they pursue to achieve goals, then choose the option with the highest cost-performance ratio. Sociologists use rational choice theory to explain individual behavior patterns based on individuals’ goals and motivations. However, in many situations, it is impossible to know the entire range of choices or compare every possible benefit. Therefore, user “satisfaction” becomes a possible alternative theory. In practice, satisfaction translates into judgment. When information is sufficient to meet needs, action is taken even without performing a complete cost-benefit analysis. Or, from the perspective of satisfaction theory,

behavior can be explained from satisfaction, while rational choice theory may not have the same explanatory power.

5. Application of Satisfaction Theory in Information User and Services Research Satisfaction is a decision-making process through which users can decide when to search for or use alternatives to continue meeting expectations. It is not about pursuing perfect solutions but pursuing the most satisfactory solution at the current stage. When users feel satisfied, they gain cognition of the benefits of obtaining more information and compare them with the cost investment of continuing information search. In many organizational behaviors, such as research teams or certain businesses, when a good enough solution is found, the problem is considered solved—that is, when managers know a satisfactory action plan, they feel they can stop demanding information search. Theoretically, decision-makers need to consider all potential choices and find the optimal solution among them. However, detailed intelligence analysis requires additional time and expense, so information search personnel must balance finding additional information of sufficient value with the cost of continuing the search, considering the cost-effectiveness of time, effort, and even financial resources spent.

In short, users can stop looking for more information based on the information they can find to satisfy their information needs. If information systems are difficult to use or unusable, users may also stop looking for information prematurely. In this regard, whether users have very rich information search experience or information system use experience also determines which information users deem sufficient to achieve their goals. Therefore, considering satisfaction theory, rational choice theory, or role theory all need to be considered in the context of real-world cases.

Section 2: Patterns of Information-Seeking Termination

1. Termination Patterns in Information-Seeking Behavior Information user and services research usually focuses on how contexts affect users—that is, in what work scenarios, search environments, or life domains people judge whether information is sufficient, whether to stop searching for information, or whether to continue searching for additional information. In an early library science study, the principle of information search termination was a universal application pathway under rational choice theory that well explained most information-seeking behavior phenomena.

Kraft and Lee (1979) proposed three rules for information search termination: 1. **Satisfaction rule:** Search terminates only when users find the required number of relevant documents and feel satisfied with scanning; 2. **Aversion rule:** Search terminates only when users retrieve too many irrelevant documents and then feel 厌烦; 3. **Combination rule:** If users feel satisfied by finding the required number of relevant documents, or feel 厌烦 by retrieving too many irrelevant documents, this will cause users to stop searching.

Termination rules imply users' natural emotional or affective reactions to searched documents or alternative products, without involving role theory, information choice theory, or satisfaction theory.

2. Considerations for Information-Seeking Termination Under Different Roles Scholars and university students demonstrate different choice backgrounds here. Even when applying rational choice theory, their recognized cost-benefit calculations are not 完全相同. Similarly, engineers usually select information sources based on authors they already know and have cited, while lawyers tend to use their notes about other cases and familiar abstracts, citations, and other readily available reference resources.

Historians stop searching when they feel they have obtained sufficient information to support their writing, even though other sources could continue to provide additional information. Some scholars have already tailored their research topics to minimize browsing, querying, and reconsidering questions. Time and money are important constraints on how much information humanities and social scientists collect. There are also cases where scholars judge they can solve problems and terminate when they believe they have enough information to achieve their goals. Additionally, undergraduates often adopt coping strategies in their information searches that seek to find sufficient information to meet task requirements in ways that consume the least time or social cost.

3. Considerations for Information-Seeking Termination Under Different Rational Choices The variable of information being immediately available or available within an acceptable time frame is extremely important. If information is obtained too early or too late, its usefulness and influence will decline. Additionally, costs involved in accessing specific sources also affect professionals' decisions on whether to use them. If databases and paywalls are too expensive, they will also hinder scientific communication and research. In short, human needs for information, time factors for obtaining information, and available funds all determine professionals' rational choices.

Furthermore, when professionals cannot obtain needed information, they usually try to use other sources or methods and continue processing until they achieve satisfaction. In other words, outside the framework of rational choice theory, actual situations may involve switching between rational choice theory and satisfaction theory. The issue of information search termination can highlight and reflect this situation.

4. Considerations for Information-Seeking Termination Under Different Satisfaction Levels In the practical experience of intelligence research, we know that in the process of exploring a problem, one may reach the degree of deciding to complete the information query process multiple times. However, this may not necessarily reach the satisfaction level required by managers. In the gradual process of obtaining information satisfaction, intelligence analysts

reach the point of maximizing additional information while reducing time and effort investment through one or multiple cycles of partially or fully repeating retrieval steps. Sometimes, people also encounter situations requiring additional information to readjust or clarify the research problem itself. Therefore, under normal circumstances, managers will spend time carefully reviewing research reports only before taking the final step. Project leaders in the research process do not use predetermined standards to decide whether to enter different stages of information search task assignments. They usually feel satisfied with available information or are forced to make decisions about information search termination under external time constraints.

Satisfaction and remaining time are two main contradictory factors. In this situation, people often lean toward satisfaction, while managers or project leaders lean toward satisfaction. Once managers believe they should stop the information search process, tasks or decisions made will be affected. Consequently, managers tend to continue tasks of information search behavior until there is no time left for decision-making, even though they know there might be more information available.

Section 3: Application of Information-Seeking Behavior Theory

1. Practical Perspectives on Information Services Library and information science research has identified some models for information query and search behavior. A large body of literature highlights one viewpoint: information-seeking behavior begins with recognizing the need to find information to handle a situation or solve a problem, and ends when users finally decide to stop after continuous querying. Understanding how users satisfy their information needs can be considered users' intention to find information, thereby considering how much effort users invest in information quality trade-offs and (understanding) achieving goals, solving problems, or dealing with time constraints.

If librarians consider users' goals and motivations for searching for information and then provide corresponding information, users will more easily accept the library's information services. Problem characteristics may be more important than user characteristics or user work scenario characteristics.

Only when people understand the nature of the problem can they know how much information is needed to answer it, and can they assess how much effort or investment is needed to achieve satisfaction or at least a balance between satisfaction level and time cost.

2. Information Needs of Researchers Library and information science research has identified some models for information query and search behavior. A large body of literature highlights one viewpoint: information-seeking behavior begins with recognizing the need to find information to handle a situation or solve a problem, and ends when users finally decide whether to terminate after continuous querying.

Researchers' information needs mainly include three situations: The first is information needs to maintain research in relevant fields. The second is when scientists need certain specific information. The third, which occurs least frequently, is the need for thorough searching—that is, all existing relevant information on a specific topic or domain knowledge. Therefore, here we have the famous library science principle of the contradiction between information recall and precision. On the other hand, from a monitoring perspective, exhaustive search is a type of search that provides scientists with sufficient information to determine that the search process can stop. Finding specific data and thorough searching require different levels of search effort, which also depends on user capability, whether it's the degree of understanding of the topic or the ability to implement information search. By connecting information needs with information problems, users decide how much information is needed to achieve satisfaction or decide to terminate information search, which is closely related to the nature of the problem users need to solve.

3. Information Needs in Research Work Scenarios Researchers' decisions on when to stop searching for information may depend on the influence of external environments, including functional settings of information systems, network environment or search environment limitations, or internal institutional reward and incentive mechanisms. It is also related to knowledge in the field of contracted task topics and the difficulty of information search. In other words, all or some of these factors may affect decisions about how much information is sufficient. Both external and internal environments help construct information needs, thereby constructing conditions to satisfy these needs, and thus constructing satisfaction indicators or judgment criteria for rational choices.

Information search may also come from contingency. Factors determining when users decide to stop searching for information are difficult to predict accurately like a formula in astrophysics, or at least accurately predict within a certain range. Researchers, their graduate students, and intellectuals in society may, when facing interesting or necessary research problems, form a series of orderly intellectual improvement stages through the information search process. Starting from awareness of lacking knowledge or understanding, gradually moving toward identifying problem domains or topics, then recognizing and clarifying problems, beginning information collection through defining problems and clear expression, and finally making understanding, interpretation, and possible answers to problems. These answers can be compared based on tracking evaluation or systematically identifying content of interest to users, thereby obtaining some models for reference in information services.

4. Academic Information Needs of Users From the perspective of users' academic information needs, we must also reflect on one question: Information-seeking activities are not the source of standards for deciding when to stop the information search process. The principles librarians consider for stopping information search stem from management issues such as whether library infor-

mation services are being used, how to improve them, or whether they achieve originally planned goals for information services. Of course, people can also use this set of standards to develop and consider user needs, gradually enriching theoretical connotations and accumulating experience in practice. However, from the opposite perspective, processes like intelligence research that include steps such as starting, clicking, browsing, classifying, tracking, and extracting are not user needs themselves. Researchers may continue searching for information even in the final stages of academic paper writing, trying to answer unresolved questions or find new literature.

The contingency of information search, although not explicitly explaining factors related to information search termination behavior, makes one realize that real-world scenarios are not as complete as theoretical frameworks—with beginnings and ends, purposes and methods, measurable variables, etc. In real-world scenarios, the information search process can only be partially realized. Ending an information search event involves behaviors of understanding situations or solving problems by obtaining information for this purpose. Therefore, information search may be a small part of users' "sense-making" on a problem, though it is a core part, it is not the whole.

Section 4: Information Needs and Behaviors of Students, Faculty, and Staff

1. Students' Information Needs Undergraduates and graduate students tend to view course assignments given by teachers or research reports in teachers' eyes as tasks requiring thorough information searches. If such research reports have specific requirements, such as the number of cited journal articles, required pages, or presentation time in class, then students must prioritize thorough searches to meet these specific requirements. Of course, some diligent students know they can search endlessly and continuously explore a topic in depth, but due to time factors or similar arrangements in other courses, they choose to terminate information search behavior at appropriate points, conducting information collection, organization, and analysis only within the scope required by the task to achieve their satisfaction with information needs, though often still some distance from teachers' satisfaction with the assignment. This distance can also be interpreted as an explanation for high or low course grades.

We can simplify students' information needs and design a brief observable framework as follows: 1. **Information search need:** To meet the needs of course reports. 2. **Information search termination standards:** - Quantitative standards: Number of references, number of pages, time spent - Qualitative standards: Information accuracy, multiple sources repeating same information, sufficient information collected, grasp of concepts

For students, relative to the reward mechanism (final grades) being a key factor determining time investment, this clearly demonstrates the operation of rational choice theory. We can observe their quantitative and qualitative standards to

explain when and why they stop looking for more information under rational choice.

2. Faculty' s Information Needs Faculty have teaching and academic research tasks. Corresponding information needs prompt them to adopt thorough information search behavior. Faculty need to prepare lessons for students, lecture in classes, and sometimes design and hold seminars. The time they spend searching for information often depends on the time they need to spend lecturing, presenting, or holding seminars.

However, when writing journal papers or books, faculty may also stop information searching due to time constraints. Additionally, some faculty stop looking for more information when they see the same information repeated in several sources. Occasionally, when they find exhaustive information on their topic in one place, they will spend more time looking further.

We can simplify faculty' s information needs and design a brief observable framework as follows: 1. **Information search needs:** - Preparing course materials - Preparing presentations - Writing journal papers, books, and proposing project applications 2. **Information search termination standards:** - Quantitative standards: Number of references, number of pages, time spent - Qualitative standards: Keyword, synonym, and near-synonym searches; determining research scope; discovering current or cutting-edge research; repeated same information; discovering large amounts of information sources; peer feedback; publisher requirements; project requirements

Faculty' s information needs also differ based on whether they are teaching-focused, research-focused, or balanced between teaching and research, as well as college requirements, whether they hold administrative positions, whether they undertake major projects, and how they guide master' s and doctoral students. Generally, to prepare classroom teaching, lectures, or presentations, faculty will reasonably arrange time for different tasks. In pursuing academic research efforts, such as publishing articles, they will act according to rational choice until receiving peer review feedback. For research-oriented faculty, they will invest all efforts to achieve the goal of publishing academic papers. Faculty with administrative positions may spend more time on information searching for project applications, task allocation, review, and reporting.

3. Staff Information Needs Staff also includes faculty, but more often refers to those researchers with scientific project tasks. Faculty have teaching and academic research tasks, and corresponding information needs prompt them to adopt thorough information search behavior. Staff typically use several criteria to determine how much information is sufficient for their purposes. Some criteria are inherent to organizational task levels, while others are determined by the external information environment. They also have subjective judgment criteria, such as the credibility of information sources and time constraints under work priority arrangements.

The vast majority of staff will quickly search for answers on the internet, especially search engines, and then decide how much information is enough based on the necessity of deep searching, value judgments of resource authority, browsing and search time. Interpersonal communication is also an important information source. In comparison, staff know that important news often requires interpersonal relationships, and interpersonal networks are already established before tasks.

We can simplify staff's information needs and design a brief observable framework as follows: 1. **Information need criteria:** - Research tasks - Administrative tasks 2. **Information search termination criteria:** - Quantitative standards: Number of references, number of pages, time spent - Qualitative standards: Finding valuable information, collecting representative cases, finding current information, finding research frontiers, conducting exhaustive searches, collecting comprehensive information sources

Deadlines determine how much time staff invest in finding information sources. The size of project funds, level of administrative channels, difficulty of actual work, and efficiency of cooperative teams that can be organized all determine staff's information search behavior and termination principles. Staff are the most likely group to end searches after determining they have discovered sufficient information. From the perspective of role theory, this group does not need to continue learning and may have incentives like students, nor do they have the motivation and professional role of faculty to explore unknown fields. Of course, nothing is absolute. From the perspective of satisfaction theory, whether staff believe current information needs are met depends on their superiors on one hand and their professional quality on the other.

Review Questions 1. Compare the similarities and differences among role theory, rational choice theory, and satisfaction theory. 2. Explain under what circumstances users will terminate information seeking. 3. Describe the similarities and differences in information needs among researchers, staff, and students.

Chapter 3: Digital Information Acquisition on the Internet

Content Summary: This chapter emphasizes how users obtain information in internet space, including methods, channels, selection conditions, and types of metadata services for information users. Recommended teaching time: one class session for content delivery, one class session for comparative discussion of the first three chapters.

Key Concepts: Search engine, academic search engine, digital information, digital journal, literature database, internet information, information acquisition, metadata.

Knowledge Focus: Understanding the advantages and disadvantages of various search engines; understanding the characteristics and limitations of

databases; understanding how to observe and analyze information acquisition behavior on the internet; understanding the important role and function of metadata in information services.

Section 1: Search Engines as a Primary Channel for Information Acquisition

1. Researchers and Graduate Students Have Disciplinary Differences

In the past, due to resource scarcity, users needed to build their workflows around libraries, so they paid high attention to libraries. Now, with abundant resources, users no longer focus their attention on libraries, so libraries can only build services around users' workflows. This situation will only intensify. Libraries provide multiple choices for different needs and behaviors.

There is extensive literature on researchers', faculty's, and graduate students' views on information seeking and library systems. They provide rich empirical summaries for theories, models, and methods of improving information services on academic information behavior, including role theory, rational choice theory, satisfaction theory, and evaluation criteria for user familiarity, convenience, and immediacy in context-sensitive system services. Some comparative studies from using search engines, with subtle differences between systems, also provide favorable reference cases for improving digital library systems.

2. Search Engines Are Frequently Used to Locate and Access Electronic Databases

Users are familiar with portal websites, search systems, and social platforms on the internet, and they use such information services with ease. Therefore, researchers' behaviors, cognition, and needs for discovery services have produced more changes. Generally, there is a demand for information services similar to digital library systems to have the appearance and functions of search engines.

Currently, the main frustration for researchers in science, technology, engineering, medicine, arts, and humanities and social sciences in their research process is accessing online journals. There are multiple factors: on one hand, the issue of paywalls for subscription-based knowledge access. The open access movement is currently trying to solve or alleviate this pressure and crisis. On the other hand, librarians believe that accessing online journals is key technical support they need to provide, so integrating retrieval systems or unified resource discovery systems still requires more financial investment to make usage methods more similar to familiar search engines. At the third level, search engines can access metadata of electronic databases, but whether full-text access is obtained depends on subscription status and account activation within IP ranges. Researchers' intuitive feeling is that they can search but cannot use. The problem still lies in information services, or after such services are activated, people think it's an improvement in search engine services, when it should actually be the result of improved network interoperability and subscription coverage of their institutions.

Currently, the resources researchers use most for academic information acquisition are general search engines, internal portal websites and catalogs, professional search engines, and subject-specific websites. Researchers view searching as an indispensable part of the research process and have developed corresponding search methods to minimize information overload. In these areas, improving and optimizing users' ability to acquire digital information on the internet is an urgent matter.

3. The Entire “Discovery to Delivery” Process Requires Information System Support The use, value, and impact of digital journals are self-evident to researchers. However, researchers often cannot obtain literature instantly through digital library systems, thus choosing links to electronic databases on library web pages. By clicking links to enter databases and searching for information on familiar databases, the effectiveness of information services is greatly reduced. Digital journals are important components of the research process and information search process. For researchers, time spent on them can have good time investment returns. On the other hand, e-books have also become major participants in emerging markets. Age and gender are also important predictors of e-book purchase rates. Most e-books are discovered through library catalogs and links on library web pages. Library systems and content must adapt to changing user behavior.

When discovery does not equal acquisition, information services need to have the capability to support full-process transactions and document circulation. When choosing between search engines, evidence shows that speed may not be the most important evaluation factor, but rather whether the retrieved information full text can be read. On the other hand, research on library OPACs hardly supports the advanced search options still popular in these systems, but hopes for search convenience similar to search engines and can leverage library advantages to access full text after retrieval.

Section 2: Digital Journal Literature Databases Are Not Convenient to Access

1. Users Mainly Consider Speed and Convenience What library and information professionals often find difficult to understand is that most people do not use libraries to obtain information. Many people obtain information through human resources (family, teachers, professors, colleagues, peers) and the internet. Moreover, regardless of age and education level, search engines and encyclopedias are people's first choice for seeking information because people always seek convenience. If this is the case, then library services and systems should be designed to serve those who actually use them, which may also be more efficient for libraries.

When users access online catalogs and websites, they often find them confusing and difficult to use. Therefore, if a pop-up chat box can be provided asking “What can I help you find?” it can appear when users need us, anytime and

anywhere. If most of our users prefer to communicate via text messages, chat, or instant messaging, learn through games, and access libraries' unique collections and materials through social media like WeChat, we should be there too.

2. Users Prefer to Obtain Information Through Convenient Electronic Platforms In the internet era, embedded services are increasingly important. Bringing libraries and librarians to users, whether in their offices, laboratories, homes, or even on their mobile devices, is the manifestation of embedding. Scenarios for information user and services research can also provide possibilities for regular interaction with users in online courses. Kiosks are provided in public places such as bus stations and parks where users can flip through audio and e-books, magazines, newspapers, and journals.

Users hope to access libraries and their resources anytime, anywhere (which may involve accessibility at multiple physical and virtual locations). Because for users, human, print, or electronic resources are all greatly needed, timely use of these resources is crucial. If too inconvenient, users will not use them again. Therefore, information service institutions must provide user-centered services and systems to meet user expectations. Library staff will need to establish relationships with their users and cooperate with other organizations to produce, store, and preserve document resources and datasets, and provide personalized services. Recruiting and retaining innovative and creative talents who are willing to engage with users and can quickly adopt new technologies and new communication methods is crucial for the success of information user and services research.

3. People Tend to Treat Libraries as Places for Collecting Books Most users trust library resources and information, just as they trust search engines. However, they do not think libraries can access electronic resources. The public still uses libraries and various electronic resources less frequently. There are multiple reasons for this aspect. However, the library' s brand as a "source of books" is not inherently bad. What needs consideration is how to adopt user-centered practices, fully utilize the skills and knowledge of professional librarians, minimize unnecessary information services as much as possible, and focus on user needs.

Libraries not only occupy a beautiful space but also need sufficient staffing and funding to meet user needs. Libraries themselves located in cities or towns represent a cultural embodiment and contribution. However, considering information user and services research, no single service or system can meet all needs of every user. We need to configure resource models for various user engagement patterns according to the needs and expectations of specific user groups.

Currently, a better approach is the subject librarian system, which creates services specifically tailored to user needs through collaboration and relationship-building with users. Considering the foreseeable future, data librarian is also a rapidly developing trend. In name, it moves away from the concept of book

collections toward the fashionable term of data services, but essentially, it applies new technologies and methods to stay close to user needs, meet users' information needs, and create flexible ways to use information resources.

Section 3: Researchers Prefer to Obtain Information Through the Internet

1. Users Hope Library Systems Can Enhance Their Functions Even if users can use search engines or other resources, they may not necessarily know how to obtain high-quality information from them. Therefore, developing or applying some new functions helps users meet information needs. However, the other side may also create opposite effects. Poor availability of many resources, high complexity, and lack of integration are major obstacles to information retrieval. This difficulty prevents users from focusing on the actual content of materials and instead directs their time, energy, and dissatisfaction toward the information search process itself. This makes subsequent user information literacy education more passive rather than receiving good feedback as a knowledge and skill 传授. Therefore, information user and services research becomes very necessary. Which functions need optimization, which need deletion, which need addition, which functions target what situations of user information needs, and thus need explanation and classification in information literacy education—all require field investigation.

The image of libraries as quiet spaces for obtaining books rather than accessing electronic resources remains common today. To attract people to use libraries and change their perceptions of libraries, the library experience needs to become closer to web usability, such as search engines, portal websites, and social media, and be embedded into users' personal workflows. The network environment is familiar to users; therefore, they feel comfortable and confident when choosing to search for information here. Librarians need to adapt to or seek to purchase services and systems designed as replicas of the network environment, making them convenient and easy to use.

2. Users Hope to Add Content to Help Them Evaluate Resources Establishing an economic model for allocating resources to different interaction modes for library services will benefit all types of libraries. This not only enables optimal scheduling of human resources for services but also allows allocation of electronic and print resources according to user preferences. For example, quantitative data and qualitative opinions generated by researchers using academic libraries and their services can help libraries optimize resource allocation while in turn helping users receive better services.

Most researchers accept digital content as the primary information carrier and medium and use digital resource retrieval systems to find information. Librarians play a key role in this new information environment and new types of information resources. Whether researchers can directly access various digital materials is very important. In today' s network culture and prevalence of elec-

tronic resources, users not only hope to have more access rights to resources but also hope to have the right to comment on resources. These are all new topics and emerging opportunities for information user and services research.

3. Users Are Willing to Use Information Discovery Tools Libraries must better promote their brand, value, and resources within the community. Librarians must better promote the library brand and its resources to academia, researchers, students, and the public. Libraries can demonstrate their value by identifying and promoting collections and services. One type cannot satisfy all library services, which requires providing multiple interaction modes to meet different information needs of users in different situations. This versatility and flexibility (of services) deserves further in-depth research.

Users often focus on access to information resources rather than discovery of information resources. Library systems must better provide seamless access to resources. People lack patience for browsing content knowledge bases and abstract indexing databases (to obtain information). They expect seamless access to resources, such as seamless transitions between full-text digital journals, online foreign language materials, e-books, various electronic publisher platforms, and virtual reference consultation services. The key to discovery services also lies in access rather than discovery, although their characteristics and names are knowledge discovery or information discovery or digital content discovery. To meet these expectations, it is recommended that librarians provide more authoritative and reliable digital resources through library systems and services, including everything from digital journals to carefully curated datasets, as well as virtual research environments, open source materials, non-textual and multimedia objects, blogs, etc., for discovery services in these areas.

Section 4: High-Quality Metadata Is a Necessary Condition for Information Acquisition

1. More Various Types and Formats of Digital Content Librarians must increasingly consider more types of digital formats and content. More diverse digital resources are better. However, more digital content does not mean blindly expanding more types and formats of resources. Blind expansion will only cause more users to request more digital content. On the contrary, user behavior research is necessary to investigate how library users find information in different contexts and situations. Information user and services research needs to focus more on contextual factors, then combine research results with those using more individual factors, and then distinguish what digital content is necessary and sufficient for information user and services. Only on this basis can we meet users' expansion needs for various types and formats of digital content.

Users very easily sacrifice content for time-saving convenience. Therefore, in information user and services research, understanding: selection of information sources (whether available online or in print), satisfaction with information

sources (whether they contain needed information and are easy to use), and time required to obtain and use information sources (how long it takes to obtain), etc., are important observation points for how users make choices during information search. In the current environment, most people don't have time to search for information or learn how to use new information sources or access methods. So when people can't find information, the simple conclusion is that digital resources should be increased. Increasing digital resources itself is not wrong, but matching digital content with users, enabling users to find needed digital content, and obtaining digital content in different formats or types all require support from information user and services research.

2. Researchers Still Value Human Resources in Information-Seeking Behavior Building relationships is important for both librarians and users. Both virtual reference service (VRS) librarians and reference service users highly value relationships in face-to-face (FtF) and virtual environments. Even though virtual reference services are more convenient, users still prefer face-to-face reference services because they bring them closer to librarians. Assisting scientific research, teaching, and learning activities, and building interpersonal relationships during the information service process is important. Adopting new and unconventional methods to connect and interact users with librarians when they need help is undoubtedly one of the best practices in information user and services research.

This may require a new type of librarian and information professional who has the desire for transformation and is eager to try new technologies and communication methods. Some users need training in electronic resource retrieval, others don't; some scholars widely use different research tools, while others remain consistent for decades; some faculty and staff obtain good satisfaction of information needs through recommendation systems and social media, while others are not allowed to touch social networks during work hours. So, how to decide the optimization of an information service or information search behavior depends on users, user needs, and the scenarios of user needs, not on the information service segment itself. Therefore, the value of human resources in information search behavior—that is, information service personnel—still exists. It's just that according to the development and changes of the information environment, current and future development tends more toward information service personnel who understand users and are good at communicating with users.

3. Users' Information Literacy Has Not Improved The current information environment is extremely rich, characterized by a surge in the number of information sources and providers, diversification of information access methods, and information redundancy resulting from diverse information sources. In this “overloaded” information environment, many information users easily experience anxiety due to information insufficiency. Although young people have obvious talent for computers and are confident in their abilities, this actually

masks their poor information skills and information literacy.

Future libraries need to continuously change to survive. Whether public libraries, professional libraries, or even academic libraries, to adapt to the rapidly changing global environment, they need to provide a sound development environment for “innovation, productivity, collaboration, and knowledge.” Traditional library work focused on how to obtain information. Now, obtaining information is no longer a problem. Librarians need to fill gaps in using, creating, and curating information. Currently, many librarians mainly assist users in content creation, evaluation, and production. On one hand, we not only need to create knowledge bases for content but can also guide and motivate researchers, scholars, and business people to contribute, including data sharing and content reuse. To this end, librarians need to establish stable relationships with users who create, collect, and analyze datasets to provide policies, systems, and services for the storage, access, preservation, and shared use of these data.

Review Questions 1. What are the main reasons for search engines as sources of information acquisition? 2. What are the main reasons for digital journal literature databases as sources of information acquisition? 3. What conveniences and difficulties does the internet bring? 4. Why is metadata needed to handle more types of digital content?

Chapter 4: Becoming a Convenient Channel for Users

Content Summary: This chapter stands from the perspective of information users to explain how information services should be considered. Recommended teaching time: one class session for content delivery, one class session for classroom discussion comparing with Chapter 3.

Key Concepts: Information selection, information channel, user psychology, generational differences, convenience.

Knowledge Focus: Mastering multi-level thinking and analysis of information-seeking behavior, user information needs, information acquisition channels, and user generations based on the concept of convenience.

Section 1: User Psychology in Selecting Information-Seeking Channels

1. Increased Options for Information Source Selection People’s decisions on how to obtain information usually depend on the context of information needs. Context can be learning or work environments, such as classrooms, offices, factories, or private environments such as homes or coffee shops. Users will consult different information sources and adopt different communication forms to meet their information needs based on context and personal situation. Additionally, as mentioned earlier, time factors affect the comprehensiveness of

information search, sources of information acquisition, and patterns of information query.

Whether in libraries or through libraries, the internet is a convenient way to obtain information. Libraries are considered to have the role of providing information through other media such as the internet, but the internet cannot replace libraries. In the world not long ago, information resources were scarce, and libraries were almost the only source of reliable information. To successfully meet their own information needs, users had to comply with various practical norms and standards of libraries. Nowadays, with the development of the internet, web browsers, and various services (blogs, chat rooms, social media websites, etc.), as well as easily accessible rich digital content, resources are increasingly abundant while users' attention to libraries has become relatively less. Librarians find they must compete with other more convenient, familiar, and easier-to-use information sources. In the past, users built their workflows around library systems and services, but now, the increasingly obvious trend is that libraries must build services around users' workflows.

2. People Adopt the Simplest Methods to Collect Information In today's information environment, people may sacrifice information content for the convenience of information sources. Convenience is a major factor in people's choice of information sources; it is a way to improve comfort or save time. Users tend to choose online resources over physical libraries because if users find libraries disappointing, they try to avoid them. This is not entirely caused by information services or librarians; there are also objective factors, such as users' limited time, distance from libraries, and time spent on library searches.

Regarding information search, the connotation of convenience includes familiarity with resources, perceived ease of use, and physical proximity. For example, users may consider web searches fast and easy. Web searches can provide instant access to information acquisition and what they want, although not always the best information source, but usually because of its convenience or ease of use, or because it doesn't require much time or money.

3. Accessibility, Usability, Convenience, and Time According to role theory, students may prefer using web searches because they include the time and effort required to obtain information. Such searches can complete homework more quickly, easily, and conveniently. Services like Wikipedia may better meet undergraduates' needs because in a world where credibility is lower than what students preset or expect, it provides a combination of coverage, currency, convenience, and understandability.

According to rational choice theory, even user groups can be viewed from the perspective of independent and basic individual behavior. Users act according to their own interests, not necessarily to achieve goals similar to other individuals, but according to their own preferences, values, or utilities. For example, the poor

prefer to seek immediate satisfaction, tend toward quick incentives, pleasure, or excitement, and like to engage in activities that provide immediate returns.

According to satisfaction theory, in the information search process, convenience is a contextual criterion for people to make choices and take actions. This concept includes their selection of information sources, satisfaction with information sources, ease of use of information sources, and the time frame they allow for information search. For example, in daily life, limited time frames restrict information search behavior, but in academic communication contexts, the availability and accessibility of information are the main factors affecting information source selection.

Under these different perspectives, another issue worth noting is the user group itself. Users from different generations may have different applicability for adopting role theory, rational choice theory, satisfaction theory, or other theories.

Section 2: Generational Differences Among Users

1. Baby Boomers' Information Use Characteristics Baby boomers are the largest generation in the world. After World War II ended in 1945, with increased life expectancy, their numbers will continue to grow in demographic terms. The baby boomer generation is more educated, more technologically literate, and economically more advantaged than any generation. They tend toward self-fulfillment desires, work is very important to them, they have collectivist tendencies, and they desire personal and spiritual growth. Currently, the main characteristics of baby boomers are focusing on health and staying young, and staying connected with technology. Baby boomers increasingly use technology in libraries. They have high expectations for public libraries to provide newer and better resources.

The baby boomer generation has changed the forms of work and technology of previous generations. More and more white-collar workers or older people continue to pour into the labor market, exposing them to technology integrated into daily life. Baby boomers have different requirements for information because they read more and use public libraries more than previous generations. "Most people can use computers and the internet at work and in life." For baby boomers, information acquisition and email are the most prominent uses of computers and the internet. Their interests and habits bring new requirements for information and technology. Although baby boomers and millennials show different behaviors and characteristics, there are also some similarities.

2. Millennials' Information Use Characteristics Millennials, born between 1979 and 2000, are also known as the Net Generation or Generation Y. They are digital natives, immersed in information technology as they grow up, so they take these technologies for granted. Technology surrounds them and dominates their social interactions. They do not tolerate delays and need and demand rapid responses from communication partners. Additionally, millenni-

als' relationship patterns tend to be non-hierarchical. They can be independent individuals or part of a single network whole, especially communication habits developed in technological communication environments such as instant messaging (IM) and chat groups.

Millennials tend toward experiential learning, have more critical thinking abilities and judgment. Millennials work and learn in visual environments and are good at processing visual information, so they have relatively many requirements for information interaction systems and their information design. Additionally, millennials often have difficulty concentrating for long periods and think in hypertext ways. Older generations often go online for specific tasks, while millennials are comfortable both online and offline.

3. Comparison of the Two Generations Due to differences between the two generations, information services can be designed according to different needs, such as developing services and systems that meet the needs of both. Given users' increasing loss of interest in traditional library services and website content, library websites should be updated frequently, including the latest information, personalized online services, and interactive functions. Librarians need to create different areas for different user needs. Millennials hope to provide various communication areas, but baby boomers need quieter spaces, such as comfortable seating and well-lit environments.

Millennials think data resource catalogs should be more like internet search engines or online stores, provide spaces for social and group work, and make it easier to connect with librarians. Older baby boomers are more interested in convenience, such as mobile libraries, library book delivery vehicles, and coffee house environments.

To effectively meet millennials' user needs, librarians need to develop a series of customizable and flexible services, including regular feedback, providing trustworthy guidance, opportunities for social and interactive learning, visual and kinesthetic elements, and authentic, original, relevant, and connected thematic exchanges.

In terms of interactive communication, conversations between baby boomers and librarians are often more like business meetings than social interactions, or they are unwilling to communicate via instant messaging through text or voice, while millennials use more exclamations, slang, and abbreviations, which are transformed from social chats or reflect habits from text messaging over time.

Section 3: Convenience in Information Search

1. Different User Generations' Views on Convenience Convenience is one of the cores of information search behavior. Whether academic information search or daily life information search, when users make information source choices, they may play different roles in different situations, but all have needs for convenience.

When users make rational choices in information search, resource accessibility is one method to measure convenience. The most convenient information sources may be internet search engines, electronic databases, virtual reference services, or online electronic storage, e-books, and online booksellers. For millennials, the importance of search engines is self-evident. Besides conveniently accessible database resources on computer desktops or at home, they also consider human resources as convenient data sources for information sources and having a personal library at hand. For baby boomers, convenience often involves using physical libraries and their data, and how to access library resources when libraries are closed or on weekends. The enhancement of library systems varies by participants' academic roles, but these are often related to the convenience of accessing resources.

2. Improving Convenience in Different Contexts Different contexts and situations of information needs do not reduce the role of convenience, although convenience factors vary by situation. For example, both students facing long academic tasks and experts and scholars value convenient access to high-quality resources stored in libraries, but academic tasks place more emphasis on convenience than daily life information needs because academic tasks are heavy and unavoidable.

In electronic database search or search engine environments, convenience remains important. Virtual reference consultation services play a certain role in improving the convenience of users' information source selection behavior. Especially when users face long time spans of academic tasks, they tend to find librarians at the beginning to formulate reasonable information search strategies or recommend appropriate information sources and tools. In short time spans, whether because the information need itself has a short cycle or long time spans are divided into various independent short periods, this effect and need are not necessarily obvious. This highly time-oriented information need is expressed most among younger groups, especially millennials, but is present in both groups.

3. Overall Improvement of Convenience in Information Search The image of libraries as quiet spaces for obtaining books rather than accessing electronic resources remains common today. To attract people to use libraries and change their perceptions of libraries, the library experience needs to become closer to web usability and be embedded into personal workflows. The network environment is familiar to users; therefore, they feel comfortable and confident when choosing to search for information here. Librarians need to adapt to or seek to purchase services and systems designed as replicas of the network environment, making them convenient and easy to use.

In some cases, information seekers easily sacrifice content for convenience. Therefore, convenience is one of the main criteria for making choices during information search. Convenience includes selection of information sources,

satisfaction with information sources, and time required to obtain and use information sources. In the current environment, most people don't have time to search for information or learn how to use new information sources or access methods. To become one of the preferred sources of information, library systems and interfaces need to be similar to popular web interfaces, making people feel familiar. At the same time, library services also need to be easily accessible and usable with little or no training. Convenience is a key factor for users in all demographic classifications to conduct information searches and will likely continue to be so in the future.

Review Questions 1. Recall what information search channels you usually choose and why. 2. Describe the characteristics of different generations of users. Which generation do you belong to? Do you think the introduction in this chapter correctly describes your situation? 3. Write down what you think are the requirements for convenience in information search and exchange insights with others.

Chapter 5: Services Integrating into Information User Scenarios

Content Summary: This chapter emphasizes the importance of “actions speak louder than words” and “learning by doing,” mainly exploring how to understand and further comprehend information user and services research through field investigation rather than purely reading this book or listening to lectures. Recommended teaching time: one class session for content delivery, with after-class assignments focusing on each person designing a preliminary research topic for information user and services research.

Key Concepts: Research design, analytical framework, scientific method, academic theory, practical application.

Knowledge Focus: Understanding the help of information user and services research for academic theory and practical application; understanding various related research directions; mastering the process from designing to conducting to completing projects.

Section 1: The Role of Information User and Services Research

Information user and services research, sometimes also called information behavior, information search behavior research, or user research, is not a new research direction. As early as 1931, Ranganathan wrote, “Perhaps the most convenient way to study the results of this law is to track users from the moment they enter the library until they leave.” This “tracking users” viewpoint sounds like considering big data analysis now—analyzing all data about end users—and also like the increasingly popular log analysis and anthropological research in

library and information science, emphasizing viewing resource allocation issues from the user' s perspective.

The current socio-economic development environment has triggered renewed emphasis on re-evaluating the roles of scientific research and education institutions and libraries—that is, how to reflect the value of information user and services in the current academic environment. This evaluation includes analyzing data obtained from the education system to measure student success, rather than services and resources provided by libraries. The evaluation also includes using data generated by library systems and services, such as network analysis and feedback from academia (whether they use libraries or not). If they do use libraries, it is important to clarify how and why they use them. If they don' t use libraries, it is equally important to clarify how and what they use to obtain information and understand why they use these services and resources instead of those provided by libraries.

Section 2: Framework for Information User and Services Research

Nowadays, ways to obtain information are more convenient and familiar to users than obtaining information from traditional library environments. Libraries are not the first choice for most people to obtain information. This may be attributed to people not knowing services exist or some existing services being unfamiliar or not conforming to their workflows. One approach is to improve existing information service resources, models, and methods; another is to solve this through brand promotion and marketing activities.

On this issue, a wiser approach is to collect behavioral evidence about information users' perceptions, habits, and needs. We can ensure that future library service designs are centered around users. Additionally, clarifying how people participate in scientific research activities and analyzing users' information in academic communication activities, those factors affecting how and why they choose to use resources, thereby making problems open for discussion to facilitate the formulation of research agendas, and then integrating information service librarians into users' lives.

On the path to examining these issues, some effective research results have proposed relatively reliable frameworks at the current stage: Role theory and rational choice theory provide two analytical frameworks for understanding why users decide to stop looking for more information when acquiring information, while satisfaction theory provides a third analytical framework for explaining phenomena.

Section 3: Topics in Information User and Services Research

In the “overloaded” information environment, information users often feel information insufficiency and anxiety. By understanding how users seek information sources and how they select information content to meet their own needs, we can

gain insights into information-seeking. Therefore, this problem can be specifically divided into a series including: information seeking, information searching, extension of information collection processes to how and when users stop searching for information. This series can be summarized into three main questions:

1. If we try to clarify how people seek information, how and why they obtain information, and how and why they choose to use specific technologies, can information services provide services that meet some of these needs?
2. In today's limited resource environment, does this exceed the scope, boundaries, or capabilities of information services? Is this a direction we need to pursue?
3. Should we only focus on those who currently use our resources and services, and subsequently develop personalized or "boutique" library services? How should non-users be considered?

As the information environment changes, we need to envision services that fill gaps in people's professional and personal lives. Working around emerging issues, such as developing data management plans and reusing practices and policies, people and knowledge networks, creative design of physical and virtual spaces, provides opportunities for librarians to develop libraries suitable for users' lives.

Section 4: Uses of Information User and Services Research

We have learned that information environments and conditions often prescribe how people behave and engage with technology. These resources are usually discovered through web browsers, including freely available resources such as Wikipedia; human resources and library resources. Our research shows that building relationships and interacting with people are very important. If they understand and trust us, then when they need information, they will seek help from us and recommend us and our services to others. When asked to identify successful virtual reference consultations, users cited instances where they didn't get answers, but when they had good relationships with librarians, librarians were friendly and helpful. This reflects the importance of engagement and relationship-building in online and physical environments to develop successful and effective services.

The network environment and affordable devices make it simple and convenient to access free information sources whether human, digital, or physical. It will become very important for librarians to develop partnerships with those who create, collect, and analyze datasets to provide policies, systems, and services for the storage, access, protection, and shared use of these datasets. Librarians, library users, and potential users indicate that this relationship is crucial. In the future, some different types of librarians may be needed—those who embrace change. New technologies, communication methods, and service pushes will continue to prompt libraries to rethink current services. This requires building relationships with academic community members to provide user-centered services that meet their needs and expectations.

In today's fast-paced world where information often overwhelms people, users of information systems want quick and convenient access to information. Convenience is a key factor. Convenience is a contextual criterion for user choice and behavior in all stages of the information-seeking process. It can be measured, evaluated, compared, and discussed regarding users' information source selection, user satisfaction, ease of use of information sources, and response time of information seeking. Especially in demographic classifications—comparisons after user classification by age, gender, academic role, virtual reference service users or potential users—can quickly reveal the role of convenience in various contexts (including academic information search and daily life information seeking), thereby obtaining suggestions for improving and enhancing information services.

Libraries are influenced by the ways individuals engage with technology; the ways users seek, obtain, contribute to, and use information; and the ways and reasons they practice these behaviors and do what they do, all of which affect librarians. This work choice represents a research focus that depends on our findings and work priorities in the research field of embedding libraries into institutional workflows and integrating users into the environment. It provides the library community with behavioral evidence about users' perceptions, habits, and confirmation that future library services revolve around some influences of user technology, modern research, and learning environments. To make libraries still meaningful in the future world, information user and services research needs to continuously explore how to improve and provide services so that people can use, create, and manage information and content.

Review Questions 1. Why study information user behavior? 2. Explain the three paradigms and frameworks of information user behavior. 3. What are the three main questions in information user behavior research? 4. Explain the relationship between network environment, libraries, and reader users.

Chapter 6: Basic Methods for Information User and Services Research

Content Summary: This chapter meticulously lists the main research methods for information user and services research, starting from preliminary preparation, providing fourteen data collection and analysis methods, and three relatively novel research capabilities. It introduces how to combine and apply various research methods to the research topics assigned in the homework after Chapter 5. This chapter has substantial content; three class sessions are recommended for teaching.

Key Concepts: Usability, content testing, card sorting, questionnaire survey, user interview, diary, information architecture, contextual inquiry, A/B testing, stakeholder, content analysis, affinity diagram, mixed methods, prioritization.

Knowledge Focus: How to prepare user research, how to select appropriate research methods (advantages, disadvantages, limitations of various methods), how to combine various research methods.

Section 1: Preliminary Preparation for Information User and Services Research

1. User Research and User Researchers User research refers to the study of people's (users') behaviors, motivations, and needs in specific contexts. This affects how people understand and utilize things in daily life. How these factors change over time is also within the scope of user research. User research is closely related to products and services that interact with people. User research differs from market research. The purpose of market research is to identify consumer preferences and needs. They have different goals and outcomes.

The role of user researcher is increasingly common in digital and service industries, even in policy formulation. User researchers are usually established in institutions that emphasize "user experience" or "user-first" work methods. Common related professions include: business developers/business analysts; communications personnel; copywriters and content designers; digital marketing and campaign specialists; digital/transformation/IT specialists; service designers; gallery and museum curators; information architects; marketing managers; politicians/policy analysts; social media/digital communications specialists; teachers/professors; visual and interaction designers; web administrators and developers.

Many institutions' service foundation is to create ideal experiences for users, but they do not fully recognize the importance of users during the development process. Without user participation, an institution may spend a lot of money creating a failed product and service because they don't understand who their users are; what users need/what they're trying to do; how users currently try to do things; and how users want to do these things.

The role of user research can be summarized as: - Designing better products, services, and experiences - Improving existing products - Adapting to changing behaviors and expectations - Saving money by developing the right product the first time - Influencing users by providing them with what they need, want, and more - Influencing user behavior by allowing users to do what they want and letting them do what you want - Providing evidence-based rather than opinion-based solutions for stakeholders to influence decision-making - Questioning the institution's original internal assumptions

User research applies natural observation and communication skills in specific ways. In fact, everyone has tried related attempts: testing a person's idea, seeing their reaction to it, improving the idea, and trying again.

2. Research Matters To conduct effective research, it is necessary to clarify the research purpose, concentrate research in one place, and produce the most

effective results. Focus on problem framing, also called opportunity framing, to understand the problems you are trying to solve or understand, or the opportunities contained in the research. Considerations include: - Clarify research purposes and share them with stakeholders (anyone involved in the project) - Obtain consent before starting research - Agree on goals and related matters in advance to avoid constant changes during the research process - If uncertain about research questions, you might think: the purpose of research is to understand the problem - There will certainly be many applicable research methods, but talking to the right people about this is still necessary

Regarding timing, ideally all the time, you can also choose times when user research has the greatest positive impact. If working in a truly agile, user-centered environment, you can plan user research regularly. If researching a completely new concept, product, or service, user research needs to start as soon as possible. At the beginning stage of the concept, after some preliminary thinking, user research is needed to understand whether current thinking is heading in the right direction. Understanding how people behave and think can clarify whether the current concept is improving users' lives or solving needed problems. If the product/service already exists, there is never a bad time to conduct user research; problems found in user research can be corrected in the next round of work, and research and testing can be conducted again. When conducting user research, focus on research with clear time constraints. Time sensitivity may limit method choices; researchers may choose the fastest and simplest method to meet time constraints, but it may not be the most appropriate method.

Regarding ethics and law, it is necessary to be transparent about what is being researched and the process. This needs to be shared with people participating in the research. At the beginning of any research session, participants need to be given some detailed information (whether they are filling out online surveys or conducting face-to-face interviews).

Participants need to be told: - Whether data will be recorded in some way (video, audio, screen, survey data capture, etc.) - How data will be manipulated (will this data only be used for this research?) - Who will it be shared with: people in the organization or outside the organization? - How is data sorted? Is it safe? - How long will this data be stored? For example: until the project ends? One year or forever?

Informed consent for data manipulation needs to be obtained. If someone does not express consent at the beginning, the session needs to be terminated. Keep consent forms as long as information is used and stored. If someone withdraws consent, you need to stop research immediately and ensure that any collected data is destroyed/deleted, and this collected data should not be used in research analysis.

3. User Research Participants There are many different ways to describe users of products, services, and content: users, audiences, customers, or con-

sumers. Getting the right people involved is one of the basic principles of good research: if you don't understand who "they" are, you won't be able to provide "them" with the right things. Whatever services an institution provides, you can always find corresponding users of interest. The situation where everyone is a user is basically impossible. If you try to cover everyone in research, the research will probably not be very successful. The most basic question is: identify your own users.

You can cover designated users and potential users. Users with similar behaviors and needs can be grouped into one category. According to different requirements, you can have different types of user groups. Different user groups behave differently, so choosing different user research groups will affect final research results. Having a small group of suitable users is more effective than a large number of unsuitable users. To achieve research purposes, you need to think about treating users, audiences, and customers as research participants. There are many reasons why researchers may recruit the wrong participants: unclear who users are; users are difficult to access (such as lawyers, doctors, presidents of large companies, seriously ill people and their families, etc.); the funds needed to include them in research are expensive.

You need to find the right respondents. There are specialized agencies that recruit users for user research and market research. You can recruit the needed population for research by providing recruitment requirements to agencies. Whether you choose by yourself or through agency recruitment, you need to pay attention to two points: recruitment announcements need to clearly specify the recruited participants and their numbers; recruitment screening uses questionnaires to screen out people suitable for participating in research.

Recruitment announcements should include: research dates; locations; research duration; number of participants needed; specific time occupied by research; rewards (compensation for participants); demographic characteristics of needed participants.

Recruitment screening requirements: Since respondents' self-assessment behavior is relatively difficult, detailed descriptions and explanations of related steps are needed. Use neutral language to provide potential options for respondents to reflect on their own behavior, rather than only targeting content the research hopes to obtain.

Questionnaire elements should include: introduction; demographic behavior; logical symbols; confidence level; technology and device use; confidentiality and disclosure level; accessibility.

Common problems: - Don't assume everyone can correctly understand the information conveyed to them. Otherwise, two situations may occur: 1. Provide explanations that don't actually help users; 2. Users don't need explanations, try to understand questions through guessing, and eventually feed back incorrect data. - Having closed-ended questions (yes/no questions) is necessary and effective in some cases. However, in exploratory research, interviews, and us-

ability testing research, open-ended questions are needed. For example, “How was your experience with XXXX?” - “Do you like it?” seems like a good question. But it actually affects respondents’ behavior, making them more inclined to give positive rather than negative answers. Because most people don’ t want to hurt others’ feelings, they will consider the reaction of the answer to the tester. - “Do you understand XXX content?” This question already assumes respondents make yes or no judgments based on understanding the content. - “How do you understand XXX?” This question already assumes respondents have some understanding of XXX. - “What does XXXX mean to you?” This question doesn’ t involve whether respondents have sufficient understanding of XXX, just simply asking for their descriptive judgment.

4. Research Considerations Regarding safety issues: No matter where you try to conduct research, you need to inform the research team in advance about the location and time. It is recommended that two people jointly complete indoor user research work. This is a consideration for safety and trust for both research parties. If participants are relatively rude or have bad attitudes, please try to ignore them. You can ask interviewers before research begins whether they should pay attention to medical conditions and emergency medical measures as appropriate. Being in an environment with respondents, mutual influence is unavoidable, so you need to consider the impression you convey to users when conducting user research. Dress appropriately, not too formal, but matching the occasion. Prepare corresponding equipment in advance. If participants are in mobile places such as transportation transitions, you need to prepare in advance for them and cooperate with participants’ schedules, arriving early. If you are in a mobile place yourself, you need to pay attention to preparing everything needed for research as much as possible.

Regarding cultural differences: It is necessary to consider cultural differences brought by different cultures. Consider international research, research in different regions, and research in different socio-economic groups. Consider language barriers, local customs and behaviors, and some potential differences, and formulate appropriate research plans for this. Prepare plans for differences. Deeply understand the content of collected data.

Section 2: Usability Testing

1. Definition of Usability Testing Usability testing (also called user testing) is a common method that involves observing user behavior and identifying problems when users use a product or application. Usability testing has many forms, including qualitative and quantitative, as well as moderated and unmoderated usability testing.

Moderated usability testing: Researchers and users interact simultaneously in the same room. Researchers and users are in different places but interact through screen-sharing technology.

Unmoderated usability testing: Researchers and users are simultaneously in the same room, but researchers do not intervene or talk when users complete tasks. When users perform research tasks at times and places of their own choosing, researchers do not participate.

These two types of testing are complementary: both types of research can be conducted. For example, moderated usability testing can be conducted on prototypes to solve all major usability problems; during the product development cycle, unmoderated usability testing can be conducted. If possible, conduct both studies simultaneously. If you already have some user research experience, you may encounter stakeholder resistance and lack of confidence in the small samples involved in qualitative testing compared to the large samples obtained from unmoderated users. Building stakeholders' understanding of qualitative user testing will help gain their trust in results and confidence in next-step decision-making. This may be difficult to schedule for busy stakeholders, so video playback can help.

2. Moderated Usability Testing Moderated usability testing provides more control. Researchers can answer questions raised by participants (if applicable) or notice questions raised by participants. Benefits of this testing include: it can adjust research based on moderated findings; it is cost-effective; results are robust; it requires assistive usability testing including assistive technology users.

However, moderated usability testing is a time-consuming research method. Scheduling research with participants is more difficult and limits their time and location. Additionally, moderated usability testing uses small samples, so it is not statistically significant. If you need to study “natural behavior” without intervention, this method is not very suitable.

Results are affected by the method, which is called the “observer effect” – observation changes the observed and measured behavior. You cannot bypass the fact that watching and talking with participants will change what they do compared to when you are not present observing. This is a flexible method that can be used at any stage of the product or service development life cycle, from early prototypes to fully implemented operating systems, services, and experiences. If possible, conduct tests face-to-face. Qualitative usability testing means this research will not be statistically significant. It also means you don't count the number of clicks participants need to complete tasks or time how long it takes to perform a task. A “user test script” is a document where you write operations that need to be followed exactly in the order written. A “user test protocol” looks exactly the same as the script but is used differently. You don't have to do everything in the exact order it's written down. For example: usability test document—introduction and ethical/legal issues (5 minutes); brief pre-task interview questions (5 minutes); usability test research tasks; brief post-task interview questions (5 minutes).

Thinking aloud is the main method for conducting moderated usability testing. Participants need to verbally describe what they are doing, their thoughts, and feelings while performing defined tasks, which helps to gain in-depth understanding of participants' psychological processes during task execution. For researchers, experience is needed to judge when it is appropriate to speak during testing (because participants need encouragement to express their thoughts) and when to remain silent. When participants ask questions, immediately note down their questions and when they ask them during tasks. Before answering, you can first ask the participant group what they would do if they were doing these things themselves. This is very useful for seeing whether they can solve problems themselves or the point at which they cannot solve problems and give up.

If participants' questions are not important, you can choose not to answer, just ask them to move to the next step. You can tell participants that questions will be answered uniformly after the research ends. If questions are crucial to research progress, please provide help, but be sure to note the factor of providing help. Because the researcher encounters this problem and cannot make progress themselves, this is a serious usability problem.

During research, important issues and key information should be recorded: participant name/number, task name, task completion/partial completion/failure status.

3. Unmoderated Usability Testing Unmoderated usability testing means participants complete specific, defined tasks without researchers present or intervening, mainly studying digital projects. Unmoderated usability testing can be completed face-to-face or remotely. In remote unmoderated usability testing, participants can basically complete research anytime, anywhere, and on any device, thereby providing flexibility. Some people think it is more realistic and fairer than moderated usability testing. Unmoderated usability testing understands how participants actually complete tasks through observation. You cannot talk with participants while they perform tasks or ask them what they are doing and why. The reason for choosing this method is: large data samples are needed.

Therefore, it is suitable for situations where: large data samples are needed; participants are difficult to access; time is tight; specific contexts; budget is limited.

All methods have their application limitations. Disadvantages of unmoderated usability testing include: cannot determine whether suitable participants can be recruited; lacks in-depth dialogue; researchers have less control over what happens. If large numbers of participants are needed for quantitative research, remote unmoderated usability testing can be used. You can track/record participants' operations in some way so that data can be analyzed after capture.

High-quality unmoderated usability testing needs to focus on format issues: low-

fidelity or high-fidelity; digital or paper prototypes; real-time test environment; real-time public website; any other relevant assets. Additionally, determine which observations to record. Remote testing also affects tool selection. For example, allow participants to add qualitative annotations. Determine which metrics to record: task completion rate; time to perform tasks; time on page; number of clicks per task; web analytics data (e.g., browser, operating system, screen resolution, device).

Usable related questions: - I think I would like to use this system frequently. - I found the system unnecessarily complex. - I thought the system was easy to use. - I think that I would need the support of a technical person to be able to use this system. - I found the various functions in this system were well integrated. - Any relevant questions can be used. For example: - I thought there was too much inconsistency in this system. - I would imagine that most people would learn to use this system very quickly. - I found the system very cumbersome to use. - I felt very confident using the system. - I needed to learn a lot of things before I could get going with this system. - It is recommended to use a clearly defined scale, such as: Strongly Agree/Neither Agree nor Strongly Disagree/

“Thank-you statements” can be used in the ending part of the study. If testing face-to-face, you can finally express a brief statement to participants, which can include appreciation for their participation, reminders of what happens next, and contact information if participants have questions.

During face-to-face research, participants are left alone in the research lab to complete a series of tasks. Based on their work agility, you can understand how they complete tasks.

Because of close proximity to participants, after face-to-face testing is completed, there is an opportunity to ask them questions about their experience. This can be done through several methods: online or paper surveys; brief interviews; experience under eye-tracking protocol (PEEP). If using a research lab, you can test with eye tracking so you can ask questions: Did participants notice xx? Can participants use xx? What is the cognitive load of xx on the page? Does xx make it harder or easier for participants to navigate to what they need?

Section 3: Content Testing Method

1. Definition of Content Testing Method Content testing is a specific type of usability testing that focuses on studying the suitability and understandability of tested content for target audiences. Good content requires a lot of effort to create. If content is created correctly, it can help build trust and confidence in users and reduce the risk of errors for organizations and users.

The research method aims to deeply understand what people see, the language they use, and how they will process action-oriented and task-oriented content. Whether focusing on content or looking at usability more broadly, this method does require some time and effort to become proficient. For example, when com-

paring multiple versions of digital content, multivariate testing may be needed, which requires some support from technical personnel.

2. When to Use Content Testing Method Content needs to be researched as early as possible in a product's development cycle. Especially in the world of digital development, once the technical structure becomes relatively stable, content becomes easier to implement. Since creating good content may take a lot of time and effort, it is necessary to start creating and repeatedly testing it early.

3. How to Use Content Testing Method Before starting research, you need to prepare for any type of content testing. You can check the assumed reading age for written content. You can print out words, phrases, and questions and ask users to read them aloud and explain their meanings. This method is useful for creating content that meets different cognitive needs and abilities. This testing can eliminate the "I am being tested" feeling in research and maintain low stress and anxiety levels because there are no "correct" answers. Open-ended questions can be asked, such as "What does this mean to you?" Open-ended and task-oriented content questions can also be used to determine whether participants understand the content and their expectations for results, or what to do next based on what they have read.

For example: "How would you use this website to register for xxx?" Cloze tests are another method focusing on reading comprehension. Participants view selected text where certain words are deleted and then fill in the blanks. If unsure about which comprehension test to conduct, run some pilot tests to see participants' most effective responses and which provide the most useful insights.

When people express their language feelings, this language can be reflected in content. This method can be used for sensitive content. This research method can also be used to gain in-depth understanding of the language used by user groups, differences between them, and whether their usage aligns with organizational usage.

By using A/B testing, you can compare two (or more) versions of content to see which version performs better. This is a good way to test how users connect with content. You can show each version to participants, or you can practically test it by showing each version to different users of digital products/services. Print content for each participant and one copy for yourself, highlighting key points with a highlighter. Ask participants to read and highlight things that give them more confidence and things that reduce their confidence. The research team immediately understands the impact of what they write.

Section 4: Card Sorting Method

1. Definition of Card Sorting Method Card sorting is a method used to understand how people think about and associate things, grouping items related

to each other. Card sorting does not necessarily need to focus on content and website items. It can also provide insight into people' s mental models.

Card sorting mainly targets content. If used in isolation without considering tasks and processes, it may produce an information architecture that users cannot use in actual tasks. To meet user needs, card sorting should be combined with other methods (such as prototyping or usability testing). The card sorting method can be time-consuming, depending on the amount of content to be sorted and the number of participants.

2. When to Use Card Sorting Method The card sorting method can be used at any time stage in the product, service, or experience life cycle. Different card sorting methods are used at different times depending on where the product or service currently is and what the goals are. - **Open card sorting:** Participants group items and name groups as needed. - **Closed card sorting:** Researchers predefine group names and ask participants to use them. Used to confirm that all user groups can use pre-existing structures. - **Mixed card sorting:** There may be some predefined groups, but participants can add other groups. - **Iterative card sorting:** Participants iteratively refine groupings from previous participants. - **Open card sorting is highly exploratory.** - **Multiple iterative card sorting projects:** This is when you conduct more than one round of research, possibly breaking it into manageable parts, or if you have multiple user groups, research each group separately. - **Single iterative card sorting project:** Having participants refine the work of early participants is almost like conducting dynamic...

Scenarios suitable for using open card sorting include: - If you have no fixed ideas about how items should be grouped for projects of interest, conduct open card sorting. - When you need to build something new from scratch. - When analysis and other insights indicate that current groups simply don' t work at all. - When some major change has occurred that means the current structure no longer applies.

3. How to Use Card Sorting Method In moderated card sorting, researchers and participants interact simultaneously in the same room. Items need to be written on cards, participants place items on the table, and simultaneously discuss their thoughts and understanding of items and item groups with researchers. The first thing to do is determine the topic list. This can come from multiple sources, such as existing or potential online content, process descriptions, applications, and functions. It also includes planned content; you can create structures that can be used now and in the near future (to a certain extent).

Whatever topics you decide to test, you need to ensure they are all at the same level. For example, if most cards are individual pages, don' t include cards containing entire websites. You need to make all cards display individually. Other levels of the website will have to be in different card categories; otherwise,

participants will find it difficult to group content at different granularity levels. The general consensus is between 30 and 100 cards. If fewer than 30, there are not enough items to form groups. More than 100 cards may be time-consuming and tiring for participants. The more complex the topic, the fewer cards should be used because this type of card sorting has high cognitive difficulty.

There will rarely be a group of users interested in all aspects of the provided products. Usually, users will be very interested in one or two specific things and perhaps somewhat interested in two other areas. You can have everyone sort all the content, but asking participants to sort things they don't understand or are not interested in will lead to inaccuracy and inconsistency. Moderated face-to-face sorting provides the greatest flexibility: open, closed, iterative, or mixed. The protocol should include: introduction and ethical/legal issues (5 minutes); brief pre-task interview questions (5 minutes); card sorting samples and prompts; brief post-task interview questions (5 minutes).

For remote and unmoderated card sorting, when participants conduct card sorting at a certain time and place, researchers will not participate. Researchers need to conduct the following steps: preliminary survey questions; sorting instructions; post-sorting questions; thank participants.

Like usability testing, card sorting should be iterative. One card sorting session won't show everything you need to know, especially when content is huge or there are multiple different user groups. It should be clear: don't try to do everything once and for all. This not only makes setup and operation difficult and complex.

Section 5: Survey Method

1. Definition of Survey Method Both market research and user research frequently use surveys. Surveys have limitations but are inexpensive to run and can attract many participants. The discussion here mainly focuses on surveys conducted face-to-face or by phone.

Surveys can count or quantify concepts and allow conclusions drawn from samples to be applied to broader populations. Statistically significant data (requiring about 1,000 responses) can convince stakeholders that designs or decisions are valid. You may not need to aim for statistical significance, but surveys are still a useful method for collecting quantitative and structured data for analysis.

2. When to Use Survey Method Surveys can be conducted at any stage of the product or service development process or life cycle. They can be used in the following stages: - Before redesigning, to understand what users want to accomplish and their satisfaction with the current experience - After launching a new or improved product/service, to understand whether the new design meets user needs and identify areas for improvement - When needing to rate or rank content or functions, to obtain ideas for future improvements - When needing to explore why people access or use products/services and evaluate their access

experience - When needing to quantify results of qualitative research activities (such as contextual interviews) - When needing to evaluate system usability

Launching simple online surveys is very easy. However, if you need reasonable logic and paths to show the right questions to the right people, surveys can also become very complex. Surveys can quickly attract many participants. Phone surveys and face-to-face surveys will require more time and effort but may be the most inclusive way to find the right people. If participants of interest cannot easily access computers and the internet, or have low digital capabilities, phone surveys and face-to-face surveys are especially needed.

3. How to Use Survey Method Like any user research, before designing a survey, you need to clarify the purpose, where you can find participants, and what tools to use. Additionally, pay attention to the limitations of information collection.

Pay attention to basic rights that must be obtained. Keep the survey as short as possible. Provide participants with an estimate of completion time in advance. If possible, show participants their progress when completing the survey. Include both open-ended and closed-ended questions. Minimize open-ended questions; multiple-choice and rating scale questions are more useful for expressing participants' feelings about a topic.

Rating scale questions should have equal numbers of positive and negative choices; include neutral and "don't know" options, allowing participants not to provide answers. Surveys need to group similar questions together and arrange them in logical order. Questions need to be suitable for the audience. You can first ask participants about themselves; self-selection will help provide correct questions. You need to understand how to use the logical rules of the selected survey tool. In follow-up surveys or interviews, ask respondents if they are willing to answer more in-depth questions (and collect their contact information).

Surveys are most effective when asking participants about relevant practical experiences they have just completed. Questions can include: - Who users are - What users want - What they purchased - Where they shop - What they own - How they view products/services - Whether they can find what they want - Their satisfaction with products/services - What they like and dislike - What frustrations or problems they have encountered recently - Whether they would recommend products/services to others - If they have any improvement ideas or suggestions - How they would describe products/services in one or more words - If they could change one thing about products/services, what would it be and why - What functions they cannot do without - Anything else they would like to share (open-ended question)

If you have a target audience/user group, you need to consider how to recruit these people for the survey. This actually depends on the goal. Some considerations: - Don't force sharing of contacts and personal details (unless providing incentives) - Don't use double negatives and technical jargon - When using

surveys for research, writing clearly and concisely is very important - Don't use multiple concepts in one question: each question should focus on one thing - If you want to attract new user groups/audiences, such as users you don't know, users you know but cannot access, you need to hire agencies to find them - Before releasing the questionnaire to all audiences, it's best to test it first - If necessary, conduct a pilot survey first. For example, you can ask colleagues and others to participate in the survey, but don't give them too much background information; only provide the willingness of any potential participants - Whether to include incentives affects the type of people who complete the survey: basic 5-minute surveys don't necessarily need to provide any incentives. For more detailed and complex surveys, some form of incentive needs to be provided

Section 6: User Interview Method

1. Definition of User Interview Method We are all familiar with some form of interview, usually job interviews. In research, user interviews are also a common and well-established method used in social sciences, market research, user research, and human-computer interaction. They can be conducted face-to-face through phone or video calls. For user research purposes, user interviews are useful for understanding attitudes and preferences (and how they change over time), common behaviors, the environments in which users live and operate, and how they think about and associate things.

User interviews (especially face-to-face interviews) are a good way to connect with users who have difficulty accessing technology and users with low literacy and digital skills. User interviews can be used to understand participants' experiences and backgrounds. However, in many cases, users are not designers, so interviews are not a good way to ask users to create details of ideal solutions or to ask users to answer specific improvement suggestions. User interviews need to clarify what is currently happening, how users feel, what goals/what they want to achieve, and the outcomes they want to achieve.

2. When to Use User Interview Method In situations of limited time and budget, user interviews are a somewhat opportunistic method—that is, when insights are needed but there are no resources for more complex research.

User interviews can provide preliminary understanding of work backgrounds and encountered problems, which will help define project scope and goals. User interviews are a good place to start project scoping. When practice is ready, user interviews can begin.

During interviews, appropriate guidance is needed for some sensitive topics.

3. How to Use User Interview Method Interview question techniques: - Avoid using jargon and technical terms - Use simple English as much as possible - If you must use technical terms, explain their meanings - Use neutral open-ended questions that don't force participants to answer in a certain way - Avoid

long answers because they are difficult to answer - Avoid compound sentences; try to break them into single questions

Some general prompt questions: - Can you tell me why? - Why do you think so? - Can you describe how you did it? - Tell me more about xxx. - How did this experience make you feel?

Interview timing and content require experience accumulation. Participants may ask questions; seeking help is natural. Note down questions and stated answers, and improve them afterward. Sometimes participants ask researchers' opinions, engage in more conversation, or try to find answers they think researchers are looking for. Occasionally maintaining awkward silence may be useful, while most participants will strive to fill this gap. Researchers may also become accustomed to using "mmm" and "uh-ha" to encourage participants to continue speaking, showing they are listening without going astray. If participants cannot answer questions, don't force them to give answers, as the answers are likely to be fabricated.

For structured and semi-structured interviews, you need to create an interview guide to ensure the same topics are covered with each participant. The difference between the two lies in the types of questions included. During interviews, related questions can be grouped together to help the flow and participants' thinking processes. If interviews cover sensitive topics, try to start with simpler questions before moving to more "difficult" questions. It is best to attach a thank-you letter, such as: "Thank you very much for your participation." Using prompts can facilitate participants' answers or provide examples when they encounter difficulties.

Section 7: Diary Study Method

1. Definition of Diary Study Method Diary studies can be used to record qualitative data over a specific time period, with participants completing diaries themselves. Diary studies provide participants with a framework to record their observations and data about specific things at specific times, helping to gain contextual understanding of experiences, behaviors, and attitudes over time; creating specific scenarios in a "lab environment" to collect data may be relatively difficult.

In terms of professional equipment, diary studies are a low-cost method, but they are also a high-cost method for data collection and potential data analysis. Diary studies are crucial for changes over time. If the research is not about changing over time, these studies may not be suitable for diary studies. Some situations are not suitable for diary studies, such as conducting diary studies in emotionally charged or productivity-intensive environments: you may not ask caregivers to fill out diaries about their working hours.

2. When to Use Diary Study Method Diary studies are very useful when you want to understand long-term behaviors such as: - Habits: When do users

participate daily? - Usage scenarios: In what capacity do users participate? - This data can be used for scenarios in subsequent usability testing research - Attitudes and motivations: What motivates people to do specific things? How do they feel and think? - Changes in behavior and perception: How well does the system learn? How loyal are people over time? - User experience: What are typical and cross-channel user experiences when participants interact with products using different devices and channels? What is the cumulative impact of multiple service contact points?

Diary studies are also very useful for: - Tracking behaviors of lengthy processes that users need for days or longer, such as purchasing large/expensive items - Discovering motivations that prompt users to take certain actions - Analyzing how products/services adapt to regular habits - Evaluating retention rates

The structure of diary studies usually focuses on one of the following: - Specific things: Understand all interactions at a specific time - General behaviors: Collect general information about user behaviors - Specific activities: Understand how people complete specific activities - General activities: Understand how people complete general activities - Expectations, mindsets, emotions, and social or physical environments: Diary studies can observe these influences, thereby clarifying how user experiences are formed within each time period

3. How to Use Diary Study Method First, you need to determine the scope of project goals, define research focus, and understand the long-term behaviors you want to understand. - You need to specify a timetable for running the study - You need to choose data collection tools for participants to use - You need to determine who needs to participate in the study and recruit them. Each user group may only need 4 to 6 suitable participants - You need to prepare instructions or support materials. Introduce project purpose and research reasons: this can be done by arranging meetings or phone calls with each participant to discuss research details. Review the recording schedule and discuss the expected goals you hope the research can achieve. Provide key dates for contact and follow-up, and contact information for the main researcher involved in any questions. Discuss the tools participants will use and ensure all participants are familiar with the technology. Provide data collection instructions, including when to record data and a list of questions each diary entry should cover. You can provide example diary entries for participants based on the complexity of the data you want to collect.

Diaries can be open-format or highly structured: In open-ended diaries, participants record activities and events in their own language, which can encourage reflection and contemplation. Highly structured diaries have closed questions and are pre-categorized to collect accurate information. Mixed methods are usually adopted to collect qualitative and quantitative data. You need to learn and evaluate all information provided by each participant. Then plan follow-up interviews to discuss content in detail and ask exploratory questions to discover specific details needed and clarify as necessary. Ask participants to provide

feedback on their experience participating in the study so you can adjust the process next time.

Considerations: - You must wait for participants to feed back corresponding diaries before starting analysis - Written forms may not obtain rich experiences like audio or video - Handwritten notes are not always easy to read, and transcription (if needed) may be time-consuming - You can ask participants to usually submit diary entries digitally at the end of each day - There are many tools that can do this: email; collaborative tools like QQ; Baidu hard drive for uploading videos and audio; WeChat feeds where participants can send text messages or private WeChat accounts; online questionnaires

Section 8: Information Architecture Method

1. Definition of Information Architecture Method Information architecture (IA) refers to the structure of information. The most common example is the organization and labeling of website content and functions. IA covers very broad (entire site structure and navigation) and detailed (labels and content) aspects. IA verification can be used to evaluate draft structures created after card sorting with a large number of users. These draft structures may add, delete, or modify existing content in some way, or be completely new structures. If you suspect that problems encountered are related to poor labeling and poor content structure, IA verification is more suitable for such problems without considering design elements. If you suspect that interaction or visual design is related to problems encountered, usability testing is more suitable. IA verification is not an isolated research method; for example, it is usually combined with card sorting, usability testing, or content testing.

2. When to Conduct Information Architecture Verification Information architecture can be conducted at any link in product development. If you are not sure about the location of content/items, you can place them in multiple locations.

Text version of information architecture: In text fields or spreadsheets (simplified version of the structure). Tools tend to use this format to create clickable navigation of structures without visual design. Participants need to complete a list of representative tasks. There is no correct number of tasks, but choices should represent the research field. Optimal Workshop is an expert in this field, recommending no more than 10 tasks per information verification. If there are multiple user groups with specific interests, provide separate verifications for each group instead of having everyone do all tests. If the structure is very large, participants may get too much information. Technology is not the main problem for tree testing of large structures.

3. How to Conduct Information Architecture Verification If you want to test small to medium structures (usually fewer than 500 items), you can usually test the entire tree; it is not enough to cause any adverse testing effects.

If the tree is large (500-1,000 items), you can test a “simplified” version of the structure, for example, focusing on how the top three or four layers work. At the same time, participants should have time to complete a large number of tasks in a relatively short time. You can also test the entire structure, but this will reduce participants’ experience. You can cut the structure by removing parts that are not important for testing. You can choose to test only specific subsets of the entire structure, such as the “culture” section of a newspaper site.

The simplest way to reduce a large structure to a more manageable size is to cut everything below a certain level. Reducing IA size in this way will only discover whether participants can reach the correct general area, not the specific location. If you don’ t want to test a certain section, you can cut it off, while other parts (the parts you really want to test) remain. If you are particularly interested in a certain area, you can select a subset of the structure. In this case, you should recruit participants who are interested in or have expertise in this specific area. Unless global navigation items are small and exclude links or shortcuts not in global navigation (such as overviews). Otherwise, ideally, global navigation items should be included. You should also exclude “jump” headings such as “Search,” “Contact Us,” and “Help.”

Considerations: - IA verification is needed to ensure products work properly, or whether optimization is needed before sending to a large number of participants - Usually contact participants via email and provide a link to the verification - Need to specify a schedule for the verification and clearly explain it to participants - Need to pay attention to response rates - Can send a reminder email midway through this period to encourage those who have not yet completed the verification

Section 9: Ethnography Method

1. Definition of Ethnography Method Ethnography is used to study humans and culture. It is also used in user research to study the activities of people and groups in daily life, capturing natural and unnatural reactions and unexpected situations. Ethnography can be used to understand: how people integrate things into daily life; real behaviors; how products or services interact in people’ s lives.

If focusing on studying how specific teams work, you can observe the interactions between research objects and other teams through ethnographic methods. Research may include studying the interactions between research objects and relatives, friends, customers, and the public, depending on the research scope.

Ethnography is not suitable for projects that require quick turnaround. Ethnographic research is expensive in terms of time, resources, and skills. A lot of planning and coordination are needed before meeting with participants. Participants need some time to adapt to the observer’ s presence, so brief ethnographic projects do not necessarily produce authentic results and are therefore not suitable for research that needs quick results.

2. When to Use Ethnography Method At the early stages of a project, observing people in the real world is very useful because it provides insight into the scope of the problem and the context in which it exists. Understanding actual situations can help create realistic rather than idealized products/services. This helps understand the emotional value people have in products or services.

Ethnographic methods are labor-intensive. Ethnographic methods require complete immersion in real-world situations and social dynamics. Information and results of ethnographic methods are highly dependent on observation and interpretation, so data quality will be affected by the skill level of actual observations.

If you need to participate in complex projects from the problem definition stage and need to work with users with special needs, you need to spend time honing the use of ethnographic methods. The use of other methods also has an impact on ethnographic research.

3. How to Use Ethnography Method The goals of ethnographic research are often relatively broad. Information that can be collected includes: - What happened? - Who did what? - What are participants' impressions? - What do team members think and explain about these events? - How do they feel about them?

Try to clearly explain ideas and evidence in notes. Additionally, ask questions at appropriate times to clarify understanding of situations, contexts, and interactions taking place. In practice, you need to weigh pros and cons: you can interrupt to obtain needed insights, but at the same time, you must not destroy the dynamics being observed.

Mobile ethnographic research can be used to record data and observations when researchers are not present, thereby enhancing observation scope and expanding coverage. You can ask participants to answer contextual questions during tasks to deepen researchers' understanding of the influence of time, environment, social pressure, motivation, and previous experiences.

There are two main methods of mobile ethnography: - **Passive method:** Participants do not need to take any conscious action themselves. This will provide natural behavior information but may miss some details. - **Active method:** Participants record their own experiences in a timely manner according to their needs (as in diary studies).

Section 10: Contextual Inquiry Method

1. Definition of Contextual Inquiry Method Contextual inquiry is a hybrid of user interviews and ethnographic methods. It consists of a semi-structured interview method to obtain information about the usage environment, and then observes and inquires while participants work in their own environment. This makes data analysis more authentic.

Contextual inquiry requires participants to play the role of experts; participants are more active compared to other research methods because they complete research by demonstrating and talking about their tasks. Contextual inquiry can reveal information and understand information that users may not understand, and obtain real and detailed data by observing users' actual situations. This combines the benefits of observation and in-depth dialogue.

This method is very useful for user research where users use assistive technology and have various access and skill needs. This is not only for participants' convenience and comfort but also to observe how they arrange their environment to meet their needs.

2. When to Use Contextual Inquiry Method Contextual inquiry is used to discover parameters, criteria, functions, or processes for design or redesign, and is useful for understanding the usage environment of products or services.

If respondents cannot come to you proactively, you can go to them. In this case, consider using contextual inquiry as a research method. Additionally, instead of meeting participants in near-work environments, you can visit them in their actual locations to understand the authenticity of their environment and what they want to do in that environment.

Contextual inquiry research requires a lot of time and resources: you need to visit users in their environment and conduct in-depth observations, which requires time and planning, plus transportation budgets. Preparations needed include: - Having conditions and skills similar to those used in interviews and usability testing, depending on research scope and focus - May need to consider conducting research together with another person so you can discuss observed content and possible impacts - Need to consider participants' locations and time issues - Try to limit visits to participants to twice a day. This may sound like little work, but it is important to have time to write down notes and consider and discuss what you have learned after each visit

3. How to Use Contextual Inquiry Method The four principles of contextual inquiry are: - **Focus:** Interview plan based on clear understanding of goals - **Context:** Observe their activities from participants' environment - **Partnership:** Talk with participants about their work and let them discover any unarticulated aspects - **Interpretation:** Reach consensus with participants on important work aspects

Contextual inquiry involves identifying and finding appropriate users and stakeholders to interview and obtaining their consent. There are at least two people for each user participant. Each contextual inquiry is conducted on an individual basis, but each group only includes one person. This means you cannot determine what common behaviors are.

Scheduling-related matters: - Researchers may want to choose to see participants on busy days, while participants want to meet researchers on plain, re-

laxed (perhaps unrepresentative) days - A research interview takes about two hours. Additional interviews may need to be arranged to avoid fatiguing participants and to observe tasks when they normally occur - Understand research questions and goals - You can ask a series of standard questions to understand participants' backgrounds and their typical challenges and goals

You need to start with an introduction, including self-introduction, research purpose, and other relevant information. You can ask whether the interview can be recorded and when recording should be stopped/started. Additionally, you need to provide participants with guarantees of data confidentiality and request permission to use data anonymously as part of sharing research results. Semi-structured interviews can be conducted to generally understand participants' work. Relatively loose structures can facilitate follow-up when interesting interview questions emerge. It is important to maintain alignment with participants, focus on tasks users are performing, and discuss everything as you go (without overly interfering with natural behavior). You need to observe actively: when you can interrupt to ask what is happening, when not to disturb their work, and ensure you have participants' consent. You may need to ask participants to do something important for research goals but possibly unconventional. You need to record this in detail. Pay attention to summarizing knowledge obtained during interviews and participants' summarized feedback; participants generally do not explicitly provide feedback on whether it is wrong, which requires you to figure out yourself. If there are problems, you need to actively communicate with participants. If not done well, ask them questions and build stories with them. Some important considerations: try to avoid interpreting while listening. After interviews, you need to spend time analyzing and proposing impacts. If clients are part of participant interactions, ensure you have their consent; if you cannot obtain consent, you cannot record this. Contextual inquiry must occur where participants normally perform tasks. Try to provide participants with the highest degree of anonymity. For example, avoid using people' s names in reports or documents. There will also be participants who do not want anonymity and want their voices to be clearly heard.

Section 11: A/B Testing Method

1. Definition of A/B Testing Method A/B testing (also called split testing) compares two versions of the same thing to see which version performs better. You can help choose between different design and content options by simultaneously showing variants (A and B) to similar visitors. In A/B testing, only one new content is tested at a time to find out which option is more effective for users. Half of visitors are shown the original version of the page, and half are shown the modified version. When choosing between two possible solutions, A/B testing is used to replace intuitive choices. The final result may be different from intuition.

The goal of testing is to determine which option produces a higher conversion rate, so results cannot be rejected based on personal judgment.

2. When to Use A/B Testing Method A/B testing is useful when you need to choose between two variants. When providing participants with two versions of a service, their engagement with each experience is measured and collected and analyzed statistically. You can determine which experience has a positive, negative, or no impact on visitor behavior. Conducting A/B testing requires more than just mastering the method; it also requires analyzing identifiable patterns and selecting useful content for A/B testing (problem scoping).

3. How to Use A/B Testing Method Like any research method, A/B testing needs to follow the process of collecting data and analyzing data.

First, you need to determine goals. Goals can be anything from clicking buttons or links to product purchases and email registrations. Then generate hypotheses: after determining goals, you can begin to generate A/B testing ideas and hypotheses to clarify why you think A is better than B, B is better than A, and what will happen when the test ends? With hypotheses, you can prioritize them based on expected impact and implementation difficulty. You can also create modified versions: you can use A/B testing software to make changes to product/service elements. Many leading A/B testing tools have a visual editor that makes these changes easy.

Then conduct the test. Considerations needed include: - When to conduct the test? Consider peaks and valleys in participant numbers? - How long will it run? There are no strict rules for how long tests should run - A/B testing does not require intervals. After testing ends, it's time to analyze results

A/B testing best practices are reflected in: always test both versions simultaneously; if you test one version one week and the second version the second week, you will not collect accurate data because versions are not tested in the same environment.

Matters needing attention: - Most A/B testing tools report statistical credibility - You need to show the same variation to repeat visitors - The tool you choose should have a mechanism to remember which variations participants have seen. This prevents confusion, for example, showing users different prices or different promotional offers. This also keeps A/B testing consistent throughout the website

Section 12: Stakeholder Workshop Method

1. Definition of Stakeholder Workshop Method Stakeholder workshops are a way to involve people interested in a research project. "Stakeholders" are key people in the organization who can be responsible for completing the project, including people with expertise and in-depth knowledge of your work field, and also include users: they can do what they want and need to do.

Several different types of stakeholder workshops can be held, but they all have the same purpose and benefits, such as building consensus among parties in the

organization that may have opposite views and goals. Workshops can be used to establish consensus on the meaning of certain things.

Workshops enable stakeholders to collaborate; generate ideas, collect requirements, draft designs and solutions, agree on priorities, and identify risks and constraints.

The purpose of stakeholder workshops is not to collect raw data about opinions and preferences. It is best to avoid treating workshops as group usability tests because it is difficult to obtain useful insights from them, but rather in prototypes and other content in development.

2. When to Conduct Stakeholder Workshops Because the goals that can be achieved are diverse, workshops can be carried out at various points in the project: at the beginning of the project to agree on scope and goals.

When reporting when key milestone stages are reached and determining the next stage of the project. When multidisciplinary input is needed, it can be internal input with different expertise or external input from users. In smaller projects, there may only be time for one workshop with everyone involved; in larger projects, there may be time for multiple workshops.

In larger, more complex projects, there may be too many stakeholders and too much content for one meeting. The ideal number of people for one meeting is twelve. Depending on the type of work you are engaged in, different types of workshops can be run at different stages.

Workshops can be very valuable, but they also require a lot of time and investment. Facilitating workshops and hosting group discussions requires skills that take time to develop. Although you can learn and practice at work, it may require more preparation and consideration at the beginning.

3. How to Conduct Stakeholder Workshops As a researcher, you need to spend time and energy to organize, prepare, run, and analyze workshop results. When preparing for a workshop, you need to review existing research and documentation and gain a deep understanding of the tools being used. Interview some stakeholders in advance (or afterward), especially if they cannot attend the workshop. You can also conduct some interviews in advance, and interviews afterward can also explore certain topics and issues in more detail.

Before the workshop begins, prepare everything for each activity to be conducted. Here is a checklist of what needs to be prepared: - Have a clear agenda - Determine the time for each activity and try to stick to it - Try to keep the workshop to about three hours - Ensure you can enter the venue before the workshop starts - Two or three people are needed to organize a good session - Establish a “no calls” policy to help people focus on the task at hand - Make instructions and outputs of all sessions visible - Check people’s understanding and preparation by asking questions - If possible, organize exercises for individuals,

small groups, and large groups - Be prepared to take photos - Who really needs to be there? - The following people are needed: those who make decisions; those who have needed information; those who have “influence,” that is, the ability you need to adhere to in order to ensure project support, continued funding, etc.; those who participate in implementation (“worker bee” employees)

Section 13: Guerrilla Research Method

1. Definition of Guerrilla Research Method Guerrilla research is a fast, flexible, low-cost behavioral research method, a “just do it” type of strategy. It’s like approaching individual strangers in cafes and public places, quickly completing behavioral observations in the few minutes they use a website.

Guerrilla research is low-cost, produces quick results, can quickly address small-scale design problems, can expand teams, can help understand actual usage environments, especially when testing on external mobile devices. Unexpected research can prompt people to remain open and honest. Because guerrilla research is a fast and somewhat rough method, it usually only provides some macro trends and may be difficult to find suitable participants.

Guerrilla research also needs to consider factors: environmental challenges such as weather. Attracting people’s attention during their busy days. Technical problems may be encountered during research.

2. When to Use Guerrilla Research Method Guerrilla research is not detailed and rigorous enough to be the sole data source. When exploring problems and opportunities, guerrilla research can provide sufficient insights to help make informed decisions in early stages.

Guerrilla research can also increase understanding of problems and establish preliminary hypotheses for more in-depth and structured research. Before conducting guerrilla research, some preparation should be done to define focus, but you also need to be prepared for guerrilla research and respond to unexpected situations, because this research is less structured and controlled than other research. Therefore, you need to be familiar with what you want to test and the format used (whether on digital devices, on paper, etc.).

3. How to Use Guerrilla Research Method Planning is the key to success: you need to have an agreed-upon list of questions or tasks, focusing on achieving research goals; prioritize tasks/questions. When making initial contact, it is difficult to know how much you can gain and how much time people are willing to spend. You need to prepare a brief introduction to quickly show the work status and why you want participants to participate. You need to streamline the ethical and legal points to be covered and explain how the research will be conducted.

Considerations: - Carefully select locations based on the target population you need to recruit, and assess their body language and behavior before contacting

participants - Conducting guerrilla research on streets, in cafes, or conference halls is challenging - Sometimes it may be frustrating, but you need to keep going - Flexible methods: adjust according to strategy, modify focus and strategy. This may be more iterative than research in labs - In addition, keep session time short (actually should not exceed 15 minutes) and keep the atmosphere relaxed; food and coffee can be appropriately provided - Usually, it is best not to carry too much equipment - Keep a relatively low profile - Video, audio, and photography can be used (but this is optional) - Guerrilla research can produce real and vivid stories about users - However, obtaining data in this way is not always appropriate, and sometimes it may prevent people from participating

Guerrilla research usability testing: The essence of guerrilla research is to actively find users instead of waiting for customers to come. Products can be displayed through computers, phones, or paper media. You can connect with users wherever they are.

Contextual user interviews: These are brief interviews conducted with users in their environment (such as their homes, workplaces, etc.). This method can provide in-depth understanding of how users' environments affect how they use products or services.

Mini ethnography: This is a good way to capture how things are used in real life. It doesn't need to be too formal. In most cases, working in a doodle style can also work normally.

Section 14: Content Analysis Method

1. How to Conduct Content Analysis First, you need to understand your data. If you have time, you can re-read any content you must be familiar with. In addition, you need to identify the data you will code and establish a set of categories related to the dataset. Categories can be created by considering goals (preset categories) and scanning certain data (emerging categories). Ensure categories are understandable to others.

Since the data to be processed is usually interview transcripts, category names may be subjective, such as those related to emotions. Therefore, categories need clear descriptions and consensus.

If analyzing in a group, you should also consider whether to include synonyms of certain words. Data needs to be coded. Identified themes include: ideas, concepts, behaviors, interactions, events, terms, or phrases used. The coded data segment can be a sentence or a paragraph. It is a series of words related to a theme. Count instances belonging to each category. This will show the relative importance of information. If doing this analysis manually, for reliability, please have multiple people code the data. You may need to analyze a single dataset multiple times until the category list stabilizes.

In addition, identify patterns and connections within and between categories. Write a summary for each category to describe the key ideas to be expressed,

then look at relationships between categories. You can develop a table or matrix to illustrate relationships between two or more categories.

Reflection is needed: What does all this mean? What have you learned in this process? What are the main lessons? What do those who use the evaluation results most want to know?

2. Benefits of Content Analysis Method Content analysis is a method for quantifying qualitative data: discovering text, identifying term usage and occurrence frequency. Since it can be done manually, it is relatively simple and convenient. If done systematically, it can be highly reliable. This method can also be applied to images, video, and audio.

3. Drawbacks of Content Analysis Method The drawback is that important themes may be lost because they may not be included in the coding framework. In addition, the reliability and validity of results are also related to the quality of created categories and how they are interpreted.

Section 15: Affinity Diagram Method

1. What is Affinity Diagram Method Affinity diagrams (also called affinity maps) are very useful when you need to identify patterns in qualitative data. Method: Write ideas on sticky notes and group them around themes. This allows patterns to be identified from large amounts of qualitative data. This method can be used as part of analysis in any user research method that generates qualitative data.

Content analysis and affinity diagram methods are very similar methods. Content analysis can be considered more “rigorous,” especially if done using software. It can also be completed by individuals. Affinity diagram method is a visual analysis method completed through collaboration and physically moving data fragments into groups. The advantage of affinity diagram method is: it involves the entire team. It can help build collaborative teams and merge large amounts of data into meaningful groups and themes. However, for those unfamiliar with affinity diagrams and other types of group analysis, timely planning is needed to analyze data and ensure all content is captured for analysis.

2. How to Apply Affinity Diagram Method Combine individual and group work, browse all data, and highlight each interesting part related to project purpose. Write each discrete data on sticky notes. Include subtle variations on similar themes on sticky notes for further analysis.

3. Applying Affinity Diagram Method in Group Work You can decide to do this work with your immediate team, people who directly work on products/services, or with broader stakeholders. Have each participant highlight interesting discrete data related to project purpose and share all raw data

in the group. After reviewing all broader datasets once, have participants exchange opinions and review others' initial analyses, highlighting other omissions they think are relevant. If time allows, the group can gradually become familiar with the data, discuss differences in what different people highlight and why some think they are important while others don't. People can make some assumptions or priorities about the research and can resolve, discuss, and clarify results within the group. This method may also indicate the need for broader explanations. You can have the group exchange data again and write each piece in discrete data (highlighted), or have them write one of the discrete data they highlighted themselves. For some types of data/research/goals, you may note where the data comes from on the sticky note, or use different colored sticky notes to represent different data sources.

Section 16: Other Methods

1. Mental Model Mental models are people's intuitive understanding of how something functions based on past encounters, contacted information, daily experience, and judgment. Mental models can be used to help determine the information architecture, framework, and content provision of digital products. However, in reality, user interfaces can never correspond to every user's mental model. You can create user interfaces that match the mental models most likely possessed by users.

2. Personas Personas are fictional images (based on real data) representing a group of users with common interests, goals, characteristics, etc. Each persona provides a specific example of someone in the audience: their behavior, how they act, their attitudes, and preferences. Personas are roles that interact with the team, helping to ensure that products/services are designed for target users rather than for the institution.

3. Scenarios Scenarios are hypothetical stories. The created stories need to be detailed enough to meaningfully explore some aspect of services and experiences (or product use). Scenarios describe the stories and backgrounds of why specific user groups join products/services and can be described as text, video, or storyboards.

Good scenarios are concise and can include the following elements: - Who is the user? Why does the persona use your product/service? What are their goals? What does the user want to achieve? What must your product/service do to provide a satisfactory experience? - Each scenario should focus on one user persona: "This is a story about using xx..." - Specific questions can be given to the group: What triggers and motivates them to come to xx? What needs do they want to solve? What do they already know about how to solve their needs? How do they expect xx to help them? How many times do they come to xx in their story? What do they do on xx? What content do they look at? Do they interact with anything? What websites and sources (online and offline) do

they access during the story? Who else helps or influences them in their story? What encourages and prevents them from using the product or service? How does the website ultimately help them solve their needs? When does their story end, and what do they consider a successful user experience?

For mental models, personas, and scenario research, you can consider these questions: What motivates them at each stage? What emotions do they have at each stage? What are their key decision points? How do non-active and online activities interact in their story? What are their obstacles and pain points? How do they overcome them?

Section 17: Mixed Methods Application

1. Problems Encountered in User Research User research is a repeated and continuous process. Throughout the entire development life cycle, regardless of the product or service, there are different methods that can be applied at different times. There is no one correct combination of methods. This lecture mainly outlines some commonly used working methods.

2. How to Solve Corresponding Problems You can first use guerrilla research to quickly collect some preliminary evidence and insights to prove the problems users encounter. Users' views and feelings on a certain topic may not match reality. Expand knowledge gained from quick research to build support for more in-depth and structured research. For example, what tasks users perform, how users complete these tasks, what problems users encounter, users' mental models and how they associate and group information. Show that institutions in the field/industry have encountered similar problems and have successfully conducted some user research and benefited from it, which can help prove the value and competitive advantages of user research.

3. How to Combine Various Research Methods Experience gained from one study can be applied to another study through different methods. And every time you conduct user research, you can learn something new about the methodology itself and the research topic, which is also the charm of user research.

Section 18: Prioritizing Problems and User Needs

1. How to Prioritize Problems and User Needs If the purpose of work is to identify problems and determine priorities, the process used depends on whether qualitative or quantitative data, or a combination of both, has been collected. Applicable to selection from data generated by: moderated face-to-face user testing; moderated remote user testing; unmoderated face-to-face user testing; guerrilla research.

User stories describe users and why they need to use this product or service. Writing user stories is to determine what needs to be done next and to think

about work from the user' s perspective and prioritize work. These methods are good ways to track what needs to be done and what obstacles need to be removed currently.

You need to select the right metrics based on the services or products provided. And link KPIs with products or services to ensure the meaning of data and analysis.

2. How to Classify Problems from Data You may receive a large number of written notes about what was observed and what participants said. After each research session, you need to review the data to synthesize and identify key themes.

First, understand the data, then identify problems. You need to group similar problems together and identify patterns and connections within and between groups. Count the instances belonging to each group. Consider contextual and environmental factors, and finally determine priority problems.

Classifying problems from quantitative data is suitable for agile and lean working methods, applicable to data generated from: unmoderated face-to-face user testing, unmoderated remote user testing.

Usually, usability metrics can track progress and evaluate competitive status. Is your product or service better or worse than others? Where is it better or worse? Usability metrics include a combination of system and user performance metrics: system response time; number of errors; time needed to complete tasks; task completion success rate; user satisfaction ratings.

ISO usability standard ISO/IEC 9126-4 metrics: - **Effectiveness**: The accuracy and completeness with which users achieve specified goals - **Efficiency**: The resources consumed related to the accuracy and completeness with which users achieve goals - **Satisfaction**: The comfort and acceptability of use

Measuring effectiveness: success vs. failure ratio; percentage of tasks completed successfully on first attempt; number of persistent errors. Efficiency = (number of tasks completed successfully ÷ total number of tasks undertaken) × 100; learning time; time spent on errors; frequency of using help or documentation; number of repeated or failed commands; time spent on first attempt; time to reach expert performance; time spent correcting errors. Efficiency = (number of errors ÷ number of task steps) × 100

3. Recommendations Who you talk to depends on your initial views on solutions and recommendations. You may need to conduct more research in specific areas. You need to be very clear about why more research is needed and summarize expected methods and assumptions. You need to make changes to internal processes, change the front-end and back-end of digital products, adjust branding, and readjust product or service propositions.

User research reports and recommendations may be numerous, and sometimes people become deadlocked due to considerations for improvement work. Marking the types of recommendations proposed can make a difference, making it easy and quick to determine what can be done now and what needs planning, where more budget must be found for large-scale work.

Review Questions 1. What role do information user researchers play in libraries, small and medium-sized enterprises, and public institutions? What functions can they play? 2. What is usability testing? What types does it have? 3. What is content testing? What issues should be noted when using this method? 4. What is card sorting? What scenarios is it suitable for? 5. What is questionnaire survey? What are its advantages and disadvantages? 6. What is user interview? What are its advantages and disadvantages? 7. What is diary study? Does it study one person, one case, or multiple people, multiple cases? 8. What is information architecture verification? Please give an example of a website and analyze its information architecture. 9. What is ethnography? How can it be applied in mobile internet scenarios? 10. What is contextual inquiry? How is it different from diary study? What situations is it more suitable for? 11. What is A/B testing? What should be noted when using it? What standards should be met for A/B testing? 12. What is stakeholder workshop? How to conduct such high-level workshops? 13. What is guerrilla research? How to conduct this low-cost grassroots research method? 14. What is content analysis? What materials is it suitable for? Please give a case and analyze it. 15. What is affinity diagram? How to conduct it? 16. Please introduce the respective characteristics of mental model, persona research, and scenario research. 17. What does mixed method mean? Please combine the above methods and propose a mixed research method. 18. How to determine priority levels? Please give a real-life scenario as a case, rank priorities and give reasons.

Chapter 7: Library Information Services

Content Summary: This chapter meticulously introduces various situations of information services, from the positioning and stance of information service institutions, to their product services, to strategies and reforms for responding to changes in user needs, and to external environmental laws, regulations, and policies. Different from Chapter 6's focus on user research, Chapter 7 focuses on information services. Therefore, three class sessions are recommended for teaching, but an additional three class sessions are suggested for combined discussion of the two chapters.

Key Concepts: Library, diversification, information intermediary, reference consultation, user access, information literacy, strategic planning, organizational change, information policy, information ethics, licensing, open access, personal privacy, network security.

Knowledge Focus: Understanding the different roles and functions of different types of libraries; understanding the various differences of traditional information services for different users; understanding new types of information services; knowing how to adjust strategies and businesses according to user needs; understanding the legal common sense required for information services and user research.

Section 1: Libraries, Communities, and Information

Today’ s global knowledge infrastructure connects individuals and information institutions and services worldwide, with libraries being important components of it. The term “infrastructure” is often used for large physical systems, such as electricity and the internet. This is what we usually consider standard and extensive use. Knowledge infrastructure has many interlocking components. Some are tangible, such as physical buildings, books, equipment, and wiring. Some are intangible, such as legal, financial, administrative, cognitive, and ethical systems. In the first 100 years of history, public libraries developed the main components of knowledge infrastructure, including: - Intellectual systems, including cataloging, classification, resource selection, and reference work - Spatial systems for the flow of instructional materials, funders, and librarians, including within library buildings and outreach systems - Legal systems where communities can tax and manage libraries as social services - Educational systems where libraries work using standard principles and techniques

In the second half of the twentieth century, school, professional, and special libraries also became technologically advanced, user-centered, forward-looking institutions. In the early twenty-first century, the widespread adoption of electricity systems enabled libraries to link to users beyond physical buildings. At the same time, many libraries found that many users still regarded library physical spaces as important parts of their local communities.

1. Nineteenth Century: The Beginning In 1800, a priest in Salem, Massachusetts, as a well-informed citizen with republican ideals, proficient in 20 languages, and quite knowledgeable about local and international affairs. His personal library contained 4,000 volumes, one of the largest in the country. He himself was a walking encyclopedia. Although he relied on books and newspapers for information—these resources were expensive at the time and scattered everywhere—Bentley also obtained information through personal contact networks: men and women of all ages and fields. Through this effort, he was erudite in all fields. However, in later eras, changes in printing technology and rapid expansion of publishing and education would eliminate generalists like Bentley, as Americans sought knowledge in literature rather than through personal accumulation. The growth in the number of printed materials outpaced what any individual could own or read.

In Bentley’ s era, the United States was still largely rural, relying on northern white labor and enslaving southern black populations. The school system was

incomplete, favoring boys, and colleges were mostly established to educate male priests. Wealthy whites ruled the young country. They believed that free whites with good qualities—property-owning, educated, and capable of electing the best representatives—would make the country prosperous. However, by the end of the century, the United States had become a Dust Giant, its population filled with immigrants from Europe and Asia. The white-dominated territories held by Native Americans were destroyed, and many native groups were expelled to remote lands. After the devastating Civil War (1861-1865), slavery became illegal, but political and economic suppression of African Americans continued. Whites and people of European descent remained orthodox. It was not until the 1940s and 1950s that Asians were included in the citizenry, and not until the 1960s and 1970s that African Americans could fully exercise their constitutional rights to vote.

In the industrialized North, capitalism rapidly developed a middle class composed of pastors and professional staff. But during the Gilded Age (1870s-1880s), a large gap emerged between the rich and the working class. Nearly 40% of Americans lived in cities, while the poor lived and worked in unhealthy, dangerous areas. To eliminate this severe inequality, between 1890 and 1930 (the Progressive Era), federal, state, and municipal governments began to regulate child labor, public health, and transportation issues. Women did not have the right to vote, but white girls and boys could freely attend school, and colleges for men and women also emerged. The improvement of literacy combined with industrialization and technological development led to dramatic development in the publishing industry. This was reflected in short publications such as newspapers and in physical bibliographies. Cheap prices made printed materials accessible to a broader readership, and railways and increasingly efficient postal services made distribution convenient. Fiction was especially popular. However, some cultural experts expressed concern that unregulated radicals and even some immoral ideas would affect vulnerable groups. Modern libraries were born in this rapidly developing era, hosted by the developing middle class, and became part of the new national knowledge infrastructure.

(1) Slow Development of Academic Libraries Although schools and colleges increased rapidly in the 19th century, academic libraries contributed little to the expansion of education, which also reflected education's reliance on textbook memorization rather than original research. In 1840, the University of South Carolina had the first specially built college library. Harvard's first specially built library was born in 1841 (although this library can be traced back to the 17th century). At the same time, only one-third of colleges had at least 1,000 volumes. Fifty years later, in 1932, a library survey showed that among more than 200 four-year liberal arts colleges, more than half had collections of fewer than 3,000 volumes, and only 33 institutions had more than 6,000 volumes. It was not until the mid-20th century that most college libraries transformed from book repositories that did not emphasize use to vibrant learning spaces. Conversely, the 19th-century library movement drew inspiration from free pub-

lic libraries that emerged in the mid-century as a mixture of early social libraries and school libraries.

(2) Early “Public” Libraries In Bentley’ s era, “public” libraries were not owned by individuals, including social, circulating, and school district libraries, as well as college libraries. Books were expensive, so in colonies, some local residents formed clubs to share book resources through donation or joint purchase. Before American immigrants spread westward, this type of social library became common in New England and the Mid-Atlantic regions. By 1850, there were more than 1,000 such libraries, although their services and collections were limited and their existence was short-lived. These libraries usually catered to the needs of white elites, but African Americans also established reading rooms, libraries, and literacy groups where they could share content. For both white and black readers, reading was for community benefit, not mainly for personal self-improvement.

Circulating libraries were also common. Anyone who could afford the price could borrow books (mostly novels). By 1820, more than half of collections consisted of novels, which made non-profit organizations question this.

(3) Public Funding for Free Libraries In 1849, New Hampshire passed state taxes to establish free community libraries, and Massachusetts followed suit in 1851. In 1854, the opening of the Boston Public Library promoted the development of free public libraries everywhere. By 1875, all New England states had legislated to provide legal and financial infrastructure for free libraries. Other states enacted similar laws. As establishing local libraries became one of the ways for communities to take root and proclaim their values, the concept of free public libraries gradually became popular. Spiritually, public libraries promoted a “faith” or “spirit,” believing that reading could make individuals and society better, and that free public libraries could promote democratic progress. As tax-supported institutions, like circulating libraries, they needed to rely on appealing to the masses. Although some librarians expressed opposition, many circulating libraries formed large fiction collections to meet local needs. Public libraries soon learned one thing: to be responsible to their local areas.

(4) Women’ s Clubs Created New Libraries Some free public libraries originated from original social libraries, but some original women’ s groups became new public libraries. Like social libraries, new libraries also had strict opening hours and occupied narrow spaces, usually with outdated collections for borrowing. At the end of the century, cities replaced these old libraries with architect-designed libraries. Some new libraries were grand in scale. Some people believed that echoing halls and high ceilings were very suitable for practicing library spirit. But not everyone agreed. William Frederick Poole, the first librarian of the Chicago Public Library, believed this architecture wasted space and posed fire hazards. Small organizations in nearby communities, as “branch” libraries, also struggled to secure funds. In 1971, the Boston Public

Library opened its first branch library, expanding to 5 by 1875. Some branch libraries were initially established as “distribution stations” in stores where readers could take away selected books. In 1909, the new Chicago Public Library director Henry Legler made establishing branches the top priority, believing it was a way for libraries to connect to the rest of the area. To meet the needs of the large immigrant population in the area, Chicago Public Library branches also provided books in 17 languages, making the knowledge infrastructure international. Remote area libraries established a model with a central downtown library and branches in local communities, which became a widely accepted organizational structure in the twentieth century.

(5) Carnegie Philanthropy Promoted Standardization Providing dedicated libraries in remote areas, but between 1886 and 1917, the Carnegie Philanthropy system funded 1,689 public and college libraries in the United States. It was useless to denigrate monumental libraries. As secretary, James Bertram designed and suggested sample plans and functions, such as open-shelf design and low-level bookshelves, which were inspired by department stores and factories. These schemes made the business of sponsored libraries and librarians’ work more standardized. The Midwest benefited the most, but this resulted in free public libraries in large and small cities and rural areas across the United States being similar: quiet, clean, well-lit, warm spaces (a luxurious experience for those living in cramped, noisy environments). As they were often overflowing with readers and widely supported, these libraries became important institutions in a region.

(6) Libraries: Places for Self-Improvement and Social Harmony Although library leaders may not care much about library spirit, at the local level, librarians and funders regarded public libraries as places of “social harmony” that historian Wayne Wiegand called for, requiring acceptable behavior, providing civic collections and services that could solve problems, lead orderly good lives, and master a peaceful model under the impact of changing cultural values. Over time, Americans who often neglected or even discriminated against so-called “public” or “citizenship” in the previous era gradually understood these concepts, and these functions of libraries continued to be maintained.

(7) Librarianship Becomes a Profession In library history, 1876 saw many milestone events. In this year, librarians formed the American Library Association (ALA) and created the first library journal. Librarians began to see themselves as staff in a broader professional system and proposed standard service principles. The representative figure among them was Melvil Dewey, creator of the Dewey Decimal Classification, a member of ALA and the first editor of Library Journal.

These service principles were taught to the next generation through library education. This began in 1887 when Columbia University officially offered related courses under Dewey’ s guidance and as an internship program in large public

libraries. There was no federal funding for libraries yet, but under Dewey' s example in New York State, some states were establishing library commissions or state libraries to serve local residents.

2. Twentieth to Early Twenty-First Century: Development By 1900, the infrastructure of the library profession was basically in place, and in the new century, topics of concern to librarians had become professional concerns. The development of communication technology, such as telegraph and telephone, and the acceleration of printing production and distribution speed were affecting how librarians worked and the services they could provide. In the twentieth century, many changes occurred in these technologies, but many systems ultimately utilized were already clearly present in the early 1900s.

(1) Information Overload Caused by New Technology Information overload was already a problem. In 1924, William S. Nadel mentioned “significant improvements in communication speed and accuracy” and complained that even “trained students” found it “almost unfeasible” to research an unfamiliar topic under time factors. His suggested solution was a “central intelligence service” that could provide not only “reasonable literature resources” but also information in business and professional fields. Some basic elements already existed in public libraries like Cleveland, Ohio: open shelves, adult education, children' s and youth services, and branches and delivery stations in schools and nearby areas. Other specialized services included business libraries in Newark, New Jersey; teacher libraries in Indianapolis; and technical departments in cities like Detroit and Pittsburgh. At the same time, companies and government agencies also began to establish specialized information services. For example, in the early 1900s, Charles McCarthy of Wisconsin established the first legislative reference library as a state agency. This idea spread to other states, prompting Congress to establish the Legislative Reference Library in 1914.

(2) Libraries Pioneered Innovative Methods to Serve New User Groups Public libraries were reaching new user groups. Some library committees established traveling libraries—books in boxes placed in houses, stores, and post offices, some in foreign languages—to reach readers in remote areas. The first horse-drawn mobile bookshelf was put into operation in the early 1900s and quickly became motorized with the development of vehicles and road systems. Public libraries usually did not serve children under 12, but in the 1880s and 1890s, Caroline Hewins and Anne Carroll Moore pioneered new library fields: librarians specially designed children' s rooms and storytelling services. In the rapidly developing children' s publishing field, librarians became cultural authorities. Librarians also actively “integrated” into European immigrants. Large urban libraries often collected foreign language books. By 1913, 10% of the New York Public Library' s collection was printed in 25 foreign languages. Even in the sparsely populated West, librarians could provide foreign language literature to readers. However, services for African

Americans, Native Americans, and Asian immigrants remained limited.

In Chicago, around 1931, the South Side, occupied by a large proportion of African American residents, acquired the George Cleveland Hall Branch governed by Vivian G. Harsh, the first black library director of the Chicago Public Library. In the 1940s, about 44% of whites in the 13 southern states had access to free library services, but the proportion of African Americans with access to services was less than half of that number, and the services themselves were generally poor.

(3) Expanded Financial and Legal Infrastructure Due to local taxes, many public libraries struggled for funds and fell into crisis at the beginning of the Great Depression in 1929. The arrival of the New Deal made ALA believe that federal funding was the answer, as many libraries benefited from the Works Progress Administration in 1935. In Kentucky, “packhorse librarians” distributed books in remote mountainous areas. In New York City, workers managed open-air reading spaces and mobile book services. In Philadelphia, workers donated 5 million cards to a library. After World War II (1941-1945), ALA again tried to persuade Congress to allocate federal funds to state public library plans. Finally, in 1956, the Library Services Act (LSA) provided funds for books, salaries, and equipment (but not buildings or land) for most rural communities. In the next five years, more than 200 new mobile book kiosks served rural schools and the general public. However, the stock of library buildings was aging. In 1964, LSA was updated to the Library Services and Construction Act (LSCA), and updated again in 1996 to the Library Services and Technology Act (LSTA), reflecting the shift from building to bytes. Federal e-rate (or universal service) legislation was also passed in 1996, setting discounted rates for network connections to libraries and schools. In 1995, the Bill and Melinda Gates Foundation helped provide computers to public libraries in poor areas and expanded the program in 1997 to all nationally certified public libraries serving low-income communities.

(4) Library Development Alliance Groups At the state or county level, libraries merged to form large collaborative units, such as multi-county library systems, to improve efficiency and save money. However, in the late 1970s, new threats to local funding escalated: initially tax revolts caused by southern white resistance to anti-desegregation, which spread to other parts of the United States. For example, in Fresno County, California, LSCA funds bought bookmobiles mainly serving Mexican-American agricultural workers in the San Joaquin Valley, but with the passage of the tax reduction proposal in 1978, “La Biblioteca Ambulante” suffered continuous budget cuts. In 1989, Irwin Smith was one of only two remaining part-time assistants. He also worked halftime in the Department of Corrections. He said: “What I see in prison is...the result of immigrants’ inability to obtain the information they need to learn English, learn to read, and fully cope with the system. It costs a lot of library work to imprison someone for a year.”

(5) Libraries Promote Intellectual Freedom Librarians gradually shifted from prescriptively guiding readers toward “healthy” reading to embracing intellectual freedom. During World War I, librarians actively censored collections because anti-German sentiment led to complete suppression of German reading materials. However, in the 1930s, they began to oppose censorship and passed the first version of the Library Bill in 1939 to protect rights, and resisted McCarthyism in the post-war period. In the mid-1960s, ALA opened the Office for Intellectual Freedom, whose purpose was to help librarians and others withstand censorship while educating the public about the right to read. However, some librarians practiced passive censorship, and intellectual freedom issues continued to bring ethical dilemmas to others because their support for intellectual freedom conflicted with local restrictive requirements, especially regarding children’s books. Librarians also debated whether their role should be primarily consumerist (give them what they want) or educational (give them what they need). In the 1970s, libraries learned to recognize the importance of “libraries in users’ lives” rather than “users in libraries’ lives.”

(6) Libraries Welcome Multiculturalism LSCA aligned well with President Lyndon Johnson’s “Great Society” initiative, which, together with the civil rights movement of the 1950s and 1960s, prompted a shift toward embracing multicultural values in libraries. Children’s services took the lead. In the 1930s, African American children’s librarian Charlemae Hill Rollins called for children’s books to reflect black children positively. In the 1960s and 1970s, African Americans in the South successfully desegregated public libraries. In the 1970s and 1980s, public librarians serving adults and children began to learn the language of diversity. However, not everyone thought this was valuable.

(7) Reconceptualization of School and Academic Libraries In the post-war period, thousands of small school districts merged. School libraries became the norm in large multi-grade schools. With the passage of the GI Bill, millions of veterans could afford college, and with increased research activity, colleges and universities greatly expanded their programs and facilities, including libraries. New teaching methods reflected emphasis on research. In the 1960s and early 1970s, federal funding flows for science, engineering, and technology entered campuses. College libraries adopted user-friendly policies such as open shelves, unrestricted circulation, and group meeting spaces. Although financial conditions deteriorated starting in the late 1970s, libraries maintained their new status as collaboration hubs on campus, becoming display places to attract students (and their parents) in an era of increasingly fierce competition among schools.

(8) Changes in Library Science Education Colleges became the sole providers of library science education. Between 1961 and 1976, 23 new schools established library science education. However, between 1978 and 1991, 15 schools closed. In the 1970s, library schools began to incorporate the word “in-

formation” into their names. In the 1980s, more schools adopted “Library and Information Science” (LIS). By the mid-1990s, some LIS schools began to utilize the “L word” and formed iSchools.

(9) Libraries as Early Adopters of New Information Technology College libraries quickly applied new information technology. For example, in 1967, the Ohio College Library Center (OCLC, now the Online Computer Library Center) was established. OCLC developed into a global cataloging and bibliographic union group, marking the development of inter-library cooperation that libraries increasingly relied on in the second half of the twentieth century. With flat or declining budgets and rising costs, research libraries had to change. For example, the Research Libraries Group HathiTrust was formed. Founded in 2008, this alliance now provides more than 13 million electronic resources, allowing libraries to benefit from each other’s collections and experiences of this scale.

As libraries increasingly relied on electronic forms of collections, librarians became experts in data management and licensing systems. Outraged by expensive information acquisition prices, especially for scientific journals, librarians promoted open access, such as SPARC (Scholarly Publishing and Academic Resources Coalition). In the early twenty-first century, libraries first promoted mobile use of information and wireless access to electronic resources, and still invested heavily in physical books and corresponding readers.

(10) Libraries Without Walls In the 1990s, public libraries began to provide web-based information services to remote readers. This trend further developed in the 2000s as libraries adopted mobile and cloud technologies. However, libraries as community spaces continued to be appreciated and invested in, as innovations such as makerspaces replaced locations that provided longer-term services for customers. Large and small cities continued to build libraries. Chicago built a new downtown library in 1991 and saw that this library investment benefited from higher circulation and higher library usage rates. The Chicago Public Library also established new branch libraries.

(11) Libraries’ New Mission: Information Literacy As college libraries shifted collection focus to electronic resources and students could more conveniently use the internet, college libraries pioneered a new subfield: information literacy. Public librarians also accepted the public’s need for information literacy, and some states began to regard information literacy as a key competency for all K-12 students. Librarians often called for citizen empowerment and democracy. For example, in 2000, the Association of College and Research Libraries (ACRL) *Information Literacy Competency Standards for Higher Education* included the goal of establishing “knowledgeable citizens.” They did not idealize the late William Bentley but referred to skills in critical evaluation, effective access, and ethical use of information. In the early twenty-first century,

informed citizenship was as important as in the nineteenth and early twentieth centuries.

As college libraries shifted collection focus to electronic resources and students could more conveniently use the internet, college libraries pioneered a new sub-field: information literacy. Public librarians also accepted the public's need for information literacy, and some states began to regard information literacy as a key competency for all K-12 students.

Section 2: Diverse Information Needs

1. Defining Information Needs The concept of information needs has been understood, defined, and applied in many ways. For some, information needs are a response to a problematic situation. Needs arise from awareness of problems that hinder individuals from moving forward. Information seeking is a natural behavioral process that reduces uncertainty, fills knowledge gaps, or helps individuals understand their world. This problem-centered perspective views information behavior as a process in which people encounter many situations that prompt them to acquire knowledge and skills, search for information, and make decisions and construct meaning after clarifying how located information meets their needs.

This view is controversial because it assumes that information seeking is a natural behavioral process rooted in needs. However, information needers may not search for information; instead, they may exhibit information avoidance behavior, may lack the skills or motivation to seek useful information, or may be unable to discern information needs that others (such as librarians, other family members) can perceive.

Moreover, not all information acquisition behaviors are need-driven. For example, incidental information encounters (such as through channel surfing, checking social media) are not driven by urgent information needs. The lack of a clear basic definition of information makes the relationship between needs and queries more complex. Who decides whether and when individuals or groups need information, and how do information professionals distinguish needs from individuals' wants, demands, or expectations? There is much ambiguity in the definition of information needs and their relationship to other activities (such as information seeking).

A result-oriented definition is: Information needs represent "certain information that individuals should have to help them work effectively, solve problems satisfactorily, or happily pursue a hobby or interest." This pragmatic definition can be applied in professional settings. It points out potential constraints on information acquisition (micro, meso, macro) and considers diverse tasks and usage contexts. While some may argue that information needs only exist when users perceive them, the above definition is not clear on this point. Others believe there is an "unrecognized" state where people lack sufficient awareness to understand and articulate their own information needs. Information profes-

sionals often cannot make decisions about plans, systems, and services based on explicit information needs; these may only be the tip of the iceberg when it comes to users' complete, current information needs.

Information professionals must take seriously and strive to meet users' expressed information needs. Even seemingly trivial requests may help build relationships and lead to more important queries in the future. However, merely receiving explicit information requests is insufficient for assessing, understanding, and meeting the information needs of a user group. Information professionals must also 设法 understand the many factors that constitute and influence information needs. Moreover, to be proactive, information professionals must strive to anticipate group needs based on larger social trends before needs are perceived and expressed.

2. Theoretical Approaches to Information Needs

(1) Information Needs Implicit in Information Behavior Wilson defined information behavior as “the totality of human behavior in relation to sources and channels of information, including both active and passive information seeking and information use.” Within this framework, the scope of information activities includes: posing queries or questions, selecting information sources, and distilling ideas from text and multimedia through reading, browsing, etc. Information needs can not only promote information activities but may also be studied and analyzed based on the information behaviors they trigger. Information needs themselves cannot be observed, so they exist in a “black box” that cannot be directly seen by people. By studying how people interact with formal (such as information databases) or informal (such as friends and family) information systems, information professionals can infer users' information needs.

There are two main criticisms of this approach. First, it cannot explain what people think and feel, only what they do. When people recognize, express, and try to satisfy a need, they engage not only in different activities (e.g., consulting others, targeted searching) but also in cognitive processes (e.g., perception, interpretation) and emotional states (e.g., uncertainty, frustration). As information research increasingly explores the role of emotion in information behavior, it has become clear that in some contexts, emotion plays an important role in facilitating information seeking and use behaviors. Second, while behavior may help information professionals predict or characterize the information needs of their organizations or user groups, it does not necessarily help information professionals understand and engage with users around their complete, current information needs in context. Some needs may remain hidden or unexpressed because they involve a stigmatized or shameful topic (e.g., personal health issues, membership in a stigmatized group). At other times, “unrecognizable” (defined as lack of awareness of the need) becomes a barrier to seeking, accessing, and using information.

(2) Information Needs and Context Information needs are highly contextual; different social and material environments elicit different information needs. Therefore, information needs can be addressed according to the “user’s life world.” The life world consists of multiple sub-worlds (e.g., home, school), each containing different reference groups (e.g., peers, teachers) and human and/or technical information systems with which to interact. Information needs arise from the context of sub-worlds and the social roles individuals play in specific contexts. The importance of context in shaping information needs and human responses to such needs may explain why there is such a wealth of information behavior research that requires grouping people by occupation (e.g., lawyers, doctors), demographics (e.g., age, socioeconomic status), and roles (e.g., patients, hobbyists). Perhaps it is impossible to develop a universal approach to assessing and measuring information needs, but it is feasible to consider the changing information needs of a specific environment and the population working in that environment.

Understanding the user’s context is important not only for reflecting information needs among people but also for designing information systems. One technique applied to system design is creating a persona or describing a virtual user. A persona is a rich description constructed from relevant information about potential and actual users, giving designers a clear understanding of their design targets. Personas need not be limited to the development of technical applications but can be applied to the design of information services and programs. A contextual perspective allows information professionals to consider the various factors related to individuals, their environments, and their workplaces or communities that contribute to and influence their information needs.

3. Diverse Information Needs

(1) What Does Diversity Mean? Discussions about diversity and diverse institutions inevitably include several key terms: diversity, equity, inclusion, and multiculturalism. Each term is important, representing specific approaches and activities to address differences among populations. However, truly strategic institutions use specific terms based on culture, priorities, and their own philosophies. To help clarify how diversity is used in this chapter and to facilitate clearer future discussions about multiculturalism, diversity, equity, and inclusion, it is important to define these terms.

Multiculturalism: Although less used as a strategic goal or priority, multiculturalism or multiculturalism remains an important concept for creating services and programs. In 2005, the American Association of Colleges and Universities (AACU) released three reports as part of its “Making Excellence Inclusive” initiative. In one report, *Making Diversity Work on Campus: A Research-Based Perspective*, a simple definition of multiculturalism was provided as “the recognition or appreciation of different cultures.” Month-long cultural celebrations, cross-cultural dialogues, or rotating exhibitions of different cultures are

currently some of the most popular multicultural efforts.

Inclusion: Assuming an institution or community displays many different abilities and perspectives, inclusion efforts build an environment that values those unique skills, perspectives, and experiences. Inclusion efforts enhance individuals' value and dignity by creating a strong sense of participation and belonging.

Equity: Equity has become a key term in academia and government agencies, especially regarding compliance issues that have attracted attention. Equality assumes that some differences in individual experiences can be avoided or remedied, usually caused by inherent or acquired characteristics (race/ethnicity; gender, gender identity, or sexual identity; physical or cognitive differences; social or economic conditions; geographic environment). Pursuing equity requires recognizing that each person may have different experiences. We need to work to overcome those avoidable or remediable differences to create more equitable experiences.

Diversity: The AACU article mentioned above provides a useful definition for diversity. "In addition to conceiving diversity and exploring differences, we have also added some forms of injustice (opposition to exclusion, prejudice, and discrimination) to the definition. Indeed, perhaps more importantly for the definition of diversity, we firmly believe that diversity is fundamentally work, very time-consuming and arduous work." Diversity initiatives focus on the hard work of previously excluded, prejudiced, or discriminated-against groups through deliberate, positive, and important measures to overturn or correct experiences. Similar to equity, diversity requires joint efforts to change long-standing institutions and provide more equal experiences for all.

(2) What Characterizes Diversity Work? Diversity work often addresses the needs of specific groups or cultures within larger communities. These groups share inherent or acquired differences and form groups around these differences. For different people, some characteristics may be inherent or acquired, depending on their living environment. Diversity characteristics include: 1. **Inherent diversity:** Important difference characteristics for us, namely gender, race and ethnicity, physical and cognitive abilities, age, and sexual orientation and identity. 2. **Acquired diversity:** Those characteristics changed through our experiences and choices, namely education level, language ability, immigration experience, family status, and interpersonal relationships.

The most obvious aspects currently considered diversity work—gender, race and ethnicity, physical and mental abilities, age, and sexual orientation—are usually inherent diversity. As society and culture change, groups with the same differences gradually show unique experiences, and these difference characteristics also begin to evolve. Gender diversity work aimed at addressing differences between men and women has expanded. This work can understand the social construction of gender and can be used to think about expressions of different genders rather than taking the same approach to men and women. Under-

standing of a group also changes, such as revisions in understanding Hispanic populations or distinctions between Asian and Pacific Islander populations. As there is deeper recognition and understanding of unique experiences, exclusion, prejudice, or discrimination in group experiences, diversity work is also changing.

While considering that diversity has inherent factors helps eliminate exclusion, prejudice, or discrimination, consideration of acquired diversity can help organizations guard against homogenization and resulting limitations in understanding, development, and innovation. There is a need to recognize that many unique experiences need to be acknowledged and understood. This includes differences in economic status, education level (such as first-generation college experience), family or relationship composition (such as single-parent, adoption or foster care, multi-generational families, single, married, partners), immigration experience, geography (such as rural, urban, suburban), work experience, language ability, and religious beliefs. By understanding the unique experiences and perspectives generated by inherent and acquired differences, institutions can avoid groupthink and design more inclusive services or programs.

To broaden understanding of diversity and diversity work, many institutions use the “Diversity Wheel.” Figure 5 [Figure 5: see original paper].¹ illustrates the many experiences people gain from experiencing life. The Diversity Wheel helps illustrate that people do not experience life through a single dimension but through multiple perspectives (e.g., their economic background, race and ethnicity, gender identity, etc.), each affecting their experiences.

Diversity work should serve the community it is in, which is important to remember. When an institution considers its community, it identifies the prominent characteristics of that community and tries to better understand the experiences of people within the community. For example, information systems serving larger areas may prioritize experience differences between rural and urban users. Institutions can also identify certain characteristics that need better attention. For example, within large and diverse Asian or Hispanic populations, differences in national origin may be particularly important. Diversity is work; it must be responsive and adaptive, and cannot consistently adhere to certain definitions without changing with the work.

(3) Common Characteristics of Diversity Figure 7 [Figure 7: see original paper].²⁻¹ Diversity Wheel

1. **Gender:** Gender diversity (or gender equality) work usually focuses on traditional understandings of men and women and seeks to improve women’s representation rights in traditionally male-dominated programs or services. As understanding of gender increases, gender diversity may also go beyond common gender norms. Non-binary gender diversity includes understanding of personal gender identity (self-concept), gender expression (outward gender expression), and gender role (position in

social gender). This expanded understanding of gender may also intersect with addressing differences in sexual orientation.

2. **Race and Ethnicity:** In the United States, diversity work for race and ethnicity traditionally aligns with race and ethnicity categories standardized by the U.S. Office of Management and Budget (OMB) in the U.S. Census (e.g., Hispanic or Latino).
3. **Physical and Mental Abilities:** Individual physical and mental abilities vary greatly, making it difficult to clearly define all characteristics of this category of diversity. The Americans with Disabilities Act (ADA) is one of the most comprehensive civil rights laws, requiring prohibition of discrimination and guaranteeing equal opportunities for people with disabilities, but does not specifically list the issues or differences the legislation addresses. ADA defines disability as “a physical or mental impairment that substantially limits one or more major life activities, a person who has a history or record of such an impairment, or a person who is perceived by others as having such an impairment.”
4. **Age:** In the representation of today’s communities and institutions, generations have different experiences and perspectives. As baby boomers (born 1946-1964) begin to retire and as younger generations growing up amid major technological changes become independent decision-makers, generational differences may become more pronounced. Generational differences can include values, communication styles, work expectations, and political and social concepts.
5. **Sexual Orientation:** The unique experiences of lesbians, gays, bisexuals, and transgender people (LGBT) constitute a (still emerging) diversity category that organizations often need to address. In the workplace, diversity efforts for sexual orientation attempt to counter the discrimination faced by LGBT employees and customers. Diversity in sexual orientation can be encouraged by encouraging various representatives to participate in institutions and communities.

(4) Diversity, Access, Intellectual Freedom Diversity is linked and complementary to two key principles of information experts: intellectual freedom and equal access. Information professionals’ adherence to the principle of intellectual freedom prompts them to support and protect information users’ rights to read, seek information, and speak freely. Understanding of different user needs informs the many intellectual freedom policies supported by ALA, including diversity in collection development, universal freedom of expression, fair access to resources and services regardless of gender or sexual orientation, services for people with disabilities, and language diversity. These policies require information workers not only to collect a wide variety of information resources but also to provide a diverse set of services, proactively provided to those who need them.

Equal access to information is built upon what information institutions have traditionally called “outreach” –developing special programs for special populations or underserved or unserved populations (especially adult new learners and non-readers, incarcerated people, poor or homeless people, people with special abilities, racially and ethnically diverse communities, immigrants, geographically isolated people, elderly and homebound populations). Many services have achieved great success, but they often rely on specialized funding or experts dedicated to this work. Changes in personnel, funding, or priorities may interrupt services and terminate relationships with specific communities. Equal information access encourages shifting from always developing special services for specific user groups to always providing quality services for all user groups, by thinking from the perspective of developing needed information services for different individuals. Equal information access aims to recognize user diversity and develop information services based on their unique experiences. Reasonable services and policies are formulated through evaluation and participation in the different environments where information users are located.

4. Cross-Cultural Communication and Cooperation One of the most important diversity works that information institutions can undertake is to achieve equal access to information by incorporating diverse community designs into the design of programs and services. The responsibility and goal of information staff are to understand the diversity characteristics of their communities by becoming more familiar with language preferences, social customs, and cultural norms, and to formulate optimal service strategies. Professionals can meet and collaborate with representatives to effectively and positively meet their needs. Accommodating representatives from different communities can enhance understanding and discussion of cultural values. There is no better learning method than direct participation. Community outreach is also crucial because service development requires the same trustworthy and respected activities that demonstrate genuine interest and ultimately participate in cultural exchange.

When communicating between different communities, the complexity and importance of communication increase. Actual efficiency is far better than imagined. Active listening and awareness of individual or group thought activities are the foundation for building trustworthy and reliable dialogue and connections with audiences.

(1) Effective Communication Strategies for Serving Diverse Communities **Don’ t be a know-it-all:** Colleagues usually have the best ideas, resources, and solutions. The best role for information staff is an active listener and facilitator. Properly maintaining appreciation and humility provides greater depth for personal and organizational internal cultural development.

Remove assumptions related to privilege and class: Everyone has a set of ideas and experiences specific to their environment and experience. Information staff should remove any assumptions arising from certain positions or social

statuses; these factors may affect information staff's intentions and motivations when serving others.

Filter out middle-of-the-road views: Other (perhaps less traditional) perspectives may be valuable in analysis and operations.

Build a knowledge base: Improving personal and professional awareness and understanding of demographic frameworks is essential for participating in cultural affairs institutions.

(2) Language Language occupies a very important position in cultural competence, especially in a multi-ethnic work environment. There are many factors to consider in language selection and preferences—where and how to develop language abilities, social environments, and general language use at home compared to other environments. When you learn more about the demographic characteristics of a service community, you will realize that language used at home, immigration factors, and birthplace all affect communication. For example, the difference between Castilian Spanish and talkative Spanish, or many local dialects of Cantonese, and the difference between Taiwanese and Mandarin. Even for a common language, understanding language preferences in a diverse community is very important.

The use of Spanish or Latin American languages that are available or unavailable is also very different in communication. Language differences are reflected in both oral and written communication. The choice of words and the translation of library registration card forms, classroom signs, and other published information need to be carefully considered and decided together with community groups. Ultimately, some consensus knowledge and authoritative expert translations within communities cannot be changed.

(3) Social Customs Familiarity with social customs affects the respect and authority of services that reflect community values. These customs include many things, from food preparation, to gift-giving, to removing shoes before entering a house, to offering optional things to the oldest person in a group first. Familiarity with social customs, awareness of similarities and differences in customs, can deepen understanding of community diversity. It is important to respect the cultural ownership of customs and acknowledge their rights to share and define customs, appropriate behaviors, and importance.

(4) Cultural Norms Activities that are commonplace for some people may be unusual for others. This can include many behaviors, including family communication, hierarchy, normative principles, and cultural pride. Diverse communication may bring cultural norms that are unfamiliar to some large communities. Similarly, residents of large communities may be unfamiliar with diverse communities. For example, the concept of information and borrowable educational resources is new for first-generation and even second-generation immigrant groups who have no similar experience in their countries. Recent

cultural norms may also be a combination of traditional and modern practices, influenced and changed by large community groups.

5. Developing Culturally Competent Institutions

(1) Cross-Cultural Communication and Cooperation One of the most important diversity works that information institutions can undertake is to achieve equal access to information by incorporating diverse community designs into the design of programs and services. The responsibility and goal of information staff are to understand the diversity characteristics of their communities by becoming more familiar with language preferences, social customs, and cultural norms, and to formulate optimal service strategies. Professionals can meet and collaborate with representatives to effectively and positively meet their needs. Accommodating representatives from different communities can enhance understanding and discussion of cultural values. There is no better learning method than direct participation. Community outreach is also crucial because service development requires the same trustworthy and respected activities that demonstrate genuine interest and ultimately participate in cultural exchange.

When communicating between different communities, the complexity and importance of communication increase. Actual efficiency is far better than imagined. Active listening and awareness of individual or group thought activities are the foundation for building trustworthy and reliable dialogue and connections with audiences.

(2) Developing Culturally Competent Institutions Developing cultural competence is a key to an institution's diversity construction. Cultural competence is defined as a consistent set of behaviors, attitudes, and policies that together enable a system, institution, or professional to work effectively in cross-cultural environments. The following five basic elements are listed to represent an institution at all levels, including policy formulation, management, and practice, which should be reflected in the institution's attitudes, structures, policies, and services: - Value diversity - Have the ability for cultural self-assessment - Be aware of the inherent dynamics of cultural interaction - Have institutionalized cultural knowledge - Have adjusted services according to understanding of cultural diversity

6. Information Institutions and Community Development

(1) Information Institutions Support Communities Through collections, programs, and services, information institutions contribute to communities and, through these contributions, provide services and support to communities while enhancing opportunities for cross-cultural understanding. Many information organizations specifically allocate funds to purchase bilingual and multilingual materials related to the community. By including materials in

various formats, including diversity of writers and illustrators, and addressing themes in various fields, information institutions can reflect community diversity. It is important to establish selection of materials that reflect the diverse needs of the community. Community members can contribute to collection development through selection, arrangement, and promotion of materials.

Establishing collections that reflect and demonstrate the diversified cultural values of the community is a key step toward more inclusive institutions and communities. Programs and services can be community-driven or created through partnerships with community-based institutions. Community-wide participation can also be promoted by facilitating dialogues for cultural exchange. As respected institutions, they can promote discussions around difficult topics such as equity, race, social justice, and cultural values. An externally and community-oriented institution provides greater opportunities for gradual institutional change.

Recruitment for community leadership positions, including boards, friends groups, and volunteers, should include consideration of diversity, which can both promote community diversity efforts and be used to strengthen the institution. Outreach, promotion, and partnerships provide more opportunities to advance diversity work. Investing staff time and operational funds to maintain a broad community presence among a range of community members is crucial. In addition, sharing communications through these connections and channels can generate a real sense of ownership, respect, and participation throughout the community.

(2) Communities Support Information Institutions As communities become more actively involved in the production of knowledge and information, they can turn to information institutions not only as sources of content but also as repositories for the information and resources they create. By actively participating in diversity work, information institutions can stand at the forefront of community members' knowledge and information co-creation. Establishing partnerships with different communities can bring unique and valuable local cultural and historical resources, artistic collaborations, and even social or entrepreneurial projects.

Diverse communities can support information institutions in fulfilling their information preservation and access roles. Participation from diverse communities can help information institutions collect and preserve materials most important for documenting the community and its members. Information institutions without diverse communities may not be able to preserve their historical records. Diverse communities can cooperate with information institutions to obtain unique collections and associate them, thereby promoting research and ensuring that information resources are available for future generations.

Finally, information institutions under the participation of diverse communities remain significant throughout the community. Diverse communities provide

effective information sharing systems. When people gather together to share differences, they share experiences and insights with their peers. Information institutions that interact with diverse communities can promote their services, programs, and values within that community.

(3) Information Institutions and Social Justice The emphasis, recognition, and permission of differences among specific community members may still not resolve equity issues. The interaction between information institutions and communities requires them to face such issues. How information institutions address these questions, which often manifest as social issues, also becomes something the entire community strives to resolve. This is the most important aspect of diversity and cultural competence work conducted at the institutional level.

Library and information science has a long and complex history of acknowledging and committing to addressing equity, diversity, and inclusion issues. The development of professional fields and institutions; the use and provision of information systems, tools, and policies; and interactions with individual users, groups, and other institutions all constitute their recognition of equity, diversity, and inclusion.

Efforts to address social gaps by focusing on equity, diversity, and inclusion are often referred to as social justice. The National Association of Social Workers (NASW) defines social justice as “the view that everyone deserves equal economic, political, and social rights and opportunities.” The work of information institutions reflects and supports the work of social workers to fill the gaps left by social and political disparities by emphasizing equitable access and intellectual freedom. From meeting the reading and technology needs of elderly customers to developing services and programs for new immigrants to familiarize them with the country, information institutions play a crucial role in bridging experience gaps among community members.

7. Information Institutions Advance Social Justice Since information institutions are built and maintained through the collective and joint efforts of individuals, there are issues of oppression, power, and privilege. These issues are reflected in the content and organization of collections, the formulation and implementation of policies, the placement of locations and buildings, and the participation and inclusion of community members. The development of libraries and information services in the United States can be seen as a hegemonic discourse about white racial assimilation and personal progress in the United States, which has been widely criticized by scholars in the social sciences, especially because they create fallacies about American society that ignore ideological and material discrimination in American society.

Today, although the enduring mission of information institutions is to promote lifelong learning, it is important for institutions and their personnel to think

about how to achieve this mission. In pursuit of social justice, information institutions must question how existing policies, structures, and program systems support communities and how their inclusion efforts include all parties and resist oppression.

Information institutions and information professionals can pursue social justice throughout their practice. In collections, professionals can think about those voices and perspectives that represent privilege and create more inclusive and authentic collections. In the description and organization of information, professionals can consider the terms and structures used for cataloging and organizing content. In the past decades, information professionals have considered the inherent bias in subject terms and advocated for more inclusive terminology. Recently, library readers and professionals have expressed concern about the use of “illegal aliens” in the LC subject heading system. As public places, the history of libraries and information institutions is intertwined with racial discrimination, and some professionals advocated for racial segregation policies in spaces and services. Many disapproved. Spatial segregation and inequality continue to exist in underfunded and understaffed areas. Information professionals have a historical tradition of adjusting services and programs to address emergency needs and emerging populations. However, rapid population shifts and community needs make programming and outreach activities an important aspect of information institutions’ commitment to social justice.

Although much social justice work can be initiated through the internal focus of information professionals, an increasing number of professionals are adopting an outward-looking approach to collaborate with communities to prioritize social justice issues. Like many other institutions, information institutions can no longer dictate to the communities they serve. In an increasingly networked and interconnected world, various members of the community have the technology and power to organize and solve specific problems. This shift provides an opportunity for information institutions to develop outward, acknowledge and accept the urgent issues and aspirations of community members, and work together to solve them. This philosophy can be seen in programs such as the American Library Association’s Libraries Transforming Communities initiative, which integrates content from the Harwood Institute for Public Innovation or references Aspen Institute dialogues on public libraries.

It is almost impossible to ignore the potential marginalization of different members in the community, but through self-reflection and turning to adjustment, information institutions can move toward a more just society. When information professionals commit to addressing equity, diversity, and inclusion issues in institutions and communities, they are likely to also begin addressing social issues, concerns, and conflicts that are inseparable from the community.

Section 3: Libraries Under Diverse Information Needs

1. School Libraries To meet the intelligence and information needs of twenty-first century students, school libraries are rapidly evolving. Teaching students to access, evaluate, and use information and how to become active participants in the global landscape is the core responsibility of school librarians. School library standards knowledge from organizations such as the American Association of School Librarians (AASL) and educational standards like The Common Core are essential for today' s school librarians.

School libraries serve as important and relatively new places for learning public knowledge. In this field, school librarians provide models for lifelong learning and guiding community members in information skills as well as collaborative and creative learning. School libraries (or media centers) provide basic services for K-12. Their function is to meet the learning needs of schools. Although this seems like a simple and obvious task today, it is also complex. As actual places, school libraries are learning centers filled with learning resources and tools. But this is precisely the service provided by information professionals, such as guidance and support for students and teachers inquiring about and practicing literacy in libraries and libraries.

School libraries serve the work of educating youth in schools, mainly achieved by providing core curricula. However, school libraries serve not only the academic curriculum of schools. In addition to providing resources and tools that teachers and students can use to access and create information and build knowledge within curriculum standards, they also support personal learning outside the classroom. Through introduction, guidance, and instruction, school librarians encourage inquiry and knowledge accumulation in a flexible environment that provides collaborative learning, personal pursuits, and knowledge sharing. This chapter clarifies the unique role of school librarians as teachers, emphasizes their work as administrators, and finally introduces school library spaces. After reading this chapter, readers should understand the responsibilities of school librarians, school library teaching programs, and how library spaces support new teaching.

(1) The Role of School Librarians Today' s school library management models are still based on early twentieth-century theories. The role of school library administrators began to expand in the 1960s to include teaching roles. In the twenty-first century, the scope of school librarians' responsibilities ranges from project managers to intelligence experts (e.g., reading, information, and digital), to instructors who collaborate with classroom teachers on curriculum planning and instruction, and to mentors who provide personal guidance to the school community. The following sections outline the maintaining and emerging roles of school librarians.

- 1. Teaching and Modeling Information Literacy:** School librarians' information literacy is the main function of school librarians. Educating

students to access, evaluate, and use information in their academic environment and as citizens of a democratic country is the core of the school library curriculum. As curriculum standards guiding instruction emerge in core subject areas, school librarians also develop curriculum standards. These learning standards have evolved over time. In 1998, guidelines for school library and learning standards were developed, providing librarians with an important teaching benchmark for information literacy. The American Association of School Librarians (AASL) and the Association for Educational Communications and Technology (AECT) jointly released the *Information Power* report, which described nine student learning standards.

These learning standards guided the teaching objectives of school libraries as students, teachers, and school librarians began to navigate the information-rich new era. AASL standards were consistent with the definition of information literacy provided by the American Library Association (ALA) a year later, defining information literacy as “the ability to recognize when information is needed and to locate, evaluate, and effectively use the needed information.”

- 2. Building Digital Literacy:** References to technology are embedded in AASL student learning standards as tools for accessing, using, and creating information. Therefore, AASL standards emphasize another key role of school librarians—developing students’ digital literacy. Here, digital literacy is defined as the ability to use technology to learn and contribute to global society. “Digital literacy” cultivation means that merely understanding tools is not enough; knowing how to cultivate one’ s ability as an active member of the digital community and to strengthen and transform one’ s own learning is equally important.

School librarians must be good at identifying students’ information needs; helping students explore research questions and find and evaluate information with high quality, accuracy, and relevance; and deciding how to present answers to others in an ethical way that benefits others. At the same time, the Common Core standards emphasize that the research process must be responsible, providing school librarians with opportunities to collaborate with classroom teachers on team teaching and model information literacy skills. Under this Common Core shift to new learning expectations for students, both students and teachers need support and guidance for modern information practices.

School librarians are responsible for managing libraries. Managing a school library includes collection development, volunteer management, promotion, library marketing, and advocating how school librarians help and support student learning. School librarians work with schools and, with school board approval, develop policies and procedures to maintain the values of information access and user privacy, such as those related to material selection and handling problematic materials. This includes using filtering and acceptable use policies that are both legal and open enough to support student learning. It also includes circulation policies. School librarians also maintain and manage budgets that enable

programs to develop; this usually includes seeking funding and advocacy for the program. Managing budgets requires school librarians to understand funding categories and opportunities, grants and donations, and their daily budget accounting. They are responsible for managing a collection, selecting appropriate materials, and organizing the collection for use. They supervise staff including student and parent volunteers, as well as support from paraprofessionals. Since program maintenance is the responsibility of the school library director, they need the ability to develop strategic plans within parent organizations (schools) to ensure the relevance and use of the school library in the school community.

3. **Connected Learning:** Another learning model that school librarians can use is connected learning. School librarians use the three design principles of connected learning to design learning opportunities that support both inquiry learning and the core of Common Core State Standards. When designing learning opportunities, school librarians should recognize the principles of learning and how they connect to familiar learning models, such as inquiry-based learning methods. When emphasizing interest-driven learning, school libraries recognize and utilize intrinsic motivation. This deepens project-based inquiry learning models and problem-based learning models, allowing students to participate in personally relevant projects. For example, collaborative groups can focus on community projects of interest to participants while still maintaining connections with core academic content. When recognizing the role of peers in supportive learning, school librarians can encourage connections among learners with similar interests while enabling young people to demonstrate their expertise. School librarians can also identify, support, and encourage the development of academic skills while students have learning opportunities. By identifying skills students develop, school librarians help students learn reflective practices that allow skill transfer between different disciplines.
4. **Reading Promotion:** The most familiar role of school librarians is promoting reading. As early as the 1920s when school libraries emerged, libraries were seen as places where students could obtain personal reading materials. For a long time, school libraries have provided students with not only print materials supporting the curriculum but also recreational reading materials. School librarians model a love of reading through reading-related activities and promoted reading materials. Even in the information age, as formats change and audio or e-books become available, the focus on reading promotion remains an important role for school librarians. The historical focus on supporting and promoting reading has evolved into today's role of school librarians as literacy experts. In the twenty-first century, the role of literacy experts is particularly important because literacy is a complex concept that includes the ability to decode, comprehend, and create various types of texts. School librarians teach strategies for predicting, summarizing, and synthesizing multiple texts. They integrate media literacy into information literacy instruction, encouraging students to analyze and use information in various forms. In addition, the empha-

sis on complex texts once again highlights the role of school librarians in developing textual literacy by providing complex texts involving the core curriculum. While supporting the core curriculum remains the main task of school librarians, school librarians are also responsible for encouraging and modeling the pleasure of reading. This means school librarians have the responsibility to understand interest trends in the communities served by the library, as well as trends in genres, popular titles, state and national award-winning and famous titles. These awards include the Newbery and Coretta Scott King Awards, Caldecott Award, and Printz Award sponsored by the American Library Association, the National Book Award for Young People, and various state reader awards and lists. By keeping up with the times, school librarians provide students with opportunities to find stories they enjoy reading.

(2) School Library Teaching Models As school librarians increasingly focus on teaching, they engage with students through three different scheduling methods: fixed, flexible, and mixed. Fixed schedules mean students come to the library for class weekly or biweekly. Fixed schedules are helpful for instruction and programming but have limitations in collaboration. Flexible schedules mean teachers schedule library time as needed. This model allows teaching to be embedded in classroom curricula and relies on collaborative teaching methods. Mixed schedules combine fixed and flexible schedules, with certain times open daily for courses requiring research and inquiry guidance. Among these three teaching models, there are different teaching models, including: direct instruction or programming, such as story time; inquiry-based learning models; connected learning models.

1. **Inquiry-Based Learning:** Over the past decades, some K-12 teachers and librarians have implemented inquiry-based learning in their schools. Although the policy implementation era of No Child Left Behind and Race to the Top (2001-2011) emphasized basic skills testing needed for success of at-risk students and reduced widespread implementation of inquiry-based learning, the recent transition to Common Core State Standards, which focus on helping students develop real-world skills needed for college and career, has refocused K-12 schools on inquiry-based learning. Inquiry-based learning is defined by the following key components: real-world, relevant questions or problems; questions and investigations built on students' interests and prior knowledge; connecting school-based learning with out-of-school experiences; and iterative investigations using various resources. This includes experts in the field, primary and secondary sources, field investigations, construction of new knowledge, presentation, and reflection. There are several inquiry-based learning models, as shown in Table 6 .2.

The key to inquiry-based learning is students' ownership of the learning process, transforming the role of the teaching team into coaches and models. As information experts, school librarians can stand at the forefront of implement-

ing inquiry-based learning opportunities, emphasizing twenty-first century skills such as collaboration, communication, creativity, and critical thinking (also emphasized by Common Core standards).

(3) School Libraries as Learning Spaces School libraries have the potential to become third spaces. Third space theory is more worthy of attention in this chapter. The significance of school libraries lies in the belief that there are three aspects of learning: home, work, or school scope, and an additional space that exists as a non-profit social service in a public environment, such as public libraries (see Chapter 8: “Non-profit Social Services for Lifelong Learning: Public Libraries”). School libraries firmly fall within the school space. However, the environment of school libraries can also serve as a third space, encouraging students to participate in personal inquiry, pursue collaborative projects of interest, and enjoy a space where they can connect with community mentors. For example, school libraries support personal inquiry, personal reading interests, and personal pursuits that classrooms may not necessarily provide. School libraries participate in the connected learning framework, helping students connect with mentors and other community members based on their interests, even if these interests go beyond the school curriculum. In other words, although school libraries are located on campus, they support broader types of learning.

School libraries as third spaces have additional benefits for students because they provide a place of refuge: a space where individuals can pursue information needs and interests (which they may not be able to explore in other environments due to perceived risk). School librarians must strive to provide safe, welcoming spaces for students who need quiet time and space. School libraries that implement shared learning models, including collaborative spaces, should also consider how to provide spaces for quiet thinking, learning, and reading. In the next section, we will explore shared learning in more depth.

(4) School Libraries as Public Learning Spaces As inquiry-based learning deepens in schools, school libraries have begun to reshape how spaces and resources are used to serve learning communities. Many libraries are now defined as “learning commons,” which challenges the stereotype of school libraries as only places for independent learning materials and spaces.

Learning commons are defined as learning spaces, project spaces, and research spaces. Usually, in a single space, they combine elements related to libraries, computer labs, and collaborative areas. Learning commons provide a flexible space that can be easily reconfigured for use as performance spaces, group collaborative work, or independent learning.

In addition, learning commons are trending toward integrating elements of makerspaces, especially media and digital makerspaces, equipped with project-oriented tools such as cameras, editing hardware and software, robotics, and electronic devices. The concept of learning commons invites students to construct their understanding and design their works.

School libraries are well-suited to serve as public learning spaces in schools. They have ready-made research resources, computers for accessing information, and facilities that encourage collaboration, such as movable tables. School learning commons are improving their spaces by adding tools and resources for learners, such as adding design-based software, peripherals needed for creating digital media, and spaces for online and offline collaboration and execution. As information professionals begin to understand the potential of makerspaces in school libraries, combining practical opportunities for design-based learning has become a basic component of many learning commons. These design-based learning opportunities include the technologies mentioned above as well as 3D printers, robotics peripherals, and programming tools, and may even include simple things like LEGO to encourage spatial design. In this area, we have the responsibility to encourage students to learn using tools that are not available to all students.

School learning commons platforms provide 24/7 learning opportunities. Virtual learning commons are more than just school websites. While providing database access, online catalogs, links to recommended resources, and tutorials on information skills, they also provide interactive spaces.

Students and teachers can build and contribute to a learning commons, providing collaborative knowledge-building opportunities, peer expertise, and guidance. This includes building recommendations for reading, research tools, and school projects. However, it can also serve as an online space for displaying art, writing, and other activities. When students create works in this online space, they participate in real-world publishing and global communities.

Perhaps the most important element that school librarians can provide for learning commons is modeling lifelong learning and guiding community members in information skills. As information literacy experts who understand how to use technology to present learning, school librarians are in a good position to manage learning commons environments. They act as liaisons to experts in local and global communities. Learning commons include the entire school's learning community; they do not exist in separate classrooms. The "school learning commons" is the core of the school, where students, teachers, curriculum, and interests converge, and where students go out of the school to participate in research.

In the information age, school libraries are the center of learning. School librarians provide instruction, guidance, resources, tools, and connections to support classroom curricula and informal learning inquiries. They are an integral part of the school community. School librarians can influence learning and teaching and inject information literacy skills into students' experiences while supporting curriculum and content standards. They build unique relationships with learners and model lifelong learning by providing spaces for multiple activities.

2. Digital Libraries

(1) Demands Faced by Managing Digital Libraries Today's digital libraries face a daunting series of challenges that require leaders who understand these challenges and know how to address them. Managing expectations means finding ways to understand the main virtual readers of digital libraries. It means making difficult choices about how to allocate funds to new projects while maintaining old ones. It means strategic planning for a changing technological future. It means ensuring that digital librarians' skill sets are diverse and technology-based.

(2) Managing User Needs and Expectations Through their websites, electronic resources, email, and chat reference services, information organizations reach users who are often anonymous and geographically diverse every day. The users of today's information organizations are no longer limited to those who walk through the door. Although on-site services are very important, the most frequent and enthusiastic users of information organizations may actually live miles away and may never directly talk to staff or touch physical items. This situation brings challenges as information professionals try to understand a relatively unfamiliar audience, especially when it involves selecting what information organizations provide online and how to provide virtual services. Both passive (web analytics) and active (surveys and focus groups) methods of obtaining user data can provide a lot of information about the audience of information organizations. However, it is difficult to fully identify and reach users who may benefit most from an institution's services and resources. It is also challenging to describe these audiences in terms that attract decision-makers who provide funding for information organizations. These digital library users, both known and unknown, are part of a technically demanding public. As of 2016, 88% of American adults used the internet. Both casual information explorers and the most rigorous researchers hope that resources and services can be digitally accessed. When it comes to public libraries, users list "free use of computers and internet" and "research resources" as important resources provided by libraries. In the field of academic libraries, "speed and convenience" of direct access to resources are highly desirable, and "the more digital content of various types and formats, the better, almost unanimously." "More and more tasks require support for open access publishing and mobile content delivery, prompting academic libraries to find creative and sustainable ways to support more and diverse digital content." Government agencies, schools, cultural institutions, and businesses strengthen this expectation by providing important online information. As providers of broadband access, lenders of mobile devices, and centers for technology training, information organizations strive to meet the needs of a technology-demanding public while maintaining their current services related to analog materials.

(3) Managing Resources Information professionals wholeheartedly integrate electronic resources and digital services into their institutions to meet user needs as effectively and safely as possible. Usually, new technologies

expand the services of information organizations in exciting ways, whether improving the search capabilities of journals that were previously only available in print or developing social media strategies to tap into new audiences. As institutions add these services, personnel, financial resources, and strategies must be adjusted to accommodate them. Catalogers incorporate linked data, making different information sources machine-operable. Infrastructure expands to preserve and deliver digital materials. Managers decide how to position their institutions in their communities to help justify continued funding. In situations of unstable budgets or little revenue, shifting funds from long-established print priority projects to digital resources is a challenge. Although digital libraries are no longer a new concept, many institutions are still in transition from discrete and/or grant-funded digital library projects to stable and sustainable digital library projects. From the largest libraries to the smallest, finding trained staff and sustainable financial resources is a challenge.

(4) Managing Information Today's information organizations manage three types of digital information: licensed content, content they create themselves, and content donated by others. In some ways, these three types of digital resources are similar to print versions. For e-books and digital journals, institutions formulate purchase agreements and catalog content. Digitized content needs reference support, just like its analog counterparts. Donations still involve establishing donation relationships and agreements. These similarities conceal many ways in which information organizations must expand or adjust existing resources to manage digital information. Therefore, information organizations may end up using outdated systems that can catalog and track analog materials while also handling new systems for digital content. Rights and responsibilities related to content, whether licensed, locally created, or donated, encompass a broader scope than before in an evolving environment full of stakeholders. In addition, there are practical issues that place information organizations in a mediating position between users and content providers, negotiating new rules for digital proxies of print items. Information professionals find that when deciding whether items in their collections can be digitized, they weigh risks and rewards, considering privacy issues, copyright law, and the needs of item creators and users. From ballpark reserves to historical photos, information professionals try to discover the best ways to organize and present the information their users need while respecting legal concerns.

(5) Managing Stakeholder Expectations Information professionals working in parent organizations inevitably need to promote their services to people unfamiliar with libraries, archives, or information management. Information professionals try to quantify the value of these services in ways everyone can understand, trying to justify increasing expenditures in a context where many believe "everything is already online" and digital services are cheaper than analog services. As growing digital libraries require implementing new technologies, in-

creasing infrastructure, and continuous training, those managing digital libraries find they must be skilled at managing expectations to support this growth. It is difficult to report and explain the similarities and differences between physical metrics like foot traffic and virtual metrics like website page views. How much is “visiting” a digital library worth? What is the return on investment for digitizing annual reports when institutions can be far from users? As mentioned above, when an audience may be the entire planet, determining the scope of services for an audience can be difficult.

(6) Digital Librarians Are Crucial When you read job postings for digital librarians, data managers, metadata librarians, or scholarly publishing coordinators, you may wonder how one person can do and know everything listed in the job posting. As early as 2006, Cui and Rassmussen predicted that “digital professionals need to have more breadth and depth of knowledge and skills in traditional library knowledge, technology, and human relationships.” Although some digital librarian skills are unique, many can be found in the current information professional toolkit. Responsibilities such as project management, collaboration, outreach, education, and resource description are as important for digital librarians as for others in the field. In addition to these competencies, it is particularly important for digital librarians to keep their knowledge current regarding technological changes. For example, they need to keep up with software development, innovative services provided to users by other institutions, newly developed standards, and best practices. As more content and services move to the network environment, digital librarians must keep abreast of the complexities of intellectual property and copyright, including Creative Commons, Rightsstatements.org, and other resources supporting the use of digital information and digitized content. It is fair to say that the skills needed by modern librarians are diverse and long-term. Although computer skills and web knowledge are very popular, surprisingly, interpersonal and communication skills are considered more important. This will be a common thread running through the eight general roles of digital librarians described below.

The tasks and roles of digital librarians include: designers, collectors, educators, copyright consultants, managers, negotiators, researchers, and technologists.

3. Academic Libraries

(1) Today’ s Academic Librarians Academic librarians work closely with university students, faculty, and staff. Because they provide services in a higher education environment, they need to be more professional and have higher education levels than other types of librarians. Academic library job postings often require master’ s or doctoral degrees in relevant disciplines other than library and information science, or sometimes do not require a library and information science degree because they often need to solve disciplinary domain problems.

Because librarians are expected to make the same contributions and achieve-

ments as faculty, including conducting research, participating in academic conferences and making presentations, and publishing journal articles, many colleges and universities grant librarians the same status as faculty (whether tenured or non-tenured). In contrast, librarians with so-called academic appointments usually need to go through one or more review cycles before continuing (or permanently) obtaining faculty positions. These librarians may or may not need to conduct research or publish papers directly; in many cases, excellent service and firm belief in professional development are also sufficient for tenure affirmation.

(2) Gradually Defined Roles of Academic Librarians Today, many academic librarians provide professional services in teaching technology support, metadata and research intelligence, and academic communication.

1. **Teaching Technology Support Staff:** Teaching technology requires librarians to provide subject domain topic guides for scientific research and library resources to support academic courses taught in universities and to remotely instruct specific research methods or information literacy skills remotely. These guides (we usually call them LibGuides) enable students and faculty to access needed library resources without librarian assistance.
2. **Metadata Librarians and Intelligence Research Specialists:** Two emerging roles of academic librarians focus mainly on data, specifically metadata librarians and intelligence research specialists.
 - **Metadata Librarians:** Data management constitutes one of the newest and increasingly important roles of academic librarians. Intelligence experts can help faculty and students with data management in digital humanities or e-science projects. Digital humanities (DH) data management includes text encoding, format and encoding management, technical processing of data storage systems, data description, data preservation, and metadata. Metadata is essentially “data about data” necessary to describe digital resources associated with specific types of information resources or subject domains. Its current trends represent a earth-shaking change for generations of librarians trained in MARC, the standard format for standardized and machine-readable cataloging and formal records for all library resources since the 1960s. Technological innovations and the adoption of Resource Description and Access (RDA), Functional Requirements for Bibliographic Records (FRBR), and non-MARC patterns have led to the continuous expansion of catalogers’ roles, which now also include electronic resource acquisition and digitization of collections, batch loading of records, and work on institutional repositories. Revealing potential collection resources through digital projects has become a high priority for many libraries, and such projects require the expertise of metadata specialists.

Currently, three external factors drive the development of cataloging and metadata in academic libraries: funding shortages, competition from free search engines such as Google Scholar, and proving the necessity of cataloger positions that seem redundant in the context of automation and vendor-provided cataloging. Future metadata librarians need to participate in many new activities, including using linked data or the semantic web, or RDA/FRBR, which require additional training. The functions of metadata librarians are continuously evolving, and the position of metadata librarians in academic library organizational structures may be changing.

- **Intelligence Research Librarians:** Digital research projects usually involve big data (a general term for large datasets used for research and decision-making) and focus on developing new computational tools and infrastructure to support scientific research discoveries. Funding agencies such as the U.S. National Science Foundation (NSF) and the National Institutes of Health (NIH) now require scientists to support open access to underlying data obtained through funding. Since January 2011, proposals submitted to NSF must include data management plans. In response, some academic librarians, professionally known as intelligence research librarians, are helping researchers on campus comply with this requirement by providing assistance with planning, archiving, and sharing research data. To succeed in this role, research librarians must have extensive knowledge, as well as facilities and regulations related to data management, data preservation, funding compliance, and grant writing, plus core librarian skills such as expertise in database and web searching, understanding how information is organized, critical thinking, and being good at writing and public speaking.
- 3. **Academic Communication Librarians:** Given the major technological and economic crisis in the publishing system, academic librarians are increasingly committed to transforming the academic communication system to better meet the needs of researchers and academia. Academic communication librarians provide advice to authors on author rights and publishing options, advocate for more open and accessible scholarly communication, and even serve as publishers. In addition, many academic librarians, whether in library science or other professional disciplines, conduct their own research and publish articles and books on specific disciplines and library and information science.

(3) Research and Publishing As mentioned earlier in this chapter, academic librarians also conduct research and publish articles and books on specific disciplines and library and information science. Librarians usually need to conduct research to be promoted and obtain tenure. Requirements for tenured librarians may not always be as strict as for faculty because librarians spend most of their professional time performing work duties and usually work twelve months continuously. Nevertheless, the work requirements for librarians are

still high. After five to seven years of comprehensive review of various aspects of performance, there will be a final result for promotion or tenure approval. Libraries encourage academic librarians with non-tenured positions or administrative appointments (management and professional personnel without faculty status) to conduct scientific research and publish academic achievements, but they also have other ways to demonstrate professional competence, such as providing quality services to library users, conducting collection building and committee work, which allows them to be promoted without conducting research and publishing. There is no one-size-fits-all model for academic librarians to conduct research and publish papers.

(4) Information Literacy and Technology Literacy Education Accreditation committees and colleges have recognized the importance of developing students' critical thinking abilities. Therefore, many academic librarians engaged in public services collaborate with teaching faculty to provide information literacy and technology literacy education and training for undergraduate and graduate students. Information literacy education usually includes helping students recognize information needs, find needed information, evaluate the quality of relevant information, and use information effectively, legally, and ethically. Some academic librarians work strictly with teaching faculty following ACRL's *Information Literacy Competency Standards for Higher Education*. In 2000, ACRL defined five information literacy standards that individuals determined to be information literate must meet. Each ACRL standard is subdivided into several indicators, which are further divided into different outcomes. The standards outline the abilities, skills, and outcomes that information-literate students should possess. They recommend that librarians and faculty work together to prepare training courses to better target disciplinary focus content for students and faculty. In summary, they emphasize that librarians and faculty should "work together within specific disciplinary contexts to develop evaluation tools and strategies."

(5) Service to Universities and Professions Academic librarians also serve on university, state, and national committees. If they have faculty status, they may participate in campus governance, sharing high status with faculty and administrators. Librarians serving on state library or education boards have the right to advocate for implementation of educational standards involving information and technology literacy in state college and university systems. Librarians serving on committees sponsored by the Association of Research Libraries (ARL) or the Association of College and Research Libraries (ACRL) can formulate relevant guidelines and standards for adoption by academic library professionals nationwide.

These guidelines and standards address a range of professional issues, including:

- Best practices for fair use that academic and research libraries should adopt
- Screening and appointment of academic librarians
- Services for undergraduates
- Interlibrary loan of rare and unique materials
- Preservation, security, and

theft prevention of special collections - Provision of remote library services - Recommended competencies for special collections professionals

(6) New Models for Reference Services, Instruction, and Learning

Today, academic librarians face a significant decline in demand for traditional reference consultation services. The development of the web has made academic library users increasingly self-sufficient. Therefore, many consultation desks in colleges have been canceled or merged with other service points (such as circulation or computing services); others have switched to a tiered model where front-line staff may be students or non-professional library workers. Front-line staff are trained to answer basic questions and refer to professional librarians for more in-depth questions. Related to this development model, another service model emerged about fifteen years ago, commonly known as learning commons, information commons, or digital commons. Partially inspired by the concept of “one-stop shopping,” this is a full-service space for learning, research, or project work, usually combining library resources with computer labs and movable modular furniture, redesigning spaces to facilitate individual or team use. Professional librarians working in this service model can focus more on high-level research questions and consultation exchanges with faculty and students. The cutting-edge, most exciting parts of these spaces are design labs, collaborative facilities, creativity labs, and digital humanities (DH) labs. Other teaching facilities have also emerged in libraries at the University of Michigan, Carnegie Mellon University, MIT, Barnard College, and Yale University (just to name a few), all with a DIY spirit.

(7) Collection Development, Access, and Preservation In recent decades, the cost of resources in academic libraries has risen sharply, making it impossible for most libraries to adapt and forcing them to adopt drastic cost-cutting measures. While the cost of print books has also increased steadily, the most unaffordable are the exorbitant prices of the “Big Deal” electronic serials packages (bulk digital journals) in science, technology, engineering, and mathematics (STEM) fields provided by publishers such as Elsevier, Emerald, Sage, Springer, Taylor & Francis, and Wiley. Worse still, the prices of these digital journal databases increase at a fixed percentage (e.g., 5%) annually. If libraries abandon the “Big Deal,” they may lose access to 60% of content and would have to pay higher fees for individual subscriptions. But even print journals are costly because they need to be checked in, bound, preserved, and reshelfed after use.

Many libraries have adopted policies that prioritize purchasing digital journals (sometimes simplified as “digital-first policies”) and cancel print subscriptions where possible to avoid duplication and other related costs. Most academic libraries can smoothly cancel print journal subscriptions or move print titles to off-site storage once they have obtained reliable digital collection alternatives.

As another efficiency measure, the adoption of patron-driven or download-driven

acquisition models (PDA/DDA) is also increasing. Under this acquisition model, database vendors allow libraries to load records for e-books and digital journals not yet purchased by the library into the online catalog, enabling library users to find corresponding resources. If a user's use of an e-book or journal article exceeds a certain threshold (e.g., they read a certain number of pages of an e-book or download an article), the library will be notified of the resource's use and charged. Under this model, libraries only pay for what their users actually use.

Nevertheless, long-term preservation of digital resources remains an issue. Most vendors have not yet adequately addressed this problem, forcing libraries to rely on solutions such as the Digital Preservation Network (DPN) and HathiTrust to some extent. DPN was established to ensure long-term preservation and use of digital resources, using a federated approach to preservation, storing multiple copies of resources in multiple locations. HathiTrust is a large-scale partnership of academic libraries, providing millions of books, including content digitized through the Google Books project and archived on the internet. However, even with the combined use of DPN and HathiTrust, many digital library materials suffer permanent loss.

Due to copyright and licensing restrictions, independent library systems usually cannot share access to digital journals or books between them (e.g., Columbia University cannot share its purchased electronic collections with Yale University). Therefore, in recent decades, to share print materials as efficiently and cost-effectively as possible, many academic libraries have formed consortia. Developing joint collections is a cost-saving measure many academic libraries are considering. Under this collection development model, partner libraries divide collection areas (e.g., materials on Africa or Central Asia, or small printed books) among collections to build complementary, non-duplicative collections that are freely shared with each other.

5. Public Libraries

(1) Key Roles of Today's Public Libraries In today's digital environment, where content is widely available through multiple channels, the importance of libraries as book-lending institutions has decreased. Books, music, and movies are all easily obtained and found through vendors such as Amazon, Barnes and Noble, and iTunes. However, public libraries are more than just collections of these materials. Public libraries provide a platform where diverse cultures and ideas can collide in various forms. To some extent, public libraries are chameleons that can adapt to the different needs of diverse communities (see also Chapter 4: "Diverse Information Needs"). Public libraries have become catalysts, platforms, and bridges for community engagement and learning promotion. Today's key roles of public libraries include: 1) Centers for community engagement and learning: providing collections and other service content to support users' lifelong learning and satisfy their curiosity. 2) Community anchors:

providing bridges for people to communicate and understand different cultures, neighbors, ideas, and trends, and providing venues for citizen discussion. 3) Conveners and connectors: bringing people together to solve problems, allowing people to share their expertise with experts, thereby supporting people' s creativity, innovative spirit, and entrepreneurship.

(2) Roles of Today' s Public Libraries

1. **Centers for Community Engagement and Learning:** In some communities, the public library on the town square is a place for assembly, a community center, and a place to lay the foundation for learning through various programs, ideas, and books. Public libraries are defined as learning laboratories, becoming a platform for learning through various methods. Public libraries have a range of tools to support learning of almost any content. Supporting formal education or informal learning for people of all ages is a strength of public libraries.
2. **Community Anchors:** Strengthening connections and establishing partnerships with community businesses, artists, and some organizations is gradually becoming a basic practice. Many public libraries across the United States are trying to build new models that meet the unique needs of their communities. Some examples: Madison Public Library in Madison, Wisconsin, supports creativity development through Bubbler, an initiative that promotes connections between the community and artists among residents (poets, painters, sculptors, textile artists, animators, etc.). Such connections help provide dynamic learning experiences for people who come to participate in workshops and visit and learn. Richland Library in South Carolina is designing its spaces to better optimize studio experiences, such as ballet for children and after-school amateur programs for young people. The Los Angeles Public Library' s online GED program provides a pathway to work and educational success for students who hope to obtain high school diplomas. Multnomah Public Library welcomes immigrants to participate in citizenship courses so they can naturalize. Libraries across the country cooperate with food storage projects to provide after-school snacks and summer lunches for children.

Anythink Libraries outside Denver, Colorado, focus on helping people and supporting their pursuits of learning, collaboration, and creation. Its spaces can support various experiences from reading to entertainment, from cooperation to creation. Experiences in the library are participatory; customers can participate more deeply to become protagonists of the library and gain experiences in the library. The library is a place for inspiration and reflection. Books and information support these library activities and promote people' s learning.

3. **Conveners and Connectors:** By supporting the creative and collaborative abilities of communities, public libraries can not only help people broaden their minds but also support their career development, help them

find new interest areas, and strengthen connections with others. This helps improve the quality of life for community residents. Libraries are at the center of creation, innovation, and collaborative participation (see also Chapter 18: “Cultural Creation and Makerspaces”). Libraries are places where people can learn things happily and safely. Library planning ranges and excellent ideas found in collections are brain food for creative people. Like a farmers’ market with many fresh fruits, vegetables, and local specialties, a library is a market full of ideas, experiences, and opportunities to cooperate with experts. Creativity is about problem-solving, observing original patterns to build connections and constructing associations in new ways. Creativity is about envisioning the future, not being stuck in bottlenecks and satisfied with the status quo.

(3) Organizational Structure Supporting Learning Centers Public libraries that combine new innovative methods with traditional collection-centered services have found that creating community learning anchors requires new systems, new structures, and new operating methods. Both reconstructing library service content and its daily management require reconsideration.

1. **Space Design for Supporting Learning, Exploration, and Discovery:** Whether building new public libraries or renovating old spaces, library space planners follow traditional models. It starts with inventory: counting the number of books, desks, chairs, tables, readers, and bookshelves. Next, predict the growth of collections over time. Then plan spaces around the quantity and forecasts of these things. In the development of today’s public libraries, space for collections is gradually shrinking, while space for activities and learning is increasing. Learning spaces need flexibility, including flexible furniture, lighting, and supply spaces. People are accustomed to learning in different ways. Some people prefer to study alone in a corner of a room. Others prefer group learning.

Planning space for public libraries that store books aims to maximize storage capacity and collection security. Rows of right-angle bookshelves are generally arranged in open mazes or closed stacks. Books are classified according to classification systems, and call numbers are marked on book spines. In stark contrast is the typical bookstore layout, which considers the need to find and sell books easily. Books are stacked and arranged in different areas for easy finding. Now, public libraries are learning from these bookstore retail models to better promote and publicize collections, inspiring community residents to discover new ideas from popular collections.

Human-centered space design needs to make people feel at home. Details in furniture, color, lighting, and signage are key parts of the design space that need attention. People can discover new knowledge and explore in spaces where they feel at home, comfortable, and inspired. For public library furniture, achieving a unified and inspiring style is crucial. Let’s imagine a museum, study, or living room that we would like. Being able to be in close contact with nature, outdoor

scenery, and sunlight makes people feel happy and inspires ideas and creativity. Creating an atmosphere that makes people feel at home, comfortable, and capable is an important part of public libraries creating learning environments.

2. **Hospitality:** Famous restaurant owner Danny Meyers defines hospitality in his best-selling book *Setting the Table: The Transforming Power of Hospitality in Business* as knowing that guests are around you. An important responsibility of public libraries is to create opportunities for people to have successful experiences. Hospitality is inseparable from generosity. Just like the way spaces are designed, hospitality is about making people feel at home, spending time on important things, making people feel safe, and feeling understood. To achieve these requires emotional intelligence and empathy. This also requires librarians to have innate curiosity and enjoy dealing with people. If an organization is known for hospitality, it needs their employees to be optimistic and positive. To hire and retain optimistic employees who are willing to work in collaborative environments, public libraries need to rewrite ideal librarian recruitment requirements, formulate new job descriptions, conduct interviews to identify candidates who best meet such position requirements, and then provide training and guidance, resetting performance evaluation standards that align with library values and missions. Librarians are usually people who love books and have strong motivation to solve problems and puzzles. The ability to get along well with people is a key skill for success in the field of public libraries.

4. Professional Competence: From Storers to Guides Regardless of the space or what resources or services are provided, the most important part of every public library is the librarian. Library staff are crucial to shaping a successful public library as a learning center. The key competencies and skills of librarians are also changing and expanding. Librarians need to be meticulous, have excellent memory, love reading, abide by policies and rules, and keep the library tidy at all times. Of course, this is somewhat too strict in most cases.

Today's public librarians need to be people who are happy to establish partnerships with others. Public library work is more of a calling than a profession. Public librarians need to build connections with readers. For example, services are needed to help high school students complete their studies and conduct first aid learning. From story time during the first visit to a public library to playing chess with the elderly, these activities reflect that the library is residents' second home. Public librarians also send friendly messages welcoming readers. Two key skills needed by public librarians are empathy and generosity. Whether it's an occasion where readers need a smile or someone needs to listen to stories or advice, the work of public librarians requires a certain level of emotional intelligence. Today, the work of librarians can also promote continuing education and help communities solve their unique problems. Michael Stephens, associate professor at the San Jose State University School of Information, redefines the

work of librarians: “Librarians help people understand the world.” The role of librarians is increasingly like a guide who can help people discover their own development paths and explore their own interests.

5. Professional Libraries/Information Centers

(1) What Are Professional Libraries/Information Centers? The predecessors of today’s professional libraries and information centers can be traced back to the eighteenth and nineteenth centuries’ professional collections in law and medicine, as well as membership libraries with collections in science and history, which were more for educational purposes than supporting any organization’s operations. Today, professional libraries and information centers are established in various parent organizations. They provide resources and services to support organizations such as companies, museums, government agencies, and hospitals. Many departments or functional agencies under parent organizations are strategically aligned, all committed to supporting the parent organization’s overall goals, and professional libraries and information centers are also among them.

Each professional library and information center is unique. Some professional libraries and information centers are 100% virtual, have no physical collections, and only provide electronic resources and services to global multilingual user groups. Others consist of historical documents or artifacts whose physical bodies must be stored in temperature-controlled environments. Most professional libraries and information centers fall somewhere in between, providing resources and/or services that best meet stakeholders’ needs.

Professional librarians and information professionals typically: - Serve different user or client groups with unique requirements - Provide information products that support decision-making - Create and manage knowledge systems within organizations - Analyze big data to establish long-term vision and determine competitive advantages

(2) Work Environment of Professional Libraries/Information Centers Information professionals working in professional libraries and information centers may be assigned to specific professional locations or libraries, may be arranged in different departments, or may be dispatched around the world. Depending on the organization, there may be an information professional working independently, or there may be forty or more information professionals working together in a team. Regardless of location and size, the key to professional libraries and information centers is providing information services strategically aligned with the parent organization. In special library environments, those who use resources and services are usually regarded as clients, customers, or users.

Some special librarians and information professionals run their own independent service businesses. Their environment may be a home office that relies on screen-

sharing technology to meet with clients, or it may be a business trip meeting at a client's location, coffee shop, or even a collaborative workspace. Such information management professionals may have no physical collections and may rely heavily on access to online subscription content to conduct primary and secondary research.

For these information professionals, it is very important to determine whether their products and services can provide value to the organization. To assess value, information professionals measure the usage of the products, platforms, and services they provide, and measuring usage can help information professionals prove that the organization can obtain a return on investment (ROI) from their services. Then, information professionals can make fact-based decisions—retaining or changing the information products and services they provide. At the same time, ROI is equally important for independent information professionals and stakeholders of information centers.

(3) Roles, Opportunities, Challenges, and Trends Just as all information professionals participate in information acquisition, management, and sharing activities, professional librarians also provide decision-support information. All activities of information professionals should serve the mission of the organization. Usually, information professionals become experts in information products and research fields. They also know their clients very well because clients are often a clearly defined group, such as scientists, lawyers, artists, or donors. The close relationships that information professionals establish with clients can help librarians maintain a client-needs-first concept and regularly provide clients with new relevant information.

(4) Roles of Professionals Professional librarians and information professionals in an organization often engage in “business serving business” work, so they need an entrepreneurial spirit when developing and managing library operations. Information professionals need to carefully evaluate products based on client needs and negotiate with suppliers. Information professionals often participate in research and information analysis on complex issues. Information professionals may spend hours or days completing an information request. Some information professionals may participate in internal knowledge management projects, where they design and implement information systems to acquire, manage, and retrieve internal knowledge for the organization. Other information professionals design and manage information portals for subscription content. For independent information professionals, every bit of these activities may be included in their roles. Whether working as independent professionals or within a large company, all professional librarians and information professionals participate in marketing and service.

Emerging roles beyond typical information organizations include team-embedded information professionals, such as business development or information technology; positions include business analysts, knowledge managers,

or user experience (UX) designers. In some cases, information professionals may be department heads of information professional teams; leaders of several departments including information centers; the organization's Chief Information Officer (CIO), providing vision and leadership for multiple information departments such as information technology (IT); or even Chief Data Officer (CDO), responsible for managing all information across the enterprise.

(5) Opportunities and Challenges The rapid development of technology provides professional librarians and information professionals with great opportunities to find new paths to success. In this information age, clients are usually “digital natives” who expect quick information responses and answers to their questions. Professional librarians and information professionals meet these expectations by experimenting with and applying new technologies.

Currently, some of the most pressing challenges faced by professional librarians and information professionals include: information expectations, cultural literacy, globalization, marketing, and copyright. Clients and customers of information centers often lack understanding of non-internet information sources that may be crucial to their success. Clients of professional libraries and information centers often need guidance on when to use open literature via the internet when they must subscribe to information sources. Similarly, they may need to develop skills to evaluate the reliability of information from questionable sources. The “on-demand information” environment brings new information expectations for employees and workflows. Professional librarians and information professionals must educate clients because in some cases, clients value speed of information access over information quality, which may endanger fact-based decision-making in organizations. Therefore, the ability of information professionals to successfully teach others information skills is crucial.

Globalization brings many interesting challenges, including information dissemination, export control, and language barriers. Because many people do not understand professional libraries and information centers and their roles, marketing of resources and services is more important in this environment than in other library operations. Understanding and managing copyright compliance tasks often fall on professional librarians and information professionals. All employees/members within an organization must comply with copyright law and content agreements with suppliers to avoid legal consequences.

(6) Current Trends Demographic changes in the workforce and exponential growth of data have important impacts on professional libraries and information centers. In 2015, millennials became the largest generation in the U.S. workforce. Each new generation works differently, and millennials are no exception. As digital natives, millennials live and work in a world full of information flows. They have high expectations for rapid response but are often unwilling to perform operations to verify and confirm information, which may adversely affect decision-making. To better serve this group, professional librarians and infor-

mation professionals can build solutions into daily workflows to enable quick access to reliable information sources needed by these information workers.

With the development of machine technology, machines can now provide a variety of analytical capabilities, including collecting information from different sources, transforming it into insights and wisdom, and thus promoting better decision-making. Predictive and prescriptive analytics are areas that information professionals can develop. Cognitive analytics is a new horizon that provides a deeper level of dynamic information analysis and is another area that professional librarians and information professionals can devote themselves to developing.

Section 4: Information Intermediation and Reference Consultation Services

1. Reference Consultation Services Before the Internet Until about 150 years ago, information professionals mainly focused on the acquisition and organization of library collections. The pre-internet reference consultation model provided librarian-centered reference consultation services at a consultation desk staffed by professional librarians.

To better understand users' information needs, reference interviews were conducted. The scope of reference questions ranged from discrete facts, data, or information and bibliographic verification questions with ready answers to directional, procedural, technical, subject-specific, and specialized research questions. Reference librarians were usually supported by a physical reference collection including encyclopedias, dictionaries, atlases, thesauri, handbooks, catalogs, government documents, and paper indexes, located nearby for easy access. Many of these functions remain indispensable for today's information user services: - Recommending, explaining, and evaluating information resources to help users meet their information needs - Providing library instruction and training - Providing consultation services to readers

Although these functions remain the cornerstone of reference services, reference services must adapt to new trends in how information users find information and must redefine the competencies and definitions of reference services (as shown in Text Box 11.1):

Text Box 7.4-1 Key Competencies for Reference Services

Key Competencies for Reference Services The Reference and User Services Association (RUSA) passed key competencies in 2008: - Visibility/Approachability - Listening/Inquiry

These guidelines are being revised. According to a 2016 report *What's in a Name? A New Definition for Reference*, the definition of reference services needs to be re-examined to reflect current trends and should include: - Follow-up consultation and recommendations - Understanding user needs - Supporting one's own information institution - Design thinking

2. Impact of New Technology on Reference Services The rise of the internet in the 1990s began to disrupt reference services because information access was no longer limited by space. Subscriptions to reference resources (e.g., NewsBank, Web of Knowledge) and free electronic reference collections (e.g., ERIC, PubMed) became commonplace, while paper reference tools such as *Readers' Guide to Periodical Literature* and *Books in Print* gradually became obsolete. Paper reference resources were housed in libraries, occupying large amounts of shelf space. They gradually transformed into bundled digital collections such as Global Reference Center, Gale Virtual Reference Library, and Oxford Reference Online. Many digital collections, such as Google Books, the Internet Archive, and the HathiTrust Digital Library with millions of digitized paper books, began to provide 24/7 direct access to academic resources without information intermediaries. Additionally, over the past two decades, the massive creation of new digital content has led to the rise of online knowledge bases such as the Digital Public Library of America.

Therefore, most information users no longer need physical libraries as portals to information, nor do they need information professionals to help coordinate their access to information. Search engines (e.g., Google, Bing, Yahoo, DuckDuckGo) provide users with convenient access to everything from web-based images and books to maps, videos, and patents. As a result, a self-service community has formed where people often conduct their own unmediated online searches.

The emergence of personal devices, cloud computing, and application technology has made information access even easier, leading people to ask information professionals new types of reference questions. This has led to the development of new reference tools that help information professionals find answers to complex questions and provide value to users.

3. Virtual Reference Tools The emergence of the internet has also made seamless, multimodal virtual reference tools possible, providing users with multiple access points to information centers. Virtual reference services, sometimes called digital reference services or mobile reference services, extend the scope of traditional reference services by providing synchronous and asynchronous, computer-mediated reference services to users through email, chat/instant messaging, text messaging/SMS, voice chat, and cloud video conferencing. Smartphone and other mobile device-based web applications provide users with additional mobility. The global coverage and “anytime, anywhere” on-demand access of these new tools mean that reference services are no longer confined to a single location.

Although technology is used in these interactions, virtual reference interviews are not much different from face-to-face exchanges because they use many of the same reference techniques and skills. Text Box 7.4-2 describes the different virtual reference tools that reference librarians can use to meet user needs.

Text Box 7.4-2 Virtual Reference Tools: Opportunities and Chal-

Challenges

Synchronous reference options such as chat provide information professionals with more opportunities to clarify questions and provide real-time feedback.

Text messaging provides options for synchronous or asynchronous interaction.

Virtual librarians initially had the potential to use immersive technologies (such as Second Life) to provide reference services, but these did not gain widespread popularity.

Other options, such as co-browsing with users, have shown more lasting vitality.

More in-depth research consultation and personalized guidance can use free (e.g., Google Hangout, FaceTime, and Skype) or subscription-based (e.g., Collaborate, Elluminate, GoToMeeting, and WebEx) meeting technologies.

Asynchronous tools like email are impersonal and pose challenges for information professionals who cannot easily clarify users' questions because these tools do not provide immediate responses to questions.

Real-time interactions can be cumbersome, and the success of voice chat depends on network connection conditions.

Since many information institutions do not have staff providing virtual reference services for long periods, online cooperative reference services providing 24-hour service have become another option. The Online Computer Library Center (OCLC) provides QuestionPoint as a round-the-clock reference cooperative, including chat, email, and reference knowledge bases from libraries worldwide. Other information institutions have adopted alliance approaches, such as Ask a Librarian, a statewide alliance of public and academic libraries in Florida. However, since virtual reference desk staff are shared among participating libraries, this may result in information professionals being asked to answer questions about library systems they have no personal experience with.

Technological advancements have also impacted readers' advisory services provided by information professionals in school and public libraries. Information professionals have begun to use readers' advisory tools such as NoveList, LibGuides, and Pinterest to push reading resources covering rich topics from Christian fiction, graphic novels to popular crafts and local history. Users can obtain these reading recommendations through external services such as Amazon, GoodReads, and social media applications like Facebook and Twitter.

Today, reference librarians continue to play an educational role, helping users learn how to locate, navigate, and evaluate information. Currently, many types of library instruction are provided to groups or individuals, ranging from library instruction and bibliographic instruction to information literacy and, most recently, media literacy. Instruction can be provided face-to-face or online. In a 1997 experiment, web conferencing was first used for synchronous library instruction, providing instruction for remote students and gradually becoming an

alternative to traditional face-to-face instruction. Since then, new tools including streaming video, webinars, and webcasts can be embedded into curricula when needed. Regardless of location, information professionals can provide online synchronous group instruction and can also use tools like Collaborate, WebEx, and GoToTraining to provide instruction for online individual users. In addition, asynchronous videos and screencasts can be created using online interactive tools such as Screencast-O-Matic, Jing, or Guide on the Side for on-demand instruction.

To help people meet their information needs, four different types of online Q&A services have emerged: - **Community-based Q&A**, such as Yahoo! Answers, allows users to exchange information in discussion threads with questioners and one or more answers. - **Collaborative Q&A**, such as WikiAnswers, uses a collaborative editing system for questions and answers so that community peers can cooperate to improve the wording of questions and answers. - **Social Q&A**, such as Quora, allows members of interpersonal network groups to ask and answer questions from other members of the same social network using e-commerce real-time chat applications. - **Expert-based Q&A**, such as LibAnswers, provides a hybrid solution that can provide questions and answers, as well as a knowledge database of frequently asked questions, integrated with email, web forms, and Twitter.

Web 2.0 social tools also facilitate interaction and sharing through blogs, wikis, and group messaging. Social media tools including Pinterest, Instagram, Snapchat, Facebook, and Twitter are often used to promote library resources and services and to participate in personal learning networks. Technological advancements in these social tools have had a profound impact on libraries and information services, prompting changes in reference service methods and promoting the development of a new service model called “Reference 2.0.” In the twenty-first century, “Reference 2.0” mainly uses collaborative social network tools to provide digital reference services. “Reference 2.0” services enable reference services to transcend the geographical limitations of reference desks, allowing two-way seamless interaction between information users and reference librarians providing information intermediary services. For example, co-browsing in chat consultation expands the scope of reference services. When expert help is needed to solve specific problems, Twitter can help librarians expand their social circles by posting tweets. Information professionals can also use other social media such as blogs, Twitter, Instagram, and Pinterest to promote reference services and facilitate information intermediation.

Since users can now obtain fragmented, distributed, and often free information intermediary services online, library-provided reference services are competing with various alternative information intermediary methods in the Google era. However, compared to other information intermediaries users can access, information professionals have unique professional knowledge and skills. Specifically, reference librarians provide added value to users through professional research questions, meet user-driven needs, and provide the “high-tech and high-touch”

approach that many users desire. This professionalism makes them knowledge experts in the Google era.

4. Transformation of Information Intermediation Methods The accelerating pace of technological change has made the ways of providing information services increasingly diversified and decentralized. One way libraries provide information services is to use a single integrated circulation service point, where reference service staff are mainly well-trained professional assistants. Another method uses a tiered reference service approach, where professional assistants and student staff answer routine questions (e.g., about collections, policies, restroom locations), while professional librarians answer more difficult questions. Therefore, reference librarians are reserved more for providing consultation services when users need help with more in-depth issues. This allows information professionals to have time to provide services like “My Librarian,” offering labor-intensive personalized assistance to meet individual information intermediation needs. The choice to provide multiple reference service methods, whether face-to-face or online, depends on the specific needs of the library.

The emergence of virtual assistants (e.g., Apple’ s Siri, Amazon’ s Alexa, Microsoft’ s Cortana, Facebook’ s Jarvis, and other chatbots that provide unmediated answers to questions) exemplifies other ways of information dissemination. Considering the development of these artificial intelligence (AI) applications by Apple, Amazon, Google, and Microsoft, as well as other technological advancements, and the reduction in library reference business volume over the past 25 years, information professionals have begun discussing the future of reference services. Part of the reason for the reduction in reference business volume may be the development of all these new online resources and search tools. According to the Association of Research Libraries (ARL), reference business volume decreased by 69% from 1991 to 2012, while the Pew Research Center’ s *2016 Library Report* indicated that public library reference help decreased by 15% from 2012 to 2016. Another reason for the reduction in reference business volume is that librarians’ consultation roles are changing; they answer more in-depth, time-consuming questions, such as those related to knowledge creation. To prove their value, reference librarians have increased efforts to quantify the relevance of their information intermediation services and document the return on investment of providing reference services.

Changing user needs, enhanced social media functions brought by Reference 2.0, and declining reference usage statistics have all put pressure on libraries to reach users in new ways. Therefore, libraries place greater emphasis on providing outreach services. In fact, Tyckoson defines outreach activities (promoting services and resources provided by information organizations to a broader user community) as the fourth responsibility undertaken by contemporary reference librarians.

Some new approaches to reference outreach have been adopted. For example, roving reference, sometimes called roaming reference, uses a retail-like approach

to promote reference services by providing them in high-traffic areas away from the reference desk. It usually provides help where users need it in the library rather than at a designated fixed location. Outreach or community librarians play the same role outside library buildings. The emergence of tablet and mobile phone technologies has driven the development of these reference models. Although these efforts increase the visibility of information professionals, sometimes finding users who may need help is challenging.

More targeted outreach work also provides visibility for information professionals, making it easier for them to engage with users. For example, some information professionals use Pokémon Go to reach new library visitors, while others utilize library events, including Harry Potter parties, International Games Day, and anime exhibitions. Other libraries focus on serving disadvantaged populations, such as improving library service levels to help immigrants, homeless people, the elderly, etc.

Embedded librarians provide another method to expand services, making librarians as information intermediaries part of a team or community. For example, public librarians can be embedded in local government or community organizations. Academic librarians may spend part of their time in departmental offices or embedded in online courses, entering departmental curriculum planning committees or becoming part of instructional technology teams that design faculty curricula. Embedded librarians often develop organic cooperative relationships with faculty and students, users, municipal staff, and even medical teams working in hospitals. Whatever the role, embedded librarians can provide relevant information to their teams or communities.

The most successful application of embedded librarians may be information professionals fully embedded in online courses and face-to-face courses for information literacy team teaching. Providing embedded instructional guidance and research help to students ensures they can access information professionals when needed for their courses. Librarians providing face-to-face instruction can also create teaching modules for flipped classrooms that students can view before class; asynchronous instruction before class allows students to focus on applying what they have learned in the classroom.

A major challenge facing embedded librarians is scalability, ensuring that enough information professionals are embedded in core courses. For example, embedded librarians can be embedded in as many as 30 or more courses every 8 weeks. One solution adopted by San José State University is to provide asynchronous information literacy teaching modules that can be easily customized and embedded into courses. This provides a solution for information professionals to play an active role as information intermediaries in online teaching courses, allowing them to reach online learners who may never walk into a library.

5. New Roles for Information Intermediation As information-seeking behavior becomes increasingly user-driven, virtualized, and self-directed, reference librarians have taken on new roles coordinating users and their information access. These new roles can be illustrated by a set of job titles: - Information Services Librarian - Digital Librarian - Liaison Librarian - Online Services Librarian - Remote Services Librarian - Emerging Technologies Librarian - Innovation Catalyst Librarian - Marketing and Outreach Librarian - Community Librarian - Immigration Services Librarian

These emerging roles often require cross-departmental responsibilities, ranging from managing learning resource centers in schools and higher education institutions to using learning management systems to provide digital resources and reference consultation services. Librarians play information intermediation roles in four different key areas.

(1) Information Literacy Information professionals are meeting users' diverse and global new information needs by conducting information literacy education. School librarians use the AASL *Standards for the 21st-Century Learner* to support the development of information skills for students in traditional schools and self-learners, enabling them to use technology as an important tool for learning now and in the future. Similarly, academic libraries are committed to improving information literacy skills described in the ACRL *Framework for Information Literacy for Higher Education*. Meanwhile, public libraries are offering courses through multiple methods, teaching users new technologies while cultivating their information and technology literacy skills, providing courses on topics such as estate planning, and helping adults complete high school degrees through Florida's Smart Horizons Career Online High School. These public libraries also expand access to higher education through resources like the University Library of the Phoenix Public Library. They provide homework help and tutoring services for school-age children and self-learners, and offer fun computer programming classes for preschool children to support STEM (science, technology, engineering, and mathematics) programs.

(2) Serving Different Groups Information professionals are serving many different groups. In public libraries, information professionals are helping immigrants improve their reading ability and providing English as a second language courses. They also tell stories for autistic children and provide parenting skills for parents to meet their children's reading needs. Similarly, academic libraries ensure that students learning online receive the same level of library guidance as on-campus students, providing timely and continuous guidance to help students learn how to use and cite information ethically in their coursework. School libraries provide after-school learning places for homeless children, while public libraries also find ways to provide homeless adults with everything from computer use to social services.

(3) Serving Local Businesses and Communities Information professionals also help local community businesses and workers. They offer courses on resume writing, interview skills, computer skills, and job skill development. Local business people can attend courses on how to finance non-profit organizations or how to handle business contracts, and can even receive one-on-one advice on issues ranging from procurement to licensing and local government policies.

(4) Technology Literacy Finally, information professionals are helping users learn how to use new technologies and develop new skills. Libraries are striving to help the elderly learn various technology products, such as Kindles and iPads. Makerspaces and test spaces allow users to use new technologies to build models, promoting experiments and academic research progress through shared resources and knowledge.

In the twenty-first century, information professionals need to be prepared for changing user behaviors, help users use new information tools and resources, and collaborate with everyone from universities and schools to local organizations and communities. This means that reference librarians and various information intermediaries need to be creative, innovative, and technologically proficient. Information intermediation requires continuous learning of new skills to provide the human-centered, high-tech reference services that users want. Regardless of the model or type of information organization, it is important to integrate reference services with other parts of the organization to meet user needs.

Section 5: User Experience

1. Beyond the Web: Defining “User Experience” More Broadly Although usability (how effectively, efficiently, and satisfactorily users interact with user interfaces) is an important part of user experience, UX includes more than just interface usability. In 2004, information architect Peter Morville visualized the complex relationships among various key factors in user experience in the User Experience Honeycomb (Figure 14 [Figure 14: see original paper].1). When designing a good user experience, every aspect in the honeycomb must be presented.

Figure 7.5-1 User Experience Honeycomb

(1) Touchpoints, Channels, etc. A touchpoint is a specific task interaction between a person and an information organization through any of a large number of possible static, virtual, or human agents. These possible agents are described as channels: “the medium of interaction between users and organizations.” Do not confuse with devices; channels can facilitate different modes of interaction or communication even through a single device. To better understand this, see Text Box 14.1, which demonstrates various modes of interaction through a single mobile phone. Many technologies can help you think about these different touchpoints, channels, and paths from the customer’s perspective. One of them is journey mapping:

A user journey map is a very simple concept: it is a diagram that can illustrate the steps users go through when interacting with your company, such as a product, online experience, retail experience, service, or any combination. The more touchpoints you have, the more complex such a map is, but also the more necessary.

It is important to remember that although all elements of the end-user experience may not be directly within the control of the information organization, all aspects of the experience do affect how end-users feel, think, and judge during the experience. See Text Box 14.1: “Journey Mapping Exercise.”

Text Box 7.5-1 Journey Mapping Exercise

Mobile phones allow users to choose whether to interact with information organizations through 7 possible channels: - Mobile applications - Websites or web applications, such as online catalogs - Social media - Email - Instant messaging services

There are many channels in total!

(2) User Experience and Physical Space The physical location where information organizations provide access to collections and services is a fundamental aspect of the overall user experience. Maintaining a consistent cross-channel experience requires ensuring that physical and virtual environments are well integrated and present compatible vocabulary, tone, and emotion.

Information organizations may directly or indirectly manage services provided within their buildings; for example, a local business may operate a café. In all types of information organizations, the condition of equipment (well-maintained, outdated, worn, convenient, clumsy, etc.) is often beyond the direct control of information professionals. In such cases, it is likely that a group outside the information organization initiates innovation, coordinates custody services, and even improves signage. For example, at Oregon State University, information professionals have spent a lot of time and effort inspecting and improving “wayfinding,” or how users find their way in spaces, such as modifying signage and implementing staffed services.

2. Learning and Practice in Related Fields Designing a good user experience is closely related to learning and practice in some fields and may even span different academic and professional fields. This chapter emphasizes some insights applicable to the daily work of information organizations and information professionals, particularly information architecture and interaction design, design thinking, service design, and content strategy.

(1) Information Architecture and Interaction Design Information architecture and interaction design emphasize defining the patterns and sequences in which options are presented to users. Interaction design focuses on the choices involved in performing and completing tasks. Information architecture (IA)

deals with the options involved in delivering information to users. Information architecture is usually part of information science curricula and is closely related to library science among other disciplines. Related to IA is interaction design, which focuses on describing possible user behaviors and defining how systems adapt and respond to such behaviors.

(2) Design Thinking Design thinking is a creative method and a series of steps that can help libraries design meaningful solutions. It is a process that utilizes abilities we are all born with but often ignore, such as deep empathy and intuition. The design thinking process always includes three main stages: inspiration, ideation, and iteration.

(3) Service Design In a 2015 article on service design in libraries, Joe Marquez and Annie Downey defined service design as a comprehensive, co-creative, user-centered approach to understanding user behavior to create or improve services. By co-creative, Marquez and Downey mean that information professionals work directly with users to identify problems, brainstorm solutions, create and test prototypes, and implement updates. They further propose that in library service design, collections and library physical spaces are services, just as reference and circulation are services. To evaluate these services, librarians need to focus on user experience.

(4) Content Strategy Kristina Halvorson and Melissa Rach define content strategy very concisely: “Content is what users read, learn, see, and experience. Content strategy guides your content innovation plan, delivery, and management.” Information professionals are very familiar with the forms in which content exists, that is, in various forms in collection contexts, but what about content created on behalf of the organization? Finding a unified voice among a group of colleagues with different interests, responsibilities, and availabilities is a challenge. A strong content strategy is an important tool for providing the best service to the information organization community.

3. In Practice: Information Organizations and User Experience Design Although there are specific challenges and environments in the context of information organizations, the overall principles and best practices for planning, creating, evaluating, and maintaining user experience are the same as for other organizations. In *Useful, Usable, Desirable: Applying User Experience Design to Libraries*, the “8 Principles of Library User Experience Design” are elaborated: - You are not your user. - Users are not broken. - Good user experience requires research. - Building good user experience requires empathy. - Good user experience must be simple before it can be fun. - Good user experience design is universal. - Good user experience design is purposeful. - Good user experience design is holistic.

User experience design is explicitly or implicitly connected to all professional fields in information services, including: - Access services: directly contacting

users through various venues, policies, signage, and stack management - Cataloging and metadata creation: mainly through the impact of catalogs and/or discovery interfaces on customers; findability is a key user experience issue - Collection development and management: directly contacting users through various venues and material selection - Information and technology literacy instruction: directly contacting users through various venues - Reference and research support services: directly contacting users through different venues, reader consultation policies, and instructions

4. Key Skills: Potential Tools and Techniques Although many technical skills and professional knowledge help user-centered design practice, some key competencies are essentially non-technical. These include curiosity, empathy, clear communication, and effective collaboration. With attention and practice, these skills can be developed by information professionals in any role.

(1) Curiosity and the Five Whys Genuine interest in people is invaluable in any user service-centered work and is key to success in any user service-oriented profession. This section presents a technique that relies on asking questions—the Five Whys—to reveal valuable data about user preferences and habits. As the name suggests, this technique asks “why” five times as a method for deeper understanding. Below are the answers to each question, for example:

4. Why is time information not visible on the library homepage? Because only web developers can access and edit the homepage through the server, not through the content management system.
5. Why are content management system functions limited? Because it was installed ten years ago.

For the above scenario, other investigations can be conducted to determine other areas needing improvement, such as: Does the information organization have social media where information related to special closures can also be shared? etc. Understanding the difference between problems and symptoms can help research teams understand the focus of problems and decide how to address symptoms. In the above case, the symptom is users complaining about building access, but the underlying problem is that the content management system, a key tool, lacks sufficient functionality and needs updating. The Five Whys technique requires no funding and can be conducted without direct user participation in some cases (if answers can be determined by professionals based on existing data, such as emails or process records).

(2) Empathy and Observation Empathy is your understanding of another person. Empathy is an action that applies understanding, built on the willingness to spend time discovering others’ deep thoughts and reactions, and intentionally understanding another person’ s cognitive and emotional state. Empathy gives you the ability to try on someone else’ s perspective, to think and react like them in specific situations. The book *Practical Empathy* outlines

observation as a method that can distill insights collected in interviews into actionable data for designing or modifying products and services.

Observation includes passively inhabiting a space for a period of time, actively studying and documenting what happens in the space without referencing one's own judgments or evaluations. How do people move within the space? How is furniture arranged? Is the space staffed, and do staff interact with visitors? Continuous observation of the same space will explain usage pattern changes daily, weekly, and quarterly; it will also explain unexpected uses of spaces or furniture that can provide insights into unmet needs.

If observation is just paying close attention to what is happening, why is it a special technique? The more familiar a person is with a space or process, the less actively they pay attention to it. The effects of familiarity in shared spaces compound. This explains why unsightly messy boxes and materials are placed on shelves behind checkout counters that customers notice but staff do not. Reasons may include: 1. Staff face the opposite direction. 2. Shelves are no longer objects of attention. 3. Responsibility for maintaining which areas is not clearly defined.

Second, the ability to subjectively observe and record details without referencing one's own evaluations, judgments, or feelings about the situation is a valuable skill that must be consciously cultivated. Any individual's evaluation depends on personal experiences, biases, and preferences. If acted upon prematurely, these personalized evaluations of spaces or processes may lead to unnecessary or even costly changes.

Observation can be conducted anywhere, spontaneously or planned. If available, observation requires minimal tools (a method for taking notes) and very low incidental costs (e.g., space entry fees, beverage prices), etc.

(3) Clear Communication and Writing for the Audience Communication includes both the act of sharing or transmitting information and the process of internalizing shared information by the target audience. The real concern at all levels is whether communications sent (e.g., writing emails to colleagues, publishing quarterly newsletters, preparing annual reports, etc.) clearly convey the sender's intentions to recipients. One technique is called "writing for the audience," focusing on writing, but these principles also apply to oral communication:

The fundamental purpose of scientific discourse is not just to express information and ideas but to actually communicate. No matter how happy the author is to convert all correct data into sentences and paragraphs, what matters most is whether most readers accurately perceive the author's ideas. Therefore, to understand how to best improve writing, we should better understand how readers read.

When authors are aware of readers' expectations, they can organize their articles

to make their meanings clearer. Before writing any article of any scale or complexity, best practices include asking three questions: 1. Who is this message for? (Users) 2. How familiar is the audience with the conveyed information? (Context) 3. What are people's expectations for how the message is delivered (e.g., email, newsletter, report)? (Channel)

(4) Effective Collaboration and Agile Development Methods User experience work is often project-based or even ongoing and frequently involves multiple stakeholders (colleagues and users) from inside and outside the organization. Skills such as strategic planning, data analysis, and change management are crucial not only for managers but also for successfully managing projects. Successful projects require effective collaboration. Familiarity with project management techniques can establish an efficient structure that helps complete projects faster. Agile development methods are a structured, collaborative, iterative process in which products or services are gradually developed under continuous feedback from target users.

Although agile methods (e.g., Scrum, Kanban) are usually associated with IT projects, they can be widely adopted.

Section 6: Accessing Information Anytime, Anywhere: Access Services

6.1 Facilitating Access

Access services represent the sum of many different parts, and their operations affect every user of an information organization. Library access services open in the morning and ensure security at night. They serve as a vital link with campus operations such as building maintenance, security, and food services. Access services oversee the quality and availability of library spaces, manage physical collections, circulate materials and technology, support unique formats for special facilities, and accommodate group and class use. They support teaching and learning through traditional and electronic reserves, giving libraries a strong presence in course management systems and online education. Access services form the front line of our consortial relationships, managing an expanding regional, national, and global interlibrary loan and document delivery service to support high-quality scholarship.

Access services function as an early warning system, monitoring building environmental issues and collection preservation and damage problems. They serve as gatekeepers for authorizing and authenticating library users' access to the vast electronic resources we lease and acquire. Access services are indispensable, fundamental, and universal.

6.1.1 Circulation and Integrated Library Systems Circulation services and access services are often used interchangeably because access services are generally considered circulation activities plus other functions. Circulation plays

a vital role within access services, fulfilling the important responsibility of managing both the users of an information organization and the items they can use. It facilitates access to physical materials between the information organization and its users and enables identification of the location of any item in the physical collection at any time. All these roles are automated and managed to varying degrees through the information organization's Integrated Library System (ILS). The ILS is used not only to manage traditional book and journal collections but also to track materials disseminated through e-reading devices, laptops, audiovisual materials, and even Wi-Fi hotspots and makerspace equipment.

Circulation functions are typically located at or near the main entrance/exit point of an information institution. Consequently, access services, particularly circulation, can become the first and only point of contact between most users and the organization. In other words, access services constitute the original user interface of an information organization, where perceptions of the organization are formed. Consider the variety of interactions at any circulation desk in any information organization on any given day—errors are likely to occur. These may result from serious user violations such as theft or destruction of organizational property, or they may be more benign, such as well-enforced policies. Access services staff must be trained to create positive user experiences. Negative user interactions affect the information organization. In today's digitally connected era, businesses have recognized that negative customer interactions can spread virally through various Web 2.0 technologies such as blogs, Twitter, Yelp, or Facebook. Experiences with access services staff often influence users' perceptions of an organization.

Declining book circulation and the rise of electronic resources have caused many information organizations to reconsider the role of the circulation desk. Particularly in college and university libraries, a one-stop shopping trend has emerged by combining the circulation desk with the reference desk or information desk. Streamlining services and freeing staff time for other activities have also led institutions to add self-checkout terminals at circulation counters, a change that can improve service quality. These terminals allow users to check out materials with minimal or no staff involvement. However, no system is foolproof, and errors can occur requiring staff intervention. Therefore, self-checkout machines are typically placed close to the circulation desk. Although technologies such as ILS and self-checkout have dramatically changed how circulation departments operate, excellent user interaction—whether face-to-face, by phone, or online—remains essential.

6.1.2 Collection Management The storage, retrieval, and maintenance of an organization's physical collections, also known as collection management, constitute an important access service function. Depending on the organization, collection management functions may be performed by volunteers, student workers, or paraprofessionals. These staff members typically: reshelve returned

items or new items added to the collection; regularly check items on shelves to ensure proper placement (commonly called shelf-reading); and adjust items on shelves to accommodate collection size changes, often called shifting.

Declining book circulation, the ubiquity of digital journals, and calls to use shelf space for other purposes have prompted information professionals to experiment with various storage solutions to maximize existing storage capacity. Compact shelving stores more materials than traditional shelving because space between shelves is largely eliminated. Consider compressing an entire library stack together, then opening one section to retrieve needed books or journals—this is how compact shelving works. Users still retrieve items using call numbers, but instead of walking into the stacks to locate items, they obtain the precise access point for needed materials through manual or automated placement systems. Automated Storage and Retrieval Systems (AS/RS) provide technological solutions for the placement and storage of physical collections.

6.1.3 Resource Sharing Resource sharing, sometimes called interlibrary loan (ILL), is the process of providing users with materials not readily available at their own institution. Users request desired items. If an item belongs to another information organization, a request to borrow the item is sent. When received, it is loaned to the patron for a loan period determined by the lending organization. Resource sharing supplements materials owned by an information organization and enhances users' information needs by providing access to items beyond their local collection. Increasingly, users can also request items held in their local collection but currently unavailable, allowing multiple users to research the same topic without competing for resources.

Resource sharing services provided for local collections are called document delivery. Document delivery services were initially offered by large academic libraries to save faculty time and avoid inconvenience—they could obtain and copy printed journal materials themselves. Document delivery services allow faculty to request materials that are then sent directly to their offices via campus mail, scanning, or email. The development of remote collections in academic and public libraries, along with the proliferation of distance education in academic institutions, has expanded demand for document delivery services. Typically, users request locally missing items through the same resource sharing system. Document delivery can alleviate access problems in remote storage and demonstrates in clear and compelling ways how access services contribute to information organization success by supporting distance education users.

Resource sharing is not without cost—it requires significant investment in human and financial resources. Staff intervention is needed to locate, retrieve, and scan materials, particularly when users request articles or book chapters rather than complete publications. Additionally, request scheduling, tracking, and management can be labor-intensive, leading many large information organizations to invest in separate information management systems to handle resource sharing tasks. Organizations typically bear transportation costs, fees

for acquiring items, copyright fees, costs for lost or overdue items, and costs from article suppliers. While book circulation may decline, demand for resource sharing in information organizations is increasing. This paradox exists because users want to use information organizations and their services, not necessarily the materials provided on physical shelves. Furthermore, advances in resource sharing technology have reduced turnaround time for articles and other requests from days to hours.

6.1.4 Course Reserves Course reserves are common in colleges and universities. Reserves can be physical objects available at a service desk or digital resources available remotely (typically through password-protected portals called e-reserves). When available at service desks, access services staff purchase new materials or retrieve already-owned materials from the stacks at faculty request and place them in a restricted area, usually behind the service desk. These materials are added to faculty course lists, and students can retrieve them at the library. Loan periods are generally short, often no more than a few hours, and frequently carry high overdue fines to ensure timely return. Formats can include books, journal articles, DVDs, even anatomical models. When resources can be obtained locally, course reserves can also utilize academic libraries' laptops, e-readers, or other non-traditional borrowing items.

Reserve materials are ideal for solving problems related to managing high-demand materials. This service allows users equal access to the same materials. The rise of distance education and the general desire to provide good user experiences have prompted many academic libraries to provide remote access to digital reserve materials. In terms of process, e-reserves differ significantly from print reserves. Faculty still identify materials they need the library to reserve, but instead of photocopying materials or placing them behind service points, they need librarians to provide digital copies that can be accessed online (hosted by the library or the college/university's course management system) or through direct links to electronic resources. The library remains involved in processing and maintaining this service, but users largely cannot see its efforts.

6.1.5 Other Assigned Duties The countless ways access services support information organizations demonstrate that access services are most important for everyone. Access services, as a reflection of the larger information organization's needs and characteristics, can make discussion of common experiences across institutions difficult. However, it is not uncommon for access services practitioners to assume roles as library security officers, copyright experts, and building managers within their information organizations.

Access services can assume library security roles because they are typically responsible for enforcing and protecting various organizational policies, such as entrance, fine, food and beverage, noise, and use policies. Given their ubiquitous nature, access services should assume these responsibilities. Sometimes enforcing these policies leads to conflict. Frontline access services staff are typi-

cally several levels removed from policy or decision-making, so frustration arises when reasons behind policies or changes are not adequately communicated to staff, or when frontline staff have no opportunity to provide feedback to authorities before policy implementation. To successfully navigate these well-known minefields, access services practitioners need to be familiar with the information organization's current policies and various arguments against them, and need training on how best to defuse potential conflicts with users.

Due to the nature of resource sharing and course reserves, access services practitioners are typically well-versed in copyright rules. Others in information organizations often want access services staff to serve as copyright experts. At a minimum, those responsible for document delivery or course reserves must be familiar with working knowledge of fair use and various guidelines regarding fair use. The last major revision to U.S. copyright law occurred more than 40 years ago, and since then, content producers and information practitioners have attempted to draft guidelines or model practices, but failed because both sides disagreed. Information organizations often request more conservative interpretations of copyright law to maintain goodwill with content providers.

The building manager role ensures access services staff are present throughout all operating hours of an information organization. Access services often serve as the liaison between the information organization and the institution's facilities or physical plant department. Building problems are typically first reported to access services staff. Additionally, access services staff have a unique perspective at frontline service points to oversee certain facility-related issues in information organization operations, such as 24-hour operations and creating effective wayfinding signage.

Just as an information organization's electronic resources are available 24 hours a day, demand for access to physical collections has led many academic libraries to operate 24 hours a day, 5 days a week, sometimes even 7 days a week. Providing 24-hour access is a formidable task. The barrier to providing this service usually comes down to overnight staffing. Sometimes full-time service staff work night shifts, sometimes student assistants or work-study-funded students are responsible. If services provided during these nighttime hours are inadequate, a member of the organization's security department can serve as staff to provide adequate service. Solutions must consider local conditions, including funding and building design.

Creation and subsequent revision of organizational signage may be the responsibility of access services staff. Responsibilities for signage include maintaining signs at the ends of shelf ranges indicating the first and last call numbers in each row. Additionally, access services professionals should treat signage as responses to frequently asked questions. Clear language and appropriately placed signs can significantly reduce directional questions at service points and create a welcoming and inclusive atmosphere.

6.2 Evaluating Access Services

The previous sections introduced various access service functions and demonstrated how access services contribute to information organization success. However, contributing to organizational success is no longer sufficient, as the continued relevance of information organizations is being questioned as never before in many fields (such as academia and local and state government). Every function or department in an information organization, including access services, must demonstrate and document its contributions in purposeful and meaningful ways. The process of systematically evaluating and demonstrating successes while implementing improvements based on needs is called assessment. As information organizations strive to become more user-centered, they increasingly emphasize evaluating user needs and designing services to meet those needs. Access service functions are often central to these evaluation efforts. Additionally, for example, academic libraries must participate in formal assessment efforts on their campuses because accreditation bodies require higher education institutions to organize, document, and sustain assessment activities to achieve “regular assessment of mission and goals to ensure they are relevant and achievable,” as instructed by the Middle States Commission on Higher Education.

The most basic assessment measure is documentation of usage—how and to what extent information organization services and functions are used. Simply measuring usage involves collecting total usage volumes for different functions over a period (typically a year), aggregating this data into charts or tables, and comparing it with data from previous periods. This data can be collected through various means, including entrance and exit statistics and loan statistics for circulation and resource sharing.

Evaluating and tracking usage over time is important. However, administrators cannot determine from these data alone whether users are satisfied with the quality of services provided. User satisfaction studies (typically conducted through surveys) can answer these questions and help organizations measure the value of their services. Information organizations can choose to develop their own measurement instruments or use standardized surveys. Each approach has its advantages. Internally developed tools are certainly cheaper, and questions can be specifically tailored to the information organization’s needs. While standardized surveys cost more, these tools offer the advantage of benchmarking across organizations. The two main measurement instruments are LibQUAL+ and LibSat. Developed by the Association of Research Libraries (ARL), LibQUAL+ asks respondents to rate 21 different qualities of libraries focusing on service quality, information access, and the library as place. Respondents also rate both the minimum service level they expect and the actual service level they experience. ARL administers LibQUAL+ and provides initial analysis of results for libraries. Developed based on opinion counts, LibSat focuses more on public libraries. LibSat is a continuous survey tool used to measure user satisfaction, expectations, and the importance of those expectations to users. Regardless of which tool is used, user satisfaction studies provide valuable data that cannot

be inferred from usage statistics alone.

After collecting data, information organizations should close the assessment loop—that is, use assessment results to improve, change, or redesign services. For example, understanding when users come to the building helps determine how many staff are needed at service points. Additionally, this data can be used to set appropriate service hours or demonstrate the suitability of current service levels when calls for additional services arise. User satisfaction data may reveal whether underutilized services need more vigorous promotion or are no longer needed. Use of assessment data varies by information organization. If improvements are made, the information organization should communicate these changes to users.

Section 7: Teaching Users

7.1 Information and Technology Instruction

One of the core roles of information professionals is teaching information users. Information professionals not only ensure users know how to maximize benefits from the organization's collections but also ensure users develop effective information behaviors applicable to any environment.

7.1.1 Definitions of Information and Technology Literacy In 1989, the American Library Association (ALA) formally defined information literacy as a person's ability to “recognize when information is needed and have the ability to locate, evaluate, and effectively use needed information.” Many organizations, including the American Association of School Librarians (AASL), the Association of College and Research Libraries (ACRL), and the Public Library Association (PLA), have used this simple definition to define the skills and conceptual knowledge that information professionals should teach users in their institutions. Using this definition, these associations have developed standards for planning and evaluating access to information and technology literacy. These standards typically appear as standards and performance objectives, more recently as threshold concepts, influencing how information professionals work, formalizing the teaching role of information professionals, and recently adding assessment components to information professionals' work.

Information literacy is a survival skill for the information age. People with high information literacy do not drown in the abundant information that inundates their lives but know how to effectively discover, evaluate, and use information to solve specific problems or make decisions—whether the information they choose comes from computers, books, government agencies, films, or any other possible resource. Libraries provide the public with important access to this information, often free of charge, and must play a key role in preparing people for the demands of today's information society.

7.1.2 Growing Community Needs for Information and Technology Literacy Increased access to information has not brought all the positive social outcomes that twentieth-century critics had hoped for. Instead, the current information environment raises new concerns about how people think and learn, how they communicate with each other, and how they evaluate the information they find.

7.2 Information Literacy and Research Training

7.2.1 School Libraries The Common Core Standards, launched in 2010 and widely adopted by 2015, changed primary and secondary education in the name of improving student readiness for employment and college. Although these new standards emphasize student use of information, they provide no additional funding for school libraries or school librarians. Severely under-resourced libraries remain a pressing issue in states without minimum requirements for school library personnel. School librarians already in place continue to collaborate with classroom teachers using the new Common Core curriculum to ensure libraries have materials supporting student inquiry and provide training to teachers, staff, and students on research fundamentals. Many school librarians implement or adapt existing models to support student growth as researchers.

7.2.2 Public Libraries Public librarians teach users how to conduct research using specialized collections in public libraries. Two common examples are business research and genealogy research. This instruction makes library collections more valuable to users who may not know how to fully utilize them or even how to access them. This can improve libraries' return on investment, enable more users to use some collections that are expensive for libraries to maintain, and provide information professionals with data demonstrating why funding should continue.

7.2.3 University Libraries University librarians introduce novice researchers to advanced techniques for considering information, framing problems for inquiry, and interpreting what they find. Recent surveys show that university professors and academic library directors highly value academic librarians' efforts in developing students' information literacy, including research and analysis, ranking it above library support provided to faculty. Academic librarians also provide research instruction to graduate students and teaching assistants to ensure they have the skills needed to complete their own research and support student development.

Communication is critical when professors request information literacy instruction to help students successfully complete specific assignments. If faculty do not provide sufficient information to plan effective instruction, it is the university librarian's responsibility to educate professors about their expectations and demonstrate to faculty that more collaboration will result in better learning. In many institutions, university librarians train new faculty about information lit-

eracy, library resources, and educational standards developed by information professionals.

Communication between information professionals and faculty about research instruction can be as simple as planning one-time sessions through brief emails or conversations to meet information professionals' and professors' goals for student learning. However, sometimes information professionals and faculty collaborate more closely in planning instruction. In these cases, information professionals may suggest improvements to assignment instructions or create new assignments for students to support their development as researchers and lifelong learners. Academic librarians have also adopted a special library concept called embedded librarianship. Embedded librarians provide continuous support to students and faculty by integrating into learning environments such as courses and field trips, where they have more opportunities to intervene in student learning and create experiences that enhance positive research habits.

7.3 Educational Principles

All teaching librarians, regardless of their environment, need to apply the same basic instructional design principles when planning learning experiences: - Identify the audience/students to be taught - Identify students' information needs - Identify what to teach - Determine how to assess, formally or informally, what students have learned - Design the teaching experience - Reflect on teaching

Section 8: The Hyperlinked Library

8.1 The Hyperlinked Library

The hyperlinked library model synthesizes data collected about new social trends and information technologies used in information services, along with writings by authors such as David Weinberger, Clay Shirky, and Seth Godin. The model is based on Weinberger's "hyperlinked organization" from his 1999 book *The Cluetrain Manifesto*, which explored how the Internet changes how things work in corporate structures. Glenn states that the methodology used to build the evolving model is "future research," a combination of horizon scanning, trend research, and scenario planning. In an article in *Serials Review*, the hyperlinked library model is defined as: "An open, participatory institution that welcomes user input and creativity, built on human relationships and conversation, with a team-based, flattened organizational structure. Collections grow and develop through user participation. Information professionals can interact deeply in users' online spaces or participate to point the way."

Further exploration in *Core Competencies for Librarians* defines hyperlinked library practice through these concepts: - Libraries are everywhere, not just library buildings or online virtual spaces - Hyperlinks disrupt existing organizational structures - Organizational structures should be team-based and tend toward flattening - Cross-channel interactions should provide seamless service

- We must reach all users, not just those who use us - To date, the most powerful information services may be in each of our hands - The path forward is continuous improvement - Inevitably, chaos always emerges

Hyperlinked library services originate from continuous, active, purposeful adaptation to change—change based on deliberate planning and grounded in the library’s mission. Information professionals adapting to the hyperlinked model exercise careful trend-sensitivity discovery and apply library management principles while maintaining adequate understanding of the social and cultural impacts of emerging technologies.

Information professionals engage in transparent, open communication and dialogue with customers and potential users through various technologies across different platforms. The hyperlinked library model thrives in both physical and virtual worlds by providing collections, activities, learning opportunities, and events that actively transform audiences into participants. In a participatory culture, everyone is busy enriching knowledge and improving skill levels, with groups integrated into structures for change and improvement.

Hyperlinked libraries are transparent when communicating and accepting feedback, practicing inclusivity and openness. Information organizations activate processes to collect as much information as possible from groups, raising reader expectations for open, fair communication from information organizations.

Hyperlinked libraries promote dialogue and feedback in all forms. Transparency increases when users are invited to share their perspectives on how well information organizations perform and when information organizations listen and respond. Management demonstrates active listening and responsiveness to users and librarians by implementing requested changes, launching new services, and applying careful testing as part of solid incremental planning.

Communication technologies for mobile devices and social media make transparency easier to achieve than ever before. Information organizations can share information about existing programs and solicit feedback on social networking sites that leverage more natural, transparent, and trusted communication channels among peers and family members. By posting updates, calling for group participation, and beta-testing new services on users’ devices, all stakeholders can build hyperlinks anytime, anywhere.

8.2 The Mobile Hyperlinked Library

8.2.1 Collections Everywhere A few years ago, the author discovered that a university library had a unique songwriter’s creative works in its special collections that had been digitized, with only one page of lyrics on the library’s website. The rest were only accessible to visitors traveling to that distant institution. The university cited concerns about the collection and its copyright as reasons these documents could not be digitized for access. Quality collection-centered applications from the British Library and efforts by the New York

Public Library have overcome access barriers by highlighting collection components through iPad applications. Hyperlinked libraries can provide open access to collections anywhere, especially the most unique and interesting collections in information organizations. Mesa County Libraries in Colorado designed a mobile application to educate community members about local flora and fauna, including features for on-site users to add photos, annotations, and share updates directly from the app to social media, contributing to a knowledge base.

8.2.2 Cloud-Based Information Professionals As users spend more computing time on mobile devices and become increasingly familiar with saving and sharing content on cloud services, information professionals can leverage the power of data stored in the cloud to answer questions, share information, and collaborate with users. Massive amounts of data such as images, status updates, and comments become readily available resources. Environments like Flickr, DeviantART, Instagram, and Pinterest, which involve communities and collections of image and resource sharing, provide opportunities for cloud-based content curation and management. For example, Flickr's organizational partners include the U.S. National Museum, which shares photos and encourages users to tag, comment on, and reuse images. These virtual repositories can only be found and used with the guidance of information professionals dedicated to providing intelligent connection patterns through metadata and other organizational means.

8.2.3 Gamification The *NMC Horizon Report: 2014 Higher Education Edition* identified the application of game dynamics to learning and research environments with an adoption timeframe of 2-3 years. Gaming and game-based learning have since moved off the influential technologies timeline in the Horizon Report, but the concept of gamification remains present in broader experiences. Gaming is a portable activity that uses specific combinations of elements, mechanics, and frameworks to improve productivity, creativity, and problem-solving abilities.

Information organizations leverage gaming's capacity to increase engagement by creating online environments with leveling-up attributes that reward users. Information users can interact in experimental gamified spaces or participate in gaming groups in larger regional, national, or even international information organizations. Information professionals can participate as experts providing on-demand reconnaissance and guidance.

When discussing library experience gamification in ACRL TechConnect, Kim reported that applying game dynamics has the potential to increase engagement with library services, especially when game goals are not specific outcomes but fun, enjoyable experiences. An example of a gamified library service in the UK, "Librarygame," aims to increase playfulness and excitement— "customizing library enhancement products by adding game elements directly to the library experience to make it more fun, engaging, and delightful."

8.2.4 Hyperlocalization and Hyperlinking Increasingly, new sharing social software on mobile devices integrates location technology in unexpected and innovative ways. These interfaces may be cluttered, but mapping content to location can reveal hidden relationships within the content that can be used to predict trends and expand information services.

With the most basic location software, specific restaurants within a certain distance of any geographic location can be easily found through localized searches. When viewing national parks through services like “Find Twitter Users Near Me,” knowledge from nearby explorers can be leveraged. A typical example related to archival practices and image sharing is History Pin, a mobile-enabled website that provides “a way for people to come together to share and celebrate local history.” The site includes photos from community-shared archives accessible through a map interface.

8.3 The Library as Home and Haven

8.3.1 The Library as Classroom The *2014 Horizon Report* identified elements of the “Creative Classroom Research Model” developed by the European Commission’s Institute for Prospective Technological Studies as a framework for structuring issues, challenges, and technologies affecting education in the report. This model demonstrates components of a 21st-century technology-enabled classroom environment: learning through play/exploration/innovation, collaborating with others, meaningful activities, and networking. Applying this model to all libraries means they can serve as innovative classrooms beyond formal classrooms, supporting learners through the building blocks described above. This model includes professional libraries, public libraries, special libraries, and K-12 libraries—helping learners of all ages achieve goals, learn new skills, and gain deeper understanding of how the world works in group learning spaces. These categories enable libraries to become exploratory laboratories realized through formal and informal programming, group activities, and various experiential opportunities. Creation zones with required digital and 3D hardware are major components of many facilities, allowing people to build things. Through web and other communication technologies, unlimited possibilities exist for virtual discussions, lectures, and “field trips” with people around the world.

8.3.2 The Library as Community Space Marie Østergård, project leader for Dokk1, Aarhus Public Library in Denmark, told librarians from across the United States at the 2016 Public Library Association conference: “We design libraries for people, not books.” She described the multi-year process of redesigning and building Aarhus’s new public library. The waterfront architectural design is based on a library model scheme constructed by professors at the Danish Royal School of Library and Information Science: a fusion of inspiration space, learning space, meeting space, and performance space. The action words for each section are “inspire,” “explore,” “create,” and “participate.” Østergård reported

that an average of four thousand people daily visit Dokk1 to use workspaces for work, socializing, meetings, and leisure.

The library houses community service offices. At the intersection of meeting and performance spaces, community members participate in conference programs and open-space programs related to learning, politics, arts, and self-expression. Dokk1 promotes open dialogue among residents and encourages them to exchange ideas.

Section 9: Makerspaces

9.1 Developing Dynamic Makerspaces in Information Environments

It is easy to envision influential blog posts or conferences that imagine transforming information institutions into thriving, collaborative spaces by assembling new equipment clusters, whether the goal is developing a new makerspace or planning future development for existing maker programs. Experienced maker facilitators know that after the novelty of 3D printers or emerging tools fades, planning, coordination of community needs and desires, and patience are required to create a sustainable space that supports creative and collaborative practices. This section provides guidance for planning that hopes to achieve long-term success.

9.1.1 Determine Makerspace Goals and Expectations When information professionals purchase books, multimedia resources, or online resources, they often rely on collection development policies (see also Chapter 24: “Managing Collections”) to guide their selection. Similar guidelines will help unify expectations and outcomes when planning to purchase maker tools. Key questions include: - What is the purpose of establishing a makerspace in the organization? What are the desired outcomes? How will the institution know it is successful? - What other creative activities are underway in the community, and how do the information institution’s plans complement existing programs? - Is the mission to provide a series of interesting practical activities, skill-building educational series, enrichment or extension of school curricula, or something else? - Is the information institution the sole creative channel here, or does it serve, as Mark Anderson says, as an entry point for exploring various activities before entering formal education or professional makerspaces?

9.1.2 Start Small and Expand Based on Patron Needs A quick glance at the Flickr stream for Chicago Public Library’s Maker Lab can elevate your ideal goals to new heights. However, remember that this is one of the industry’s most mature makerspaces. While it is tempting to envision grand makerspace plans, it is equally important to start small. For example, the Michigan Maker Learning Service Project collaborates with graduate students serving K-8 maker communities; graduate students serve as mentors working with the same student maker teams year-round. Developing a supportive community

is a top priority. One strategy is to offer only three to five class options per week (makers need choices!), all low-cost, low-tech activities such as origami, cardboard challenges, toy disassembly, circuit switch kits, small toys, soft circuits, friendship bracelets, refashioning, or trash-to-treasure creations. These activities gather makers around tables, maximizing potential for eye contact and other interactions. Conversations with mentors often reveal topics participants hope to explore in the future, providing direct insight into future interest direction choices.

9.1.3 Embrace Open Source Philosophy Many information professionals are familiar with Creative Commons licensing, which allows writers, photographers, and multimedia creators to retain copyright while stating in advance that their works may be reused, remixed, or adapted under specific circumstances. Early makers adopted similar practices in open-source annotation platforms. Blueprints, design plans, and computer code can all be labeled open-source, meaning they can be used, recreated, added to, and modified without permission or payment.

For example, one of the most universally used tools in the maker movement, the Arduino microcontroller mentioned earlier, is open-source. Although they cost about \$35 to purchase, people can rebuild an Arduino using freely available online manufacturing plans or alter provided plans in new ways, as long as new plans are published similarly.

Not only is the hardware open-source, but Arduino's code is also open-source. If a maker wants to create a sensor that chirps when plants need water, ready-made manufacturing plans and open-source programming code shared by another maker are directly available online. By sharing code and building plans, future makers accelerate their growth, built on the legitimate use of others' existing work. As Arduino creator Banzi wrote, "We believe in the open-source movement, and people should truly realize that if everyone can benefit, especially when everyone and companies contribute, this movement can successfully develop. This is why we emphasize forming a positive cycle that cultivates knowledge sharing and collaboration awareness."

Although many commercial manufacturers and STEM products avoid open-source, information environments should maintain a resonant commitment to knowledge sharing because shared information is the core value.

9.1.4 Collaborate Rather Than Compete A proverb says, "A rising tide lifts all boats." Makers share this sentiment, realizing that only by helping other makers and organizations interested in makers can the entire creative ecosystem improve. When information professionals expand maker work in their institutions, seeking maker partners can yield valuable results. For example, who in the community designs video games, draws comics, or engages in yarn bombing (a creative knitting form) and is willing to mentor others? These makers

may have collaborative interests that drive outreach, promotion, learning, and community engagement.

Community makerspaces provide potential partners rather than competitors for maker work in information institutions. Collaborating to seek funding, exchange expertise, and share resources is wise progress. Typically, information institutions have space while makers have skills; through exchange, both grow. Similarly, information institutions have access to grants that for-profit makerspaces cannot obtain. Treating community makerspaces as work partners rather than competitors offers significant advantages and opportunities. Staying connected with community partners helps maximize potential rather than duplicate services.

9.1.5 Seek Diverse Combinations Traditional planning in information institutions typically schedules one activity at a time—Monday is Minecraft (the popular video game), Wednesday is knitting. Part of the excitement and innovation makerspaces bring comes from gathering people with different backgrounds and skills in the same place at the same time. Although the maker movement has existed in libraries and information centers for five years, this remains a developing field. Community makerspaces are never simple studios for single activities; thriving makerspaces have different people working on different things simultaneously. Collaborating across two or more activities simultaneously can lead to new interdisciplinary innovations. For example, children who enjoy sewing plush toys, combined with programmers who enjoy using Arduino to control sensors, can collaborate through skills to ultimately create cute objects that light up automatically when dark or plush toys that sense sick children’s body temperature. This is the 21st-century version of the 1980s Reese’s Peanut Butter Cup advertisement, where a peanut butter lover’s jar collided with a chocolate lover’s bar, creating a delicious new idea: “Two great tastes that taste great together!” One strategy to achieve this is hosting various events where diverse equipment and mentor resources are available for experimentation, or where people can work on their own projects in a community environment. Whether such events are called “Open Lab,” “Studio Time,” or jokingly “Maker Happy Hour,” these activities can help patrons enjoy personal creative time spent with others. They can turn individual work into community activities.

9.1.6 Cast a Wide Net: Welcome All Types of Makers At the 2013 Stanford University FabLearn Conference, Leah Buechley shared startling statistics about cover photos from *Make* magazine (the most popular magazine among makers). Based on her analysis of cover figures at that time, 85% were male, and none were people of color. Her survey of the *Make* editorial board showed similar results: 87% male, with no people of color. Buechley also found that the range of maker activities indicated by photo content was narrow. She found that more than half of creations featured electronics: cars accounted for 31%, robots 22%, rockets 8%, and music 5%. Unfortunately, this pattern has not changed five years after her presentation. Manufacturing is still considered dominated by

white, middle-class individuals. In fact, *Make*'s 2016 media coverage reported that 61% of Maker Faire attendees were male, with an average household income of \$119,000 and an average age of 37.

Certainly, some makers are interested in these topics. However, information institutions have a responsibility to serve everyone. The first article of the ALA Code of Ethics states, "We provide the highest level of service to all library users through equitable service policies; equitable access to resources."

Therefore, consider expanding activity ranges to embrace broader populations. The concept of "serving everyone" promotes inclusivity. Tools typically considered interesting to only one gender may actually interest both genders. For example, in Michigan, sewing machines are more popular among boys than girls.

9.1.7 Consider Activities That Respond to and Expand Current Patron Interests When planning formal maker programs, embrace the concept of "windows and mirrors." Formal project production is a good entry point for makerspaces, as are "open labs" where people apply new skills in their own time and way. In "open labs," people are exposed to new materials or tools that expand their infinite possibilities. Mirrors refer to makerspace activities that reflect existing or known patron/community interests, attracting those interested in them. For example, communities may have existing spinning enthusiasts, woodcarvers, or weavers. Planning that welcomes and recognizes these activities promotes early maker activities. Windows introduce activities people are less familiar with, haven't participated in, or are newly launched. In most communities, 3D modeling (the design process of using 3D printers to display objects from multiple dimensions) is an example of a window. Activities that add new elements to familiar objects are also windows, such as attaching circuits to paper books or digital images for use in electronic embroidery machines.

Another method to attract diverse makers is balancing short-term and long-term skill-learning projects. Particularly in under-resourced communities, some patrons may be intimidated by novel, high-tech tools or uncertain about their ability to succeed. Skill-learning that can be completed in one session helps minimize patron frustration, addresses difficult scheduling, and solves the difficulty of requiring multiple trips to successfully create products. Some short-term classes, such as learning to fold paper cups or decorate unfinished porcelain, can be completed in one gathering. These build novice confidence and prove to them that they can succeed in new fields.

As interest grows and successes increase, makers may become more willing to accept new challenges requiring longer time commitments, such as learning to code in Python, build robots, or process changes. Additionally, some people are more comfortable in formal learning environments, while others prefer to work alone and observe others covertly. Therefore, developing some interactions without guidance or providing videos or instructional materials are effective strategies makerspaces can adopt.

Another method to promote inclusivity is accepting peer mentoring and guidance. Rather than avoiding certain maker activities because staff are not experts, seek expertise from maker communities. For example, with parental permission, teenagers can teach Minecraft (the popular video game). In makerspaces, expertise is determined by experience, not age. The more expertise shared among participants, the further makerspaces can develop. Peer mentoring enables information institutions to develop learning communities.

9.1.8 Celebrate Maker Progress Along with makers' collective enthusiasm for creation, affirming patrons' achievements during the creative process enhances institutional services and provides opportunities for new patrons to participate. Design challenges are short-term engagement activities for new and existing patrons, where participants are asked to solve problems or complete tasks using uncommon materials. Consider cardboard challenges to see who can build the tallest, widest structure or robot using boxes discarded from recycling centers or appliance stores.

Rachelle Doorley documented one-time challenges for children, such as creating something new from cupcake liners. Hackathon challenges focus on using computer programming to solve problems. A new trend in challenge development involves low-cost prosthetic design and other world-changing maker practices.

Information institutions need to provide formal sharing time during workshops and showcase events. In this regard, each community is different, and willingness to share publicly varies, so choose a sharing pathway that is right for patrons and design it with their input. Some groups prefer to spend the last few minutes of workshops seeing how others understood a new task. Completed projects can be placed on tables, or participants can sit in a circle to appreciate finished works, depending on the scale of creations. Other suggestions include: - Maintaining physical photo albums, bulletin boards, or projector slides showing ongoing or completed projects - Using social sharing platforms such as the institution's Facebook, Flickr, blog, or Instagram - Holding semi-annual maker events such as Maker Faires (MAKE media licensed) or planning maker trial events (unlicensed event titles)

These efforts can attract attention from broader maker communities and those who appreciate their efforts.

9-1 Future Considerations

Information professionals should focus on these questions when thinking about the next phase of maker programs: - Whose services remain underserved in the institution's maker programs? - What is the potential for innovation and entrepreneurship in the community, and does it bring economic impact beyond personal satisfaction? - What brings makers' work together into a broad creative community in the community? - How can information professionals demonstrate how their maker programs change patrons?

Section 10: Strategic Planning

10.1 What Is Strategic Planning?

Lawrence Freedman, author of *Strategy: A History*, believes that strategy is maintaining balance among outcomes, paths, and methods; it is determining goals and the resources and methods available to achieve them. In short, strategy exists to solve problems—particularly how organizations accomplish established goals with existing resources.

Strategic planning originated in military history; the term “strategy” itself comes from the Greek word for “commander.” Many scholars cite *The Art of War* by Sun Tzu as first using this concept. Due to its military roots, modern strategic planning was adopted by the Department of Defense like the Internet and became popular in the mid-20th century. The Department of Defense adopted strategic planning after beginning to seek better, more useful methods to plan its long-term needs and achieve cost savings. By the mid-1980s, dozens of local governments had joined this trend. Numerous business books (Osborne and Gaebler’s *Reinventing Government* being among the most popular) promised that organizations could achieve higher performance levels while reducing costs and improving customer satisfaction by identifying core functions and measuring outputs.

From a fundamental information professional perspective, strategic planning is an essential element of organizational management. The process of developing and implementing strategic planning focuses organizational attention on its mission while achieving more effective resource allocation and strengthening team collaboration. However, another reason why the most agile and respected companies regularly conduct strategic planning exercises is to ensure their greatest efforts are applied to areas most critical to their long-term success. Information organizations, including public and academic libraries, can no longer repeat past practices without examining whether they meet user needs. This is particularly important for publicly funded institutions not subject to market forces, as they may otherwise require stakeholders to assume greater accountability.

10.2 Strategic Planning and Business Improvement

While the concepts of strategic planning and business improvement are sound, the challenge lies in executing both tasks simultaneously and continuously. Management professor Henry Mintzberg distinguishes between strategic thinking and strategic planning, arguing that strategic thinking is visionary, while strategic planning “as it has been practiced, is actually strategic programming, the clarification and elaboration of strategies or visions that already exist.”

It is also important to distinguish between strategic planning and continuous improvement business planning, which is widely considered a subordinate activity. Operational efficiency—the ability to do things well and continuously improve—is not strategy but a result of strategy. According to Porter, “oper-

ational efficiency means performing similar activities better than competitors.” In contrast, he defines strategy as the process by which an organization creates a unique and valuable position from among many possible choices, each involving trade-offs: “Strategy is making trade-offs in competition.” The essence of strategy is choosing what not to do. Without trade-offs, there is no need for strategy. For information organizations, strategic planning includes deciding which of many projects to accept or reject to most effectively use limited resources to accomplish organizational goals.

10.3 The Importance of Strategic Planning for Information Organizations

In the context of libraries and information management, strategic planning enables information organizations to achieve their goals by identifying projects, programs, and activities that are essential and aligned with their core mission and overall vision. Because strategic planning emphasizes high-level outcomes rather than short-term outputs, it is often long-term, typically three to five years. In the information field, much can happen in five years.

For these and other reasons, well-developed strategic planning can bring significant benefits to information organizations. Strategic planning can strengthen external communication between information organizations and the communities they serve while ensuring staff work together to achieve common goals. Additionally, by linking an information organization’s vision to its activities, a clear plan can justify budgets for mission-critical steps. If these resources cannot be obtained, the plan guides development of alternative methods to achieve equally important results.

For example, strategic plans can help public libraries effectively communicate to supporters (including donors and foundations) how taxes, donations, and other resources are used. Internally, strategic planning clearly explains how each program contributes to the organization’s mission, helping managers and staff understand the necessity of collaboration between different departments.

However, the value of strategic plans is more fully realized during budget development. Regardless of economic conditions, strategic planning provides a solid foundation to guide resource allocation to core activities, even when these resources are ultimately limited or unavailable through traditional channels. For instance, if strategic planning identifies adult literacy as a primary goal, an information organization might reasonably plan to hire more staff to teach literacy courses. However, if the organization’s budget is cut due to lack of funding and eliminates the proposed position, strategic planning will guide management to seek other methods to advance this critical activity. Inspired by guidance, staff may decide to partner with nonprofit organizations with the same mission to provide alternative funding sources for these services by offering space for similar groups in the information organization or collaborating on grant applications.

Alternatively, if strategic planning has identified maintaining substantial digital

materials as a community priority, it may be better to reduce operating hours rather than funding to meet community needs. Similarly, managers wanting to cut programs will use strategic planning guidance to cut other less critical services. In any case, the strategic planning process focuses leaders', managers', and staff's attention on the same priorities, thereby optimizing the organization's ability to achieve its goals.

10.4 The Strategic Planning Process

10.4.1 When to Develop Strategic Planning Some management experts believe strategic planning is like investment because the best time to do strategic planning was five years ago, and the second-best time is now. In practice, strategic planning is typically developed when high-level leadership changes in an organization. Many new board chairs and newly appointed directors recognize that the strategic planning process is a necessary catalyst for moving the organization forward, correcting outdated practices, and building consensus on new initiatives. Other times, strategic planning is a continuation of ongoing work, restarting another plan when the previous one has expired and become outdated. Strategic planning can also be conducted with the specific intention of systematically solving recurring problems.

In all cases, one of the primary benefits achieved during the strategic planning process is inclusion of internal stakeholders (such as library management and staff). Staff who participate in identifying key projects and plans (the first part of any strategic plan) understand and appreciate their value and are more likely to work together to achieve organizational goals. The same applies to society as a whole (such as donors and tax-paying public). When their voices are heard and suggestions recognized during the planning process, they become library advocates who contribute to the system's success.

Given the need to involve so many stakeholders, it is not surprising that successful strategic planning processes require significant investments of time and money. An external consultant is often hired to facilitate many necessary meetings and guide the entire or partial meeting process. This has some advantages, particularly when strategic planning begins to change organizational culture, because third parties may appear more neutral or objective to those maintaining the status quo. However, even when process management is internal, staff spend considerable time preparing for internal and external stakeholder meetings, writing reports, and incorporating training costs needed to refine and interpret results into structured plans.

Unfortunately, these upfront costs mean these processes may be postponed when budgets are tight. During difficult economic times, strategic planning is often treated as decoration and one of the first items cut. This is quite regrettable because, as described above, good strategic planning can be particularly valuable during difficult times, helping organizations retain focus and critical programs.

10.4.2 The Strategic Planning Process Although these steps differ, they are related. The entire process includes some degree of repetition and iteration, so it looks more like painting a picture than building a bridge. To create strategic planning, an organization must first develop and achieve consensus on mission statements and inventories of existing tasks and activities. During the preparation phase of completing the strategic planning process, tasks on the inventory will likely become key tasks because they clearly support organizational goals. These tasks serve as good examples when staff must identify key activities in subsequent strategic planning development phases.

Phase 1: Planning Preparation

Unsurprisingly, like much important work (think of painting a house), much of strategic planning's work occurs during the preparation phase. Key elements of preparing strategic planning include developing mission and vision; stakeholder interviews (including internal and external); needs assessment, including environmental scanning and SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis.

Foundation of Planning: Mission, Vision, and Values

Among these preparatory tasks, the organization primarily develops mission, vision, and values statements, which form the foundation of the strategic planning process and are distinguished as follows: mission statements are statements of purpose; vision statements are vivid images of the future the organization wants to create; values statements list the organization's guiding philosophies and beliefs.

Much information exists about the process of determining and achieving consensus on organizational mission and vision, involving work very similar to strategic planning itself. Although mission, vision, and values statements may already exist, it is best to review them with appropriate staff and stakeholders to validate and modify the team's understanding of organizational goals.

Mission statements should be short and memorable. Creating short mission statements is difficult, but they are more effective than scattered "baskets of good ideas."

Review Organizational Structure: A Transparent Process

Before conducting strategic planning, it is necessary to review organizational structure to determine its ability to accomplish mission and vision. This review will also suggest which major departments and employee groups need to be responsible for developing a successful plan and which stakeholders (including patrons and other community members) should be included in the process.

Good plans should include external stakeholders. In fact, communication with community stakeholders served by the organization (including those unserved) can provide complementary perspectives on how the plan can help the information organization achieve its ultimate goals (see also Chapter 27: "Com-

munication, Marketing, and Outreach Strategies”). For example, in public libraries, typical external stakeholders might include library support groups such as Friends of the Library or other 501(c)(3) tax-exempt groups; government officials including mayors or council members; local business owners or business associations (such as chambers of commerce); school boards; and nonprofit organizations focusing on disadvantaged communities (including homeless people and new immigrants). This broad outreach should aim to solicit general and detailed opinions from representatives of all community strata on: - To what extent the library currently meets community needs - Which library services are valuable to the community and why - What policies or practices reduce their likelihood of using the library - What services and programs should be offered in the future

Community open houses are frequently held, and communities are also surveyed.

Internal stakeholders, including library staff and board members at all levels, are also included in the strategic planning process. The same process solicits insights on the organization’ s current and future roles. Frontline staff are particularly important to this process, as they have insight into how people currently enter the organization, what services they use, and what trends and changes they see when people walk through the door or access information services online.

Conduct Needs Assessment Work

Once stakeholder input has been collected and reviewed, the next step is conducting a needs assessment, which further analyzes data to identify gaps between how the information organization serves its community and how it should serve the community in the future.

Needs assessments fall into two categories: - **Environmental Scanning:** Includes analysis of recent and long-term trends and behaviors that may help or hinder organizational progress - **SWOT Analysis:** Focuses on internal and external factors affecting the organization. SWOT stands for Strengths, Weaknesses, Opportunities, and Threats

The terms environmental scanning and SWOT analysis are often used interchangeably, but they are different. Environmental scanning is more objective. It looks at current situations and focuses outward. SWOT is more subjective, requiring both internal and external stakeholders to identify positive and negative aspects of the organization.

Typically, the first part of SWOT analysis focuses internally; participants are asked what the organization’ s strengths and weaknesses are. The next step focuses externally: “What external forces affect the organization?”Results can vary widely, such as economic downturns, new schools across the street, or emerging technologies. The chart below (Figure 7.2) shows a graphical representation of SWOT analysis.

The University of British Columbia provides a simple summary of questions to ask during SWOT analysis: - What conclusions can we draw from the SWOT

analysis about action priorities? - What should we do more of? What should we stop doing? - What should we do less of? What should we start doing? - What are the priorities for action in each area?

Figure 7.10-2 SWOT Analysis Method for Library Managers, adapted from Matthews, Joseph R.

Regarding environmental scanning, Mintzberg' s statement is worth recalling: “Strategy is a plan for the future and a pattern from the past.” Therefore, part of environmental scanning is to identify past patterns to determine how they limit or strengthen future practices: “The purpose of scanning the environment is to align your strategic plan with the reality of the world around you.”

Finally, strategic planning preparation requires a comprehensive inventory of existing programs and assessment of their outcomes. Although mission and vision statements have been adopted, it is important to meet with internal and external stakeholders before beginning the strategic process to hear their opinions on which activities more effectively meet community needs. All this information is important for development planning when the team considers which current activities support mission and vision and which are less critical to key goals.

Once data has been collected from stakeholder interviews and needs assessments, strategic planning development can begin. To ensure the plan aligns with overall mission, vision, and values, strategic planning should identify the organization' s core goals and objectives. This lays the foundation for the strategic planning process. Strategic planning may also need to provide an outline of the library' s organizational structure, highlighting departments responsible for designing and implementing specific programs.

Phase 2: Development Planning

After all preparation is complete: data from internal and external stakeholders on usage and input has been obtained, the organization' s mission, vision, and values have been discussed and articulated, and the organization is ready to enter the core of the strategic planning process. This includes identifying goals that support the organizational mission, selecting planning timeframes, assessing existing resources, and identifying and describing key projects.

Determine Goals and Core Competencies

While determining goals and objectives is one of the more challenging parts of the strategic planning process, some consider it the most creative. This is when the strategic planning team begins evaluating its research from the perspective of the organization' s mission and vision.

For example, inspired by the mission to “enhance community learning and creativity,”the Multnomah County planning team might consider what its members are currently learning and how the library can support their efforts. Conversely,

the team might observe where creativity is hindered in certain parts of the community. Key questions in this phase include: - How should the library enhance community capacity to achieve the library's mission? - Where does the community fail to meet the lofty expectations of the library's vision, and what obstacles prevent the community from moving toward this goal? - In what ways is the library capable of helping solve these problems, and which solutions require partnerships or responsibility by other organizations?

The result of this work is a list of goals aligned with the library's mission that enable it to meet community needs. Goals are the big picture, determining the library's future; objectives are steps the library must take to reach goals; these objectives in turn propose a series of programs and activities that translate goals into action, further elaborated in the library's operational plan. **Table 7.10-1** shows examples of strategic goals and objectives from Santa Clara University Library.

Table 7.10-1 Santa Clara University Library Strategic Goals and Objectives

Goal: Expand the archives and special collections repository in our community

Objective 1: Implement outreach and marketing strategies for archives and special collections

Objective 2: Pursue strategic gifts and acquisitions that reflect collection development philosophy

Objective 3: Adopt best practices for description, discovery, and preservation to improve access to our special collections

Objective 4: Create a strategy for obtaining and managing accession numbers

Note that goals are broader, while objectives are more specific and discuss how to achieve goals. Another characteristic of objectives is that each proposes a series of activities. In fact, this is one of the main advantages of objectives, as they form a bridge between the library's goals and the programs that support them, detailed in business plans that further list specific steps.

The plan should describe the projects and initiatives the information organization will undertake during the planning period to accomplish its mission and achieve its goals. While it is not necessary to provide too much detail, strategic planning should at least address the organization's signature programs, ongoing services, and new initiatives, describing how they will achieve their goals and objectives.

There is no regulation on the timeframe strategic planning should cover, but because of the time and resources spent creating the plan, it is usually long-term—at least five years or longer. In the information field, much can happen in five years.

Selection of key projects can be considered a continuation of the process of defining “goals and objectives” that align with the organization's mission. However,

the difference is that this is the part of the planning process that most deeply absorbs staff knowledge and experience, as they identify and prioritize the actual projects, products, and services the information organization will provide to meet their goals.

For example, one of Santa Clara University Library's goals is to "implement outreach and marketing strategies" to support the library's objective of "expanding archives and special collections repositories." The library might form a new staff marketing team focused on designing marketing campaigns. Similarly, to accomplish the objective of "pursuing strategic gifts and acquisitions that reflect collection development philosophy," the library would benefit from partnering with the university development department to build a list of potential donors. These projects will be further developed in business plans with specific measures of their success (for example, "obtain a certain amount of donations for the collection annually"). However, at this stage, the initial list of candidate projects for achieving organizational goals is best developed through brainstorming to capture as many ideas as possible from team members before determining their feasibility.

Once the intended project list is developed, the team must consider what resources are needed to implement them. Detailed budgets are not required, but some assessment of required resources should be made, including financial resources and staff time. Additionally, potential partnerships should be considered for activities requiring collaboration with other entities. For example, the team may find that making significant progress on key goals requires more time than initially planned and decide to extend the dates covered by the plan. This in turn may affect resources needed to support selected programs. During strategic planning development, many suggestions may focus on narrow tactical levels more suitable for operational plans. These ideas should be captured and recorded for use during implementation phases.

Phase 3: Implementation Planning

After all these efforts, it is important for the information organization to introduce the plan to the community and gain support from decision-makers who provide resources (including funding) needed to execute the plan. Equally important, managers must share the plan with staff ultimately responsible for implementation so they can translate goals and selected programs into measurable actions.

Documenting the Strategic Plan

Since strategic planning determines the direction of an information organization for a considerable period, it should serve both internal and external stakeholders. The planning report should be written and organized to be understood by as broad an audience as possible. Typical components of planning documents include introductions to mission, vision, and organizational values; descriptions of the planning process; reports on goals and objectives; and implementation roadmaps. Sometimes information organizations use different terms and phrases

in their strategic planning, but these usually refer to the same concepts. For example, objectives may be called service priorities, guiding principles may be interchangeable with values statements, and library actions may have the same meaning as objectives.

The report should also include an executive summary that distills key points into one page with graphics for marketing to communicate the plan to broader audiences. Simplified graphics and other communication strategies can help communities more easily understand the plan.

Marketing to the Community

Completion of strategic planning often provides opportunities for marketing campaigns to gain additional support for the organization (see also Chapter 27: “Communication, Marketing, and Outreach Strategies”). Strategic planning can be released through press releases across all social channels. Marketing campaigns can include additional community meetings to introduce strategic planning and solicit improvements to business plans, which can be further modified to include the most appropriate programs and services. Reconvening stakeholder groups benefits strategic planning by creating buzz and generating new advocates for its successful implementation.

As important as external presentation is rolling out the plan to staff responsible for implementation. Directors often make the mistake of only discussing strategic planning when it is first created, then only discussing it with senior managers afterward. All staff in the organization should be involved in communicating the plan, even those not directly responsible for a specific goal, because all staff contribute in some way to the organization’s overall success. Organizations can develop formal training programs to introduce the plan through processes that facilitate employee feedback.

Typically, strategic planning is created, placed on a shelf, and no one looks back at it until it is time to begin planning again. Instead, strategic planning should be treated as a “living document” that guides the information organization’s direction throughout the planning period. It should be prominently featured front and center on the organization’s website, and management and staff should refer to it frequently.

Implementing the Plan

In conjunction with strategic planning, information organizations must also develop a business plan to identify steps needed for implementation. Business plans, also called tactical plans or short-term plans, link the organization’s strategic goals and objectives with specific programs, plans, and services provided and executed in its daily operations. With shorter timeframes, typically aligned with fiscal or budget years, business plans also allocate resources needed to implement specific programs and formally incorporate them into annual budgets.

Based on strategic planning, teams identify programs and initiatives that can

be completed within the budget year, considering available budgets and other resources. These manageable programs should be accompanied by appropriate measurements linking programs to the organization's mission and vision. Business plans also identify staff roles and responsibilities and timeframes for completing each initiative.

A common mistake information organizations make is not providing adequate resources to implement goals identified in strategic planning into business plans. While robust budgets are always preferred, information organizations' funding histories demonstrate that budgets rise and fall. In fact, one benefit of strategic planning for information organizations is the ability to continuously allocate resources based on maximum impact. For example, if staff budgets have been reduced but strategic planning indicates the information organization should provide homework help centers to accomplish the objective of "encouraging life-long learning," the organization may find ways to fulfill its commitment through volunteers who can provide assistance. Or, the information organization may partner with a nonprofit organization to provide tutoring for underserved students. In all cases, strategic planning identifies which services are critical to its mission and guides the budget.

Phase 4: Measuring Performance and Adjusting the Plan

The best way to ensure successful strategic planning implementation is to develop measurable goals. While this may sound simple, goals related to high-level strategies are often difficult to quantify. Goals may be broad but should also be clear. Vague goals that are too general can easily be ignored and may never be achieved. Goals should align with the organization's overall objectives, mission, vision, and organizational values, but should also propose programs that can be achieved within a reasonable timeframe.

Performance measurement—especially efficiency measurement—is typically changed during the strategic planning lifecycle. Good planning can adapt to these changes without losing its spirit and vision.

Section 11: Change Management

11.1 Definitions of Change, Change Management, and Change Agents

It is first important to define key terms related to change management, specifically: organizational change, change management, change manager, change leader, and change agent. Organizational change is "planned change in organizational components to improve organizational [library] effectiveness." Organizational components such as mission, values, policies, procedures, technology, and personnel are vital elements that hold organizations together. Some of the biggest changes in today's information services are driven not by emerging technology but by ideological issues—for example, why libraries are essential and how they deliver core services to the communities they serve or the organizations they support (such as university systems, municipal governments,

hospitals, etc.). Change includes eight processes: 1. Creating urgency 2. Building coalitions 3. Creating a vision for change 4. Communicating the vision for change 5. Removing obstacles 6. Creating short-term wins 7. Creating change 8. Anchoring change in the organization

When using any model to implement change, information professionals need to provide structure for change to take root and flourish. This further requires information professionals to become custodians of the change process. Tech guru Guy Kawasaki calls on change leaders to make change and information related to change easy for relevant stakeholders to follow and accept, especially those directly affected by change. Clearly, change management is a complex process requiring several people to help drive change. Key roles in the change process are change manager, change leader, and change agent.

Change Manager Tasks: - Observe change as it occurs - Play a primary role in evaluating change effectiveness - Identify and analyze what change is needed - Apply tools to create positive and lasting change

Change Leaders are generally considered: - At the forefront of the change process - First adopters - First to test and drive change - First to handle initial change ambiguity

Change leaders can be arranged in a project office with cross-departmental supporters or teams of people who can influence needed change while promoting environmental stability. This is not common, but if dedicated staff are assigned, it only increases stability for the organization's planned major change efforts. Because their workload focuses on specific project work, change may occur more rapidly. These dedicated staff minimize impact on frontline staff workloads, increase collaboration, improve grassroots buy-in, and promote organizational stability.

Change Agent is a general term describing any employee with or without a title, though most often not holding positions of power in the organization. Change agents often lead change not through organizational position but through attitude and personality.

Although each key person plays a different role in the change management process, this chapter uses a single term—**change leader**—to represent all major members involved in the change process.

Change leaders help their organizations develop change management frameworks. They use a three-step process to define the change process and ask: 1. Why is change needed? 2. How will this change be achieved? What specific tools will be used to develop change and facilitate the process with change recipients (e.g., employees in the organization)? 3. When should change be implemented to achieve optimal and sustainable results?

Applying the Three-Step Method to Define the Change Process

Imagine change leaders are increasing access to the organization's electronic

audiobook collection. Using the three-step method, change leaders would develop understanding of the overall need for change and the process to follow: 1. **Why is change needed?** Existing downloadable electronic audiobook collections are available even when the [physical] library is closed, but not enough users know about this service. The library wants to increase awareness and understanding of this collection. 2. **How will change be achieved?** The library will change how it promotes the electronic audiobook collection to increase visibility; specifically, the library will increase funding to purchase more books and then promote these new books to users. 3. **When will change be implemented?** The library will immediately begin selecting new electronic audiobooks and actively market this popular collection.

11.2 Basic Change Management Skills for Information Professionals

Given the dynamic and continuous change within the information field, information professionals can expect to participate in their organization's change process at least once during their careers. Information professionals can prepare themselves and their organizations to successfully navigate change by adopting seven key competencies:

1. Demonstrating transformative leadership

These skills are explained in greater depth below.

Skill 1: Developing Vision

Developing vision begins with exploring and envisioning opportunities and possibilities for the organization while also identifying challenges. Being both a dreamer and a pragmatist characterizes all great leaders. Effective change leaders design visions resilient to changing resources, based on new directions but leveraging past achievements, and providing a common foundation and opportunity for participation across the organization. Great visions challenge the status quo and inspire leaders to engage in helping drive needed change.

As "change agents," change leaders must use every opportunity to promote the new change vision with everyone in the organization during daily activities. Ways change leaders can successfully engage people in the organization to agree with the change vision include: - Increasing financial resources to promote the vision, such as hosting events and developing marketing materials - Hiring and retraining staff with innovation at their core - Developing metrics demonstrating that individuals and the organization will benefit from the vision, then tracking and reporting this data - Creating an organizational culture where everyone can become a change agent

Skill 2: Communicating and Implementing Vision

One method of communicating and implementing change vision is through framing. Framing is the process of capturing ideas or images of the change process within a larger organizational framework to redefine organizational roles, re-

evaluate them, and give them new purpose. Understanding how to capture and convey ideas through framing information gives meaning to the agenda of organizational life to improve organizational effectiveness.

Framing language can shape and modify how events are viewed and how change leaders want their employees to see events. Leaders and managers can frame through using organizational stories, myths, and metaphors.

Skill 3: Understanding Drivers of Change

What drives organizational change? Globalization is one of the main drivers of organizational change. This means service competition comes from everywhere, all the time. Cawsey and Deszca emphasize how organizations are currently affected by several global and fundamental forces influencing the information environment, which often trigger change in information organizations. These change drivers include: - Changing social, cultural, and demographic patterns - Astonishing technological achievements that are changing our business models - Global markets bringing competition to our doorstep, making us compete worldwide - Political uncertainty remaining in many countries that may bring chaos to world markets

Other forces driving change in today's information organizations include resource availability (or lack thereof), changes in social, cultural, and demographic landscapes, technological advances, and political climate.

How do organizations adapt to these change drivers? For organizations to evolve and grow, they must dynamically interact with individuals and environments they serve. This is similar to Stern's "evolutionary adaptability," defined as the ability to accept or adopt change incrementally, often from or through grass-roots cooperation in the organization. Organizational evolutionary adaptation requires growth from reluctant or resistant staff who become more resilient over time. Although organizations must sometimes take leapfrog actions, small steps daily are helpful. Information professionals can also prepare for change by aligning with global and social trends; this can help them stay ahead of change and remain continuously aware of various factors that directly or indirectly affect the organization.

Being caught by change can have the greatest negative impact on an organization because the process of responding, catching up, and reconfiguring organizational structure to adapt to change can be more arduous and even more expensive. Outsourcing services has become a more attractive option for many information organizations trying to address organizational unpreparedness. For example, the business model of Library Systems and Services, LLC (LSSI) provides a "for-profit" alternative management system rather than the traditional nonprofit model used by many city and county governments. This allows LSSI managers to approach change management projects with strict cost-based strategies as a driver of change.

Change leaders are responsible for accepting that change occurs and playing

a primary role in evaluating change effectiveness. They must remain aware of and analyze what change is needed. Their goal is to use necessary tools and methods to create positive and lasting change. An organization's evolutionary adaptability to change will depend on how well this initial analysis is completed.

Skill 4: Analyzing What Type of Change Suits the Organization

When dealing with change—whether large or small—change leaders must consider what is needed before embarking on the change journey. As shown in Table 7.2, there are four types of organizational change: adjustment, adaptation, reorientation, and re-creation.

Table 7.11-1 Types of Organizational Change

Gradual/Continuous	Discontinuous/Radical
<p>Reactive Change</p> <ul style="list-style-type: none"> • Gradual changes made in anticipation of future events; implementation is the main task • Requires internal alignment • Focuses on single components or subsystems • Middle management roles <p>Example: Quality improvement initiatives from staff improvement committees</p>	<p>Proactive Change</p> <ul style="list-style-type: none"> • Strategic, proactive changes based on predictions of major environmental changes • Requires positioning the entire organization for new realities • Focuses on all components of the organization • Senior management creates urgency and motivates change <p>Example: Major changes in products or services provided to respond to identified opportunities</p>

Overhaul or Re-creation

Section 12: Innovative Library and Information Services: The Design Thinking Process

12.1 A New Perspective: Library and Information Services as Designed Products

Examined closely, the work of information professionals exhibits many design characteristics. Information professionals observe and describe the information world not to predict what comes next, but to solve problems by creating something (called a “product” in design terms). These products may be tangible, physical objects such as printed indexes, promotional brochures similar to “trail-blazers,” or even color pages about passive planning. These products may also be intangible, such as digital products, new classification schemes for special situations, library and information science teaching curricula, or activity planning. The emphasis on creating tools and services makes this type of design and creation well-suited to the library and information science field.

Beyond this basic similarity, cases of library and information services also reflect various aspects of design elements. For example, experience accumulation in library and information services (called “experience and knowledge systems” in design) is reflected in readers’ advisory work—a service requiring information professionals to provide reading recommendations to readers. No authoritative booklist exists for information workers to memorize and provide recommended reading lists. Instead, to complete this work, information professionals must utilize their personal knowledge reserves, such as reading books and book reviews; listening to recommendations or book reports from other professionals, friends, and family; and browsing advertisements in media.

Elements of problem discovery, framing, and reframing (the process of recognizing and viewing problems from different perspectives or viewpoints) are reflected in many reference interviews where information professionals are trained to delve deeply and explore users’ underlying real information needs, which are often not expressed in language. For example, a user might ask an information professional, “Do you have *Time* magazine?” The answer to this directly posed question is simple: “Yes” or “No.” However, the user might be a student looking for articles about the Iraq War and associates *Time* magazine with that type and topic. Or the user might be an elderly person looking for an article about a new cancer treatment, recalling it was published in *Time* magazine when it was actually published in *Newsweek*. The information professional’s responsibility is to reframe the problem so users can provide more than what they expressed they need.

Design rationale refers to the reasons and justifications for decisions made during product creation, explaining why the finished product is what it is. A major example reflected in library and information services is the concept of “literary warrant” or the rationality and validation of decisions in classification system creation. Most classification systems and thesauri are based on the idea of literary warrant; that is, any classification or term in a subject must appear in that literature resource collection. A small public library’s classification system may include descriptors for animals like cats and dogs but is unlikely to include terms like feline and canine that appear in veterinary medicine library collections. The decision of which term—cat or feline—to include in the thesaurus depends on rationale.

Reflection refers to people’s careful thinking and review of a completed project or past situation, such as when students might write reflective essays for English class. This post-action reflection is familiar to most people. It can be said that it is designers’ engagement in “reflection-in-action” or continuous reflection throughout the creative process that makes design distinctive. Although this reflection is difficult to observe, evidence shows it also occurs in library story-times. When participants debrief or review their performance afterward, they reflect purposefully to continuously improve future planning. They can also reflect in-process, adjusting tone, posture, and other interactions as needed.

12.2 Library and Information Professionals as Designers

If library and information services are indeed designed products, then information professionals need to explicitly use design principles, techniques, and methods to create more powerful and successful tools and services. However, most information professionals do not consider their work design. User Experience (UX) librarians—those directly inspired by fields like interaction design—see their roles as researchers rather than designers, devaluing design-related tasks and leaving design to other staff and departments. Design research methods are noticeably absent from information professionals’ research method textbooks, even in recent publications. When design is discussed in the library and information science context, it is often relegated to architecture and space planning, such as *Library Journal*’s annual design showcase, which primarily emphasizes architecture and interior design. Beyond this emphasis on architecture, discussions and discourse about design in library and information science often reflect technology (“such as web design”) and print formats (such as book jacket design). But in library and information science, design is not just about physical space and web pages. Information professionals design a wide variety of tools and services so users can conveniently access and use information resources.

This disconnect means that elements of design knowledge are unconsciously implicit when information professionals create problem-solving products, making it difficult to fully realize their potential.

12.3 Innovative Design Methods for Libraries

How can information professionals create and provide better tools and services by explicitly integrating design knowledge methods into their work? There are many frameworks designers draw upon, such as user-centered design or participatory design, and many specific methods designers engage in, from A/B testing to word clouds. A whole book could be written about these different methods. Therefore, the focus here is discussing how information professionals can use design thinking to help their information institutions.

12.3.1 The Design Thinking Process The design thinking method is a problem-centered, iterative process for discovering problems and creating solutions. While this process has always been used in design work, most who draw on this method agree that the explicit articulation of steps in the design process was pioneered and popularized by David Kelley, co-founder of the product design company IDEO and founder of the Hasso Plattner Institute of Design at Stanford University (also known as the “d.school”). The articulation has undergone many changes from its initial form to the present. Although specific wording varies, the design thinking process always consists of four main phases that are not linear but form an iterative cycle (see Figure 7.3), allowing continuous reflection and improvement.

The four phases are as follows:

Figure 7.12-1 The Design Thinking Process

Investigation Phase: Encourages a problem-solving mindset to discover patterns, accurately identify and articulate problems and goals, and view problems from users' and customers' perspectives, emphasizing empathy for users and customers. Empathy for users is key to understanding and framing problems.

Planning Phase: Encourages collaboration and innovation. This phase relies on divergent thinking and brainstorming to generate as many ideas as possible, no matter how absurd they may seem. Because design thinking emphasizes solving problems through multiple approaches, it generates increasingly innovative solutions.

Development Phase: Literally, when designers find their thinking constrained, they stimulate creativity by creating problem-solving solutions while promoting adaptability and flexibility. This includes creating prototypes, or low-fidelity preliminary models, to test ideas and collect more feedback before committing to full development. Sometimes prototypes are also considered a separate phase between ideation and development.

Evaluation Phase: Encourages leaders to clearly communicate values and feed back findings to continue improvement. In addition to judging product acceptance and usability, this phase needs to expose and identify new problems, connecting back to the investigation phase and beginning the cycle anew.

Section 13: Data Management and Data Analysis in Information Organizations

Data management and data analysis are key organizational functions. Without careful management and analysis of organizational data, organizations cannot operate effectively. Data provides critical information for managing organizations' daily operations and identifies gaps between existing products and services. Perhaps more importantly, data is essential for planning how to evolve to meet future organizational needs and leverage opportunities to strengthen and expand product and service offerings.

More than a decade ago, data management and data analysis were considered important skills information professionals must possess. While information professionals were seen as managers of external scholarships and resources, the volume of internal administrative data within organizations and internal scholarships in universities and research institutions has increased significantly over the past decades. Information professionals are considered capable of making significant contributions to strategic errors in data management and analysis in many organizations.

As this new role evolves, library and information organizations increasingly partner with organizations outside their own. This evolution is not limited to academia. In public libraries, members of user communities increasingly ask libraries questions related to their personal data management. In corporations,

expectations for information organizations and their staff have changed similarly.

A notable difference related to data management and analysis work is that it requires information professionals to enter larger organizational structures, working as collaborators on projects rather than working within information institutions.

13.1 A New Perspective: Library and Information Services as Designed Products

13.1.1 What Is Data Management? Data management is rapidly becoming a major service as academic libraries help faculty and researchers manage, store, and share their research data according to government and funder requirements. Data management also interests public librarians because helping citizens manage their personal data is a major opportunity for community service.

The Data Management Association (DAMA) defines data management as “the development, execution, and supervision of plans, policies, programs, and practices that control, protect, deliver, and enhance the value of data and information assets.” DAMA’s definition raises the question: “What are data and information assets?” The answer is not as simple as it appears. In corporate environments, data and information assets typically originate from applications used to run the business. For example, data from order entry systems or human resources systems is a data asset. A locally developed database containing information about other organizations (such as sales and financial data) in a competitive analysis could be a strategic data asset.

Data assets also come from applications, but in educational environments, these applications are generally considered different from the business sector. For example, in university environments, although Student Information Systems (SIS) perform many functions related to students and their academic program management, faculty do not view them as applications used to “run the business.” Although much information in Learning Management Systems (LMS) is learning material, data collected about interactions between students and faculty with that material and with each other is viewed as an information asset that can help understand issues related to the effectiveness of learning materials and courses.

In library and information institutions, the situation is more complex because datasets may be external to the organization and not under direct control. Library-subscribed research literature databases are obvious examples in this regard. These databases would be considered data assets. In fact, they are often the library’s primary “product.” Because data in research literature databases often cannot be directly managed by the organization, they differ from organizational applications. Additionally, because information related to datasets may not be readily available for analysis by library and information institutions, this may also create limitations. How data management and data analysis func-

tions are implemented within organizations depends on organizational size, type, and structure. In libraries or large organizations with libraries, management of electronic resource information is a shared responsibility led by cataloging or technical services departments for collecting and maintaining bibliographic information.

Outside libraries, the situation is completely different. In smaller organizations, data management and data analysis are often performed by a department within the information technology function. In medium-sized organizations or highly centralized large organizations, responsibilities may be divided among several departments, with data management typically located in IT and data analysis in business analysis departments, which may report to the IT organization. In very large organizations such as research universities or large multinational corporations, these two functions are often distributed across various local or line-of-business IT and analysis departments throughout the institution. Regardless of whether data is sales information, library database usage statistics, or student interaction information from an LMS, because it is raw information collected at the application level, this type of data is called “operational data.” It is subsequently used to integrate institutional data, such as matching student enrollment data from SIS to course learning objects within the LMS. This can then be expanded into analysis by correlating patterns in student enrollment data from SIS with achievement of learning outcomes in LMS courses. Another example is libraries comparing citation counts in student theses and dissertations with usage statistics from databases they subscribe to in order to make collection development decisions.

13.1.2 Data Recovery and Disaster Recovery Planning A fundamental component of post-disaster data recovery planning is developing a Disaster Recovery Plan (DRP). A disaster recovery plan documents how an organization recovers from data loss during major information technology-related incidents.

In some environments, particularly those highly dependent on large-scale database transaction processing, replication can aid data recovery. Replication is the process of frequently copying data from one storage medium to another, ensuring data always has a duplicate copy. Replication can be performed in three ways: snapshot, transactional, and merge replication. More information about these replication processes is available in the online appendix to Chapter 26.

However, in most environments, data recovery is achieved through more traditional “backup and recovery” functions. While conceptually simple—regularly backing up data so it can be restored in case of accidental deletion, corruption, or destruction—implementing a viable and robust data recovery strategy is often quite complex, involving many different decisions across the organization.

Figure 7.13-1 Data Backup Schemes—Calculated Differential vs. Incremental Differential

Depending on data nature, full daily backups of all data may not be feasible. In such cases, organizations may choose alternative data backup methods to speed backup processing (see Figure 7.4 Data Backup Schemes—Calculated Differential vs. Incremental Differential). For large management systems, differential incremental or cumulative incremental backups are commonly used to minimize time required for daily backups and overall backup media storage needs. In cumulative incremental backups, each new cumulative backup includes all new or changed data since the last full backup. Therefore, time required for each subsequent cumulative backup increases as cumulative data volume grows. In differential incremental backups, only new or changed data since the last backup is included, regardless of whether the last backup was full or differential. Therefore, differential incremental backups tend to require consistent time at each backup because they only capture new or changed data since the last backup. When deciding which method to use, we often consider balancing recovery time in case of disaster with time required to perform regular incremental backups.

For most applications, retention periods are also defined. Particularly when using differential incremental backup schemes, retention periods must account for retaining all backups that might be needed if data recovery is required. A commonly used schedule is daily/weekly/monthly/annual cycles.

13.2 Research Data Management

“Organizations participating in RDM initiatives are archiving and preserving research data. From researchers’ perspective, the most important aspect of RDM is how the program makes the research process more effective.” Although Research Data Management (RDM) is not a new concept, it has received increasing attention in recent years due to government interest in promoting data sharing for funded research, especially in scientific fields.

In its most basic form, RDM is an approach to managing the data lifecycle throughout research projects from project inception to dissemination of research results. The primary focus of information organizations participating in RDM initiatives is archiving and preserving research data. From researchers’ perspective, the most important aspect of RDM is how the program makes the research process more effective. RDM must also meet expectations and requirements of funding organizations, research institutions, and any applicable regulations or legislation. In most cases, stakeholders’ goals focus on ensuring reliable validation of results and providing convenient data access to further develop existing research.

13.3 Data Management Plans

To achieve RDM goals, many research projects now require a Data Management Plan (DMP) for funding proposals. DMPs must describe how research teams will create data, share data with collaborators, protect and store data, and make data available to other researchers.

While basic DMP elements are similar across disciplines, the vast majority of work academic libraries do with researchers focuses on DMPs in STEM (Science, Technology, Engineering, and Mathematics) fields. Different funding agencies often have different requirements with varying complexity and detail. For example, the Institute of Museum and Library Services (IMLS) currently has no specific requirements, only requiring that some type of DMP exist. The National Science Foundation (NSF) has very detailed and specific requirements, but these vary by discipline. Therefore, NSF has different DMP requirements for biological sciences, education and human resources, engineering, geosciences, etc.

13.4 Data Visualization

Data visualization is closely related to data analysis, presenting information in graphical rather than traditional text-based formats as people expect. Because data visualization has great advantages in highlighting key issues in datasets, it has been rapidly applied in many types of applications.

13.5 Data Management and Analysis Tools

When selecting data management tools, considerable software is available. Tool selection primarily depends on data nature and key points in the data lifecycle where the tool is used.

Cleaning and transforming data can be complex. Typically, data cleaning and transformation are performed using specialized tools, often associated with the underlying database or data system used to store data. However, a standalone tool used in many environments (particularly research environments) is OpenRefine. Originally developed by Google, it is now a community-supported open-source project and a versatile tool that can: - Import and transform data in various formats - Transform data (from text to numbers, etc.) - Extract and reduce data elements containing multiple values - Filter and partition data - Perform advanced operations using the General Refine Expression Language (GRE)

For managing data, perhaps the most familiar data analysis tool is Microsoft Excel. Although Excel is often considered “just a spreadsheet” program, it has been enhanced over the years to incorporate very sophisticated analytical capabilities and has become the foundation of Microsoft’s online analytics platform. Excel also has extensive statistical analysis capabilities. For many administrators, particularly in corporate environments, Excel is a platform suitable for their needs.

However, in research fields, several different platforms are used for statistical analysis, such as: - **SAS**, frequently used in public health, government, and business - **SPSS**, frequently used in social sciences - **Stata**, commonly used in general science - **Minitab**, commonly used in teaching environments to familiarize students with basic statistical concepts - **R programming language**,

providing an open-source solution for statistical analysis

While many of these statistical tools also have add-on modules providing data mining and visualization capabilities, many organizations use standalone tools to perform these functions. In the commercial sector, **Tableau** has become a popular visualization tool due to its streamlined and intuitive user interface. For data mining, many organizations use tools with open-source options for philosophical or economic reasons, such as **KNIME** or **RapidMiner**. Additionally, Microsoft's **Power BI** toolset is popular in academic and nonprofit environments that have discount licensing agreements with Microsoft.

Some tools include options allowing organizations to host and analyze their data in the cloud. For example, although Power BI can be used independently, when combined with the cloud-based Azure platform, institutions can store their data in the cloud and display analysis results in dashboards accessible via web pages.

With increasing reliance on cloud-based solutions, some data management tools are entirely cloud-based. **Qualtrics Research Core** provides data collection and statistical analysis tools fully hosted in the cloud. For many researchers, the ability to have tools managed by a trusted provider for collecting and analyzing data is a significant advantage. In addition to mitigating issues related to errors introduced when transferring responses from one tool to another, it helps ensure data security by using a single trusted platform. Similarly, for many of the same reasons, many libraries use tools like **Counting Opinions** to collect survey and performance data.

In the field of long-term data management and storage, the **CKAN project** is a data management system providing tools for publishing, sharing, and finding data. Similarly, the **Data Vault platform** is a joint project under supervisory committee auspices from the University of Manchester and the University of Edinburgh providing similar functionality.

13.6 Data Governance

In today's world, it is unacceptable to run a library or any institution on a series of unconnected and dispersed information sets (such as locally managed Microsoft Access databases). Therefore, organizations with mature data management models also have corresponding data governance models, as they are important components of effective overall data management processes, and data governance models are major factors ensuring repeatable and compatible practices are used throughout the organization.

The primary purpose of data governance is managing datasets from a holistic perspective to ensure data trustworthiness. Additionally, data governance helps ensure data within the organization meets the organization's needs rather than specific or special requirements of individual organizational units. Balancing local and organizational-level needs can be complex, but data governance models provide an agreed-upon structure that can meet multiple stakeholders' needs.

In typical data governance models, there are two main focal points: designating information quality accountability and defining how data is used and by whom. In some cases, accountability lines are clear, such as libraries being responsible for managing, maintaining, and preserving information in online public access catalogs (OPAC). However, in other areas, it may be less clear, such as in large multinational corporations where multiple accountability systems may be needed due to different local requirements. Good data governance models provide a clear framework for institutional-level data management, maintenance, and preservation, regardless of which local system the data comes from.

Implementing data governance is not simple, nor is it a fully conceptualized program. Instead, it is an incremental process organizations undertake to fully realize benefits from their datasets. A good data governance program “encourages understanding and management of data from both business and technical perspectives, plus it reinforces the importance of data as a valuable resource, enabling organizations to confidently use their data to meet regulatory and other business needs.”

Section 14: Communication, Marketing, and Outreach Strategies

14.1 Communication Models and Types

Communication occurs when an individual (sender) transmits messages to others (receivers) through verbal, written, and non-verbal means. With various communication tools, people can exchange information with colleagues, managers, users and non-users, collaborators, and funders in information organizations. Communication is successful when receivers receive exactly the information the sender intended to transmit. Although this sounds easy, many factors can affect successful information transmission.

In two-way communication, receivers should respond to senders' messages to prevent communication errors, but in many cases, receivers have no opportunity to ask senders to clarify incorrect information. Additionally, as described below, other factors may hinder correct compilation of intended messages.

One-way communication can occur in various personal and professional interactions and should be avoided in all cases. In all communication scenarios, it is well worth spending extra time discussing verbal and written communication to avoid potential errors or misunderstandings. Notably, this rule may not be followed when immediate action is required (such as in emergencies) and when instructions must be complied with.

14.2 The Value of Effective Communication: Soft Skills

Selecting and hiring candidates with the methods and interpersonal communication skills needed to support organizational goals and missions is one of the most important management responsibilities. Methods and interpersonal skills

can be acquired through academic and practical experience, but many people still have not learned effective communication skills. Lack of soft skills can negatively impact organizational success due to poor communication.

Soft skills are essential for building relationships, and information professionals should use many different methods for effective communication depending on information and target audiences. These methods include effective speaking and writing, active listening, understanding non-verbal cues, and the ability to work independently and in groups. More importantly, effective communication skills should be learned through self-study, formal courses, and continuous study of interpersonal communication courses.

14.2.1 Effective Speaking and Writing Information professionals should adhere to the gold standard of literacy, possessing solid speaking and writing skills for effective interpersonal communication, marketing, and outreach with communities and stakeholders. They need to prepare documents, teach classes, give speeches, write marketing and promotional materials, and interact with users, peers, and external groups large and small. Although public service positions require interaction with more people than technical positions, all staff still need to speak clearly and write fluently. These skills can be honed through writing courses, public speaking courses, and mentoring in effective interpersonal communication.

14.2.2 Active Listening Learning how to listen is often an informal, lifelong process. Society expects individuals to master effective communication and interaction abilities with others without formal instruction. Instructions children receive early on, such as “sit still” or “speak up,” do not accurately tell them how to act or communicate in different situations, so children’s behavior often depends on what they observe. This observation process continues throughout people’s lives as they observe others’ behavior at home, school, work, or social activities. Additionally, people need to distinguish between hearing and listening. When someone hears what others say, they may miss key points in the message due to multitasking, while effective listening skills require listeners to concentrate on messages by focusing attention or taking notes. The International Listening Association provides excellent resources for improving listening abilities.

14.2.3 Understanding Non-Verbal Cues Non-verbal cues refer to implicit messages that affect understanding of intended communication. Messages are often affected by perceivable or unperceivable non-verbal cues during sending and receiving. Examples of non-verbal cues include: body posture and movement; use of personal space; voice qualities (such as tone, speed, volume, intonation); timing of speech; personality preferences; appearance (such as clothing, hairstyle, tattoos, makeup); eye contact; smiling and nodding (for example, the meaning of nodding varies across cultures). More importantly, people should

be aware that non-verbal behavior can more strongly affect understanding of intended messages than actual spoken or written words.

Research findings indicate that non-verbal behavior accounts for 60% or more of messages sent by senders, while 40% or less of spoken words affect actual received messages. Understanding non-verbal behavior can enhance information professionals' insight to interpret and improve face-to-face communication activities.

14.2.4 Independent and Group Work Managers value employees with these soft skills and flexibility—employees who can complete projects independently according to situation and organizational needs and become effective team members. Although working alone may take less time to complete projects, working with teams has many advantages. A team's shared responsibility often leads to more complex ideas, shared workload, and satisfaction gained from partnership. Successful teams require balancing social and technical skills to build solid team structures, accepting common goals, and supporting members with rewards, training, and resources. Efficient teams also need to maintain open communication channels to prevent interpersonal conflicts caused by influencing factors mentioned later. Being a team member requires individuals to assume one of many possible roles in the team and work to maintain open communication among team members.

Managers also need other soft skills, including the ability to build solid relationships, effectively mediate conflicts, adapt to new situations and technologies, solve problems, and possess strong work ethics. For employees, it is important to understand organizational culture and organizational expectations regarding dress, personal device use, and performance.

14.3 Marketing and Outreach

Marketing, public relations (PR), and outreach are all forms of communication. In the current competitive environment, information organizations need to promote existing services and resources and demonstrate that these resources and services add value to the communities they serve. Information professionals engage in marketing and PR whenever it is necessary to provide information to targeted community groups through specific messages, services, or programs. Marketing and outreach effectiveness extends to internal and external markets, including employees, administrators, legislators, collaborators, media, and funding agencies. Through PR tools, information organizations can demonstrate their value through many channels.

Developing planning documents is the first step in marketing and promoting information organizations' resources and services. This section of the chapter introduces some planning techniques and tools needed to conduct effective communication activities.

14.3.1 Marketing Overview A solid marketing plan is built according to established goals and the organization's strategic plan (see also Chapter 19: "Strategic Planning"). Marketing should be guided by formal plans targeting specific populations, providing information to them through diverse forms, informal contacts, and community engagement. More importantly, marketing should use promotional techniques to send intended messages to new and existing target markets. Even with marketing plans to guide organizations, every employee from directors to managers must still present a positive organizational image. Every employee affects the public positively or negatively, and negative perceptions can undermine the effectiveness of otherwise flawless marketing and PR campaigns.

14.3.2 Marketing Plans Although marketing plan scope is tailored to at least one strategic plan goal, it follows the same steps as strategic planning. Information professionals can use numerous strategic planning guides and community analysis techniques. The individual (or department) responsible for overseeing the organization's marketing, PR, and outreach activities needs to be designated as the communications strategist. The following discussion focuses on promotional plans and evaluation measures to promote and document value-added resources and services available in information organizations.

14.3.3 Promotional Plans and Branding Promotional plans are very important outreach documents within marketing plans, providing various resources selected to promote the organization to various segments. The Library of Congress's "Building a Communication Plan" provides an excellent template. Although specific details of communication plans must be developed by each organization, their basic components remain the same. Basic components of communication plans include:

Media List: This list includes contact information for individuals and groups who will receive information through news media. The list aims to indicate each contact's preferred method of receiving information (such as press releases, event calendars, photos, or feature stories) and the format and timeframe for receiving information. Remember to continuously update this list.

Press Releases and Public Service Announcements (PSAs): Use press releases and PSAs to promote organizational events and send them to corresponding contacts on the media list.

Media Kit: This is a set of materials developed for special programs or services, including complete information needed for media to provide comprehensive coverage of events.

Newsletters: Print or electronic newsletters can include event calendars, news features, recommended reading materials, and/or donor lists. Although many time and cost considerations are involved in producing newsletters, if organizations decide to produce newsletters, they should treat them as marketing tools.

Promotional Materials: These are items used to promote the organization and/or its programs. Examples of promotional materials include print items (such as brochures, flyers, posters, stickers, press releases), promotional products (such as pens, cups, and bags with the organization name or logo), and social media and electronic resources (such as organizational websites, Facebook, Twitter, Instagram, electronic newsletters).

Annual Reports: Annual reports serve as unique promotional tools, presenting resources and services the organization achieved during the year in print or electronic form.

Branding: Branding is synonymous with an organization. When people hear the organization's name or see its logo or icon, branding is what they first think of. Branding should be created after organizational vision formation and requires a consistent message considering what messages are conveyed when the organization's name or logo is recognized by the public.

Elevator Pitch: This short message (45 seconds to one minute) should include information about organizational achievements, new resources, or service plans. It can be applied in impromptu meetings with potential funders or constituency members.

Social Media: Social media provides an effective communication method, but information organizations cannot actively participate in and effectively manage all social media channels. Marketing plans must select appropriate tools, focusing on segments of the community that information organizations can penetrate through social media. Organizations should conduct environmental scanning to identify community segments and determine the most popular social media channels. Environmental scanning is an analytical method that collects data about communities to assist in purpose planning. It collects information about user demographics, economic factors, and trends through organizational data, surveys, census data, scenario creation, focus groups, literature review, and consultation with managers or peers. Analyzing organizational internal and external strengths, weaknesses, opportunities, and threats through SWOT analysis is a common form of collecting the above data. The online appendix to Chapter 27 provides relevant examples of SWOT analysis from the Library of Congress. Strategic planning for marketing and PR begins with environmental scanning/community analysis. Unless information organizations regularly track and update social media, social media they use cannot serve as effective communication tools. Additionally, it is necessary to establish a social media policy that "includes how frequently your site is updated, when you check comments and replies, and what content is appropriate to post."

Section 15: Information Policy

15.1 Conceptual Elements of Information Policy Development

Although the field of information policy research is broad and multidimensional, in this section information policy is simply defined as the rules, regulations, laws, and default processes that guide and manage the information cycle (including creation, ownership, dissemination and flow, access, use, and storage). When considering this definition, two broad questions arise: - What core value issues must be considered when developing information policy? - What key issues must be addressed when developing information policy?

For example, is information accessible to everyone or only to certain specific people? Under what circumstances and how can information be obtained? At what price? What powers do government agencies have to restrict information ownership and access? Who owns information? Who decides what information to create and share, and how are these decisions made? What power inequalities result from decisions about information access and control? And to what extent can these power inequalities be accepted in a democratic society?

Decisions about information policy have profound impacts on daily life and may involve personal privacy (see Chapter 34: “Information Privacy and Cybersecurity”), intellectual freedom (see Chapter 35: “Intellectual Freedom”), and even workplace efficiency. For example, who can access people’s medical information? Who can access people’s e-book purchase records? What protective measures should be taken for information collected through online learning programs and applications? What information policies exist in people’s workplaces?

15.1.1 Values as the Basis for Policy Development Values drive the creation of information policy. Evaluating the advantages and limitations of each value in the context of freedom, security, and national capitalist economic structure provides a framework for policy analysis in democratic societies (values related to information policy development):

7. Ownership: The concept of intellectual property

15.1.2 Information Issues Driving Policy Formation Societal values are an important context for developing information policy, and specific types of issues must be addressed when developing information policy. Text Box 7.1 lists current information policy issues. Because these information policy issues are always changing, the listed issues are not exhaustive. These issues’ priorities may conflict, they may overlap, they may have political, social, and bureaucratic implications, and they may be temporary (they will no longer be issues as technology and society develop).

Text Box 7.15-1 Examples of Information Policy Issues

- Censorship and intellectual freedom
- Information ownership, disclosure, storage, confidentiality, and privacy

- Intellectual property (copyright and copyright restrictions)
- Public domain (how we ensure access to creativity)
- Social barriers to information access: including economic, cultural, generational, and educational aspects
- Telecommunications policy, broadcasting policy, and information infrastructure (such as broadband deployment, commercial ownership of television broadcasting, and network neutrality)
- Consumer information for business and privacy
- Data collection and management (including business data, personal data)
- National security and surveillance
- Computer management and computer crime
- Fee-based information services (including appropriate research)
- Universal access to information
- Media ownership and monopolies
- Healthcare information systems
- International communication policy
- Information integrity

15.1.3 Developing Policy According to Organizational Mission Just as solutions to information policy issues differ according to societal values, they also differ according to information organizations' missions and goals. Organizational missions lead to nuanced discussions of information policy. For example, public libraries may focus on the chilling effect of national legislation on reader privacy, such as the USA PATRIOT Act, which limits information privacy. Public libraries may seek to balance reader privacy protection needs with providing customized information services through social media. Academic libraries may focus more on government surveillance of faculty research while also balancing open scholarship with authors' recognition in academic tenure and review policies. Similarly, information services in corporate environments may focus on intellectual property from the perspective of protecting corporate assets and the legal use of information to gain competitive advantage.

15.2 Framework for Evaluating Policy Decisions

Ian Rowlands developed a useful framework for evaluating information policy decisions, designing a four-quadrant matrix based on conflicting aspects of information standards (as public goods and as tradable commodities) and two extremes of access (open and closed). Figure 7.5 provides examples of current information issues in each quadrant and provides decision-makers with a tool to better visualize the impact of their decisions.

Figure 7.15-1 Information Issues Matrix

Rowlands' concept of information as a public good emphasizes the view that information is a necessity for open societies. However, the matrix also shows competing priorities that limit openness to ensure personal privacy (for example, can anyone obtain my social security number?) and national security (for

example, can anyone access our government' s emergency security plans?). Information as a tradable commodity acknowledges information' s role in capitalist, knowledge societies. In such societies, potential profits from information ownership must be balanced with consumer access for continuous information discovery and quality of life improvement.

As shown in Figure 7.5, conflicts exist when weighing policy decisions from both public interest (individual rights and social equity) and private interest (ownership and economic growth) perspectives. Conflicts also exist when evaluating policy decisions from both open/unrestricted information flow (no cost, no limits) and closed/restricted information flow (fee-based, strictly limited) perspectives.

Information professionals will not always choose policies from the open/public interest quadrant. For example, information centers in business organizations, particularly those developing products or highly competitive organizations, will choose information policies that restrict information flow outside the organization and may even implement strict information flow restrictions within the organization. Considering the organization' s or society' s mission, goals, and overall values is extremely important when analyzing whether a policy is appropriate.

Another 21st-century information policy issue involving weighing two equally desirable goals is the use of electronic monitoring and encryption technologies. This can promote national security but may infringe on personal privacy without individuals' knowledge or consent. What information policy can best resolve this conflict, maximizing national security while ensuring civil liberties?

15.3 Government Policy-Making Process

Information policy is necessary at all levels of society: global, national, regional, state, local, organizational, and individual. As mentioned earlier, an organization' s mission drives its decision-making about information policy, and societal values affect how information issues are addressed. However, government agencies play a key role in information policy development. The U.S. policy-making process occurs across the government' s executive, legislative, and judicial branches. Each branch of government can play a role in the policy-making process. The policy-making process is divided into five stages, shown in Text Box 7.2.

Text Box 7.15-2 The Policy-Making Process

Once values are identified, the standard policy-making process for government and business typically includes these stages: 1. Problem identification and agenda setting 2. Policy formulation 3. Budgeting 4. Policy adoption and implementation 5. Policy evaluation

Stage 1: Problem Identification and Agenda Setting

When a social problem emerges, an agenda or broad plan for solving the problem may form within government or as officials' response to strong public demands for action. Values are the driving factors suggesting government action. This stage is considered the problem identification and agenda-setting stage in the process.

Stage 2: Policy Formulation

Next is the policy formulation stage, where solutions to problems are designed and articulated. Policy formulation typically includes broad debate based on different values and expected outcomes. To be effective, policy formulation must include compromise.

In her book *Policy Paradox: The Art of Political Decision Making*, Deborah Stone uses the metaphor of dividing a chocolate cake among students in a classroom to describe policy formulation. The cooperative goal may be to distribute cake fairly, but disagreements about this seem to emerge endlessly. In particular, there are "competing values about fair distribution." Many factors are incorporated into the decision-making process as part of value definition before policy formulation, such as whether cake should be distributed equally among students based on weight and size, or whether extenuating circumstances and pre-existing external conditions should affect the definition of "fairness." Stone identifies eight situations that may affect cake division, including whether students have already eaten some chocolate cake, whether they have a lot at home (external conditions), whether students contribute more actively to class discussions (merit), or whether a particular student may or may not receive a portion due to absence that day (welfare claims).

In the United States, this policy formulation stage typically occurs in the legislative branch but may also come from presidential executive orders or Supreme Court rulings. For example, the Freedom of Information Act (1967) was enacted by Congress and subsequently modified through various executive orders. An example of policy-making through Supreme Court ruling is the landmark 1965 case *Griswold v. Connecticut*, which declared the state's ban on contraceptives unconstitutional based on citizens' marital privacy rights. This decision had broad impact, securing Americans' constitutionally protected privacy rights.

Stage 3: Budgeting

After policy formulation, budget issues related to policy must be addressed. Remember the power of the purse. Policy implementation requires adequate funding, and the extent to which policy receives (or does not receive) funding is a powerful political tool in the policy-making process.

Stage 4: Policy Adoption and Implementation

The policy adoption stage refers to legislative passage, executive orders or new regulations taking effect, or Supreme Court rulings. This is followed by policy implementation, which, depending on the nature of the policy or ruling, is typ-

ically carried out through government agencies, individual state governments, or even local judicial departments.

Stage 5: Policy Evaluation

The final stage is evaluation, enabling decision-makers to examine policy impact and whether it remains relevant to the problem. For example, a policy may need updating or revision based on changes in public opinion, technology, or new research development, or when continued policy implementation is no longer economically feasible based on more practical cost-benefit analysis. When considering possible policy solutions to a problem, it is important to consider not only intended outcomes (for example, distributing welfare benefits to alleviate hunger) but also potential unintended consequences (for example, long-term welfare system dependence on government funding rather than self-sufficiency). Unexpected negative outcomes are often the main reason for reconsidering and revising policies.

Section 16: Information Ethics

16.1 Information Ethics: Core Concepts

Defining terms is the first step in understanding ethics. Ethics is defined as a set of principles guiding decision-making in specific environments. Ethics can be personal or shared, affecting the roots of core principles in ethical systems. Principles are also called morals, values, or beliefs, which people can instill through family, culture, and society, or choose based on personal experience and learning. When ethics are shared, such as in professional environments, their basic principles must also be shared and agreed upon with relevant personnel. Because different environments may have different areas of concern, some ethics, such as information ethics, can be adjusted for different fields.

16.2 Ethical Theories

Before studying ethics from a professional perspective, it is important to understand different theories of ethics application. Although ethical theories are diverse, this chapter focuses on three mainstream theories: utilitarianism, deontology, and care ethics.

16.2.1 Utilitarianism As defined by Henry R. West, utilitarianism is “a theory that critically evaluates whether actions, laws, institutions, and policies produce the greatest happiness.” Utilitarianism was first proposed by Jeremy Bentham and developed by John Stuart Mill, whose works popularized utilitarianism concepts. Laypeople can understand utilitarianism through dialogue between Captain Kirk and Mr. Spock in *Star Trek II: The Wrath of Khan*, when Spock tells Kirk why he must sacrifice his life in the damaged engine room: “The needs of the many outweigh the needs of the few (or the one).” If people disadvantaged by a decision are in the minority, decisions beneficial to the majority are

ethically acceptable. Critics of utilitarianism note that negative consequences can easily be justified in this ideological system.

16.2.2 Deontology The term deontology comes from the Greek word *deno*, meaning duty. It is an ethics system based on rule-following (i.e., the duty to obey rules). Immanuel Kant is considered the most prominent supporter of ethical deontological methodology. Contrary to utilitarianism, deontology focuses not on decision outcomes but on the correctness of actions taken. If rules guiding behavior depend on fundamental principles applicable to everyone, then actions are ethical regardless of outcomes. Deontology fails when all behavioral choices are correct, leaving actors in dilemmas where they must break one rule to preserve another.

16.2.3 Care Ethics Another ethical theory is care-based ethics, which can be easily summarized by the well-known Golden Rule: “Do unto others as you would have them do unto you.” Although often associated with Christianity, this creed can be found in various religious and philosophical traditions worldwide, including Confucianism, Hinduism, Islam, Judaism, Buddhism, and classical Greek and Latin texts. Therefore, it is well-founded to view it as a universal value. Additionally, “care ethics” is a feminist concept, a correction to the dominant paradigms of utilitarianism and deontology, as these methodologies represent patriarchal hegemony in modern ethical theory. Given the service orientation of the library and information profession, care-based ethical theory can be viewed as complementary to overall goals. However, like other ethical methodologies, care-based theory has flaws. When others are bad people, “do unto others” is no longer effective. Even Milton Bennett’s Platinum Rule, “treat others the way they want to be treated” (in other words, “treat people the way they want to be treated”), has been criticized because some people may want others to harm them, or they may not be capable of making appropriate decisions. Therefore, the universal applicability of care-based ethical theory is limited.

All the above ethical approaches can fail due to scenarios beyond their paradigms. Rather than focusing on the advantages and disadvantages of specific ethical approaches, it is better to understand multiple approaches to handling ethical dilemmas, because specific situations may require comprehensive consideration of various solutions to make decisions.

16.3 Professional Codes of Ethics

Having a clearly defined code of ethics is a hallmark of a true profession. In the library and information profession, there are codes of ethics that align with professions within the field. The American Library Association (ALA) first adopted the *ALA Code of Ethics* in 1939, one of the earliest codes of ethics for information professionals, establishing broad principles to “guide the work of librarians and other information service professionals.” The Society of American Archivists’

(SAA) *Code of Ethics for Archivists* and the Association of Independent Information Professionals' (AIIP) *Code of Business Ethics* cover many of the same topics but also address issues unique to their respective contexts. The International Federation of Library Associations and Institutions (IFLA) first adopted the *IFLA Code of Ethics for Librarians and Other Information Workers* in 2012. Although this code appeared later, it is the most detailed of the four examples because it must establish principles that seem self-evident in individual countries. While these documents cannot provide guidance in every situation, they can remind people of the fundamental principles of the information profession.

16.3.1 Shared Principles Across Professions When facing ethical dilemmas, the first step is to identify which principles conflict. In professional environments, shared principles must be identified and articulated. Among the four professional codes mentioned earlier, only SAA's *Code of Ethics for Archivists* is explicitly paired with a core values statement, *Core Values of Archivists*, which is essential for understanding archivists' commitment to their principles. Although the *ALA Core Values of Librarianship* was not presented simultaneously with the *ALA Code of Ethics*, it is a good starting point for a list of shared principles and serves as a framework for comparing how these principles appear in the four codes of ethics. **Table 7.3** lists these comparisons side-by-side, with detailed comparisons below:

Confidentiality and Privacy | Education and Lifelong Learning

Table 7.16-1 Shared Principles: Side-by-Side Comparison

Note: Y = Principle included, N = Principle not included. Implicit principles are included. Comparison of common principles in ALA, SAA, AIIP, and IFLA codes of ethics

Access: ALA mentions equitable access in its first article, highlighting the importance of this principle. Similarly, IFLA's code titles its first section "Access to Information" and explains why access is so important. "Access and Use" is an entire section in SAA's code, which includes acknowledging that access may be restricted based on donor agreements protecting confidential information, thereby emphasizing how competing principles can sometimes create ethical dilemmas. Although access may not apply to independent information professionals' users, AIIP's code includes "providing users with the most current, accurate information," which is similar to ensuring good information access channels.

Confidentiality/Privacy: All four codes mention confidentiality and privacy issues regarding users' information use. Like access, SAA's code specifies special responsibilities for both donor and user privacy.

Democracy: Among these codes, ALA's code states in its preamble that information professionals are in "a political system based on an informed citizenry" and notes the profession has "a special obligation to ensure the free flow of in-

formation.” Given archivists’ and independent information professionals’ special roles, and since democracy is not the only form of government in countries represented by IFLA, it is not surprising that the other three codes do not specifically mention democracy. Notably, SAA’ s core values statement explicitly mentions the relationship between democracy and archives when documenting “institutional functions, activities, and decisions” for accountability.

Diversity: IFLA’ s code is the only one that explicitly mentions diversity, stating “provide equitable services to all people in society, regardless of age, nationality, political belief, physical or mental ability, gender, wealth, education level, income, immigration and asylum status, marital status, ancestry, race, religion, or sexual orientation,” and calls for respect for linguistic minorities. Although SAA’ s code preamble states that archives “provide evidence of the entire human experience,” and ALA’ s code mentions serving “all library users,” these codes at best implicitly reference diversity. However, SAA’ s core values statement includes an entire section on diversity. AIIP’ s code does not mention diversity.

Education and Lifelong Learning: ALA’ s code Article 8 points out the importance of continuing education for professionals. IFLA lists education as one of the core missions of libraries and specifically mentions the importance of improving reading skills, teaching information literacy, and professional development. Although SAA’ s code does not mention education and lifelong learning, it is part of SAA’ s core values statement.

Intellectual Freedom: ALA’ s code explicitly states, “We uphold the principles of intellectual freedom,” while IFLA’ s code mentions the importance of “freedom of speech, freedom of expression, and freedom of access to information.” Although intellectual freedom elements such as privacy and access are mentioned above, neither SAA’ s code nor its core values statement mentions intellectual freedom. AIIP does not mention intellectual freedom.

Preservation: Not surprisingly, multiple sections of SAA’ s code and its core values statement mention the importance of preservation. ALA’ s code implies preservation is a librarian’ s responsibility when its preamble states librarians have “a special obligation to ensure the free flow of information and ideas for present and future generations.” Although IFLA’ s sections on neutrality and professionalism mention the need to advocate preservation policies, they do not discuss the purpose of preservation. AIIP’ s code does not include preservation.

Professionalism: All codes include the concept of professionalism. ALA, SAA, and IFLA call for fairness and respect when dealing with other members of the profession. AIIP gives explicit instructions on respecting library rules, rejecting projects “harmful” to the profession, and maintaining the profession’ s reputation. SAA’ s core values statement also includes a section dedicated to professionalism.

Public Good: Without some background knowledge, this core value may not be easily understood. In response to library service outsourcing and/or privatization movements, ALA’ s Core Values of Librarianship clarifies that “libraries

are an essential public good.” In this sense, apart from the connection to democracy mentioned earlier, no other code mentions this value. SAA’ s core values statement explicitly mentions public goods and social responsibility, but in the context that archives are not public goods, archives have responsibilities to the public interest.

Service: All codes except SAA emphasize service as a primary value of the profession, although SAA’ s core values statement does include a section dedicated to service.

Social Responsibility: Like the concept of public goods, understanding this concept benefits from context. ALA’ s Core Values of Librarianship states: “The broad social responsibility of the American Library Association is defined according to the contributions librarians can make to improving or solving critical social problems.” IFLA’ s code is the only one that specifically mentions social responsibility as inherent to the profession, given the importance of information services to “social, cultural, and economic well-being.” SAA’ s core values statement includes a section on social responsibility, specifically that archivists are responsible not only to employers and institutions but also have greater social responsibility for the custody of cultural archives.

Reviewing these four professional codes, their varying levels of detail clearly indicate significant differences in what principles or values they include or can be inferred. IFLA’ s code is the longest at nearly 1,600 words, using the most inclusive approach when articulating shared principles. SAA uses a relatively brief code of more than 800 words paired with a core values statement of more than 1,400 words, using a briefer code even though some core values are not reflected in the shorter code. The combined statement still does not address some issues, showing that a specialized professional statement can provide more detailed information on issues of special concern while still omitting broader areas of concern. AIIP’ s code shows a very different approach to specialized statements—it is only 187 words, the briefest of the four texts, specifically targeting concerns of that professional subset. Finally, ALA’ s code tends toward brief text, using only 380 words. In its most recent revision, it added 12 words to expand on intellectual property issues not previously discussed in this chapter because this topic was not included in any core values statement before. However, ALA, IFLA, and AIIP codes in the four codes stipulate that information professionals should respect intellectual property, with ALA and IFLA further discussing information users’ rights (IFLA, of course, in greater detail). This is an example of how codes of ethics may include principles on how information professionals should act on topics that may not be central to the profession’ s spirit but are crucial to its work. It is also an example of how codes of ethics should be adjusted and changed according to current trends.

16.4 Keeping Pace with a Changing World

As mentioned earlier, ALA first developed the *ALA Code of Ethics* in 1939. Although it has been revised three times since the *ALA Code of Ethics* was adopted to address necessary changes, might some of these values no longer be relevant? In other words, are print-based principles applicable to the digital world? The brief answer is yes, but this answer does not recognize that the world has changed, nor does it explain why these principles remain relevant.

16.4.1 Digital Content Information organizations continue to shift their collections from print/analog to digital content. Although some library users provide their own devices to access digital content, there will always be people who need to use or borrow devices provided by libraries because they do not have appropriate devices or any devices at all. Equal rights for everyone to download content are technically possible, but professional ethics codes require equal access, meaning information professionals need to bridge gaps caused by individual needs.

16.4.2 Diversity In 2012, the Diversity Counts study of the library profession indicated that minority and ethnic groups working as school librarians increased by 1% (from 11% to 12%). In response, ALA President Maureen Sullivan noted: “Although survey results show improved diversity among library staff, the [profession] clearly has a long way to go...To continue serving America’s increasingly diverse communities...libraries and the profession must reflect this diversity.” Is the profession actively recruiting underrepresented people? Can users truly feel they receive the highest level of library service when they cannot find librarians who speak their language or find materials relevant to their communities? Can users who need adaptive devices access digital content? If diversity is one of the profession’s shared principles, then information professionals must move beyond openness statements and learn how to survive. Making Equity, Diversity, and Inclusion the fourth strategic direction of ALA Strategy is a promising development that may signal commitment to action, but it is too early to judge this initiative’s success.

16.4.3 Internet Filters Since supporting the Children’s Internet Protection Act in 2003, the use of Internet filters in public and school libraries has become ubiquitous. A recent ALA study shows that information organizations tend to block content beyond what the law requires, and using Internet filters disproportionately affects library users without home Internet access. Furthermore, filters remain imperfect, blocking appropriate content while letting other information through, so concerns about information censorship persist. How should information professionals balance users’ desire to save money through e-rate discounts that require ethically compliant filters with ensuring equitable and unrestricted information access?

16.4.4 User-Created Content Information organizations have become places where users interact with and create content, not just consume it. If information organizations allow users to add their own comments to library materials' catalogs or post through libraries' social media, is deleting racist or sexist remarks censorship? Under what circumstances should organizations restrict use of 3D printers and other makerspace equipment? When does a person's hobby become a library-funded enterprise? What educational obligations do information professionals have to users regarding copyright issues for remix videos made on library equipment?

16.4.5 Privacy Many experts have declared that privacy is dead, and the continuous integration of online services and resources makes maintaining private roles increasingly difficult without completely opting out of the online world. Social media allows individuals to broadcast and document details of their lives, and many voluntarily engage in these behaviors. However, the profession continues to invest significant resources and political capital in protecting public resources. The disclosure of NSA data collection practices triggered strong public outcry, showing that not everyone takes privacy lightly. Is ALA correct to continue investing in educational efforts like "Choose Privacy Week" in resource-poor conditions? Is it correct to abandon principles adhered to since the Code of Ethics was established?

16.4.6 Service Models Article 1 of the *ALA Code of Ethics* states: "We provide the highest level of service to all library users through...equitable service policies [and] equitable access." The word "service" can be viewed in many ways. Shifting to self-service can free up staff for other projects. Some users may appreciate the sense of privacy gained from using self-checkout machines, while others worry that materials on open devices expose their personal information. All types of information organizations have increased online users, including those who never set foot in physical libraries. Do online users receive the same service level as in-person users? Or if information professionals' traditional reference desks are moved to a more centralized service center, will they provide the highest level of service to users who oppose using technology and encourage them to "talk in real time" about their questions? How do information organizations balance supporting traditional services while testing innovative ideas? When funding is tight and cuts must be made, how do information professionals evaluate services and programs?

16.4.7 Neutrality Article 7 of the *ALA Code of Ethics* states: "We distinguish between our personal convictions and professional duties and do not allow our personal beliefs to interfere with the equitable representation of institutional purposes or access to information resources." This is often interpreted to mean that information professionals must remain neutral and cannot take positions on any issues. However, although the profession aims to remain neutral about content in its collections, it is not neutral about who can access that content.

In an increasingly divided political climate, some information professionals call for restricting hate speech in their institutions, whether that means restricting user behavior or removing (or not adding) materials viewed as hateful toward others. When does selection become censorship? How can organizations support equity, diversity, and inclusion while maintaining or adding materials with conflicting values? Should racists or any other hate-inciting groups be welcomed in libraries?

For all these trends, there is a common theme: no answers are found, and more questions emerge. This is often the case with ethical dilemmas. As the preamble to the *ALA Code of Ethics* states, “The principles of this code are expressed in broad statements to guide ethical decision-making. These statements provide a framework; they cannot and do not dictate conduct to cover specific situations.” Therefore, adhering to professional codes of ethics is crucial for making correct decisions, as is knowing when to seek help.

16.5 Getting Help

Ethical dilemmas are inherently difficult to resolve. If they were easy to resolve, they would not be true dilemmas. ALA provides resources for resolving ethical dilemmas. The Office of Intellectual Freedom addresses ethical challenges for the library community. The ALA Committee on Professional Ethics first published *Interpretations of the Code of Ethics* in 2014, providing guidance on ethical issues through Q&A format interpretive statements on the Code of Ethics, covering topics such as social media, conflicts of interest, and workplace speech.

Planning ahead is the best strategy for resolving ethical dilemmas. All information professionals should understand policies and practices in their institutions and regularly review policies and procedures both to refresh their understanding and to address new developments. Professional values are at the core of these policies and procedures (such as access, privacy, balancing copyright and fair use), so open discussion of these issues can both educate new employees and remind them of what truly matters. In addition to understanding procedures and policies, scenario building is also an effective training method for resolving ethical dilemmas. Participants can be presented with scenarios that create ethical dilemmas and asked to discuss all issues before deciding how to act. Additionally, managers should keep up with issues occurring in the workplace and discuss them in regular staff meetings to assess what is working well and what could be done differently. Good practice in resolving ethical dilemmas is not necessarily a life-or-death situation.

16.6 Thinking Forward

As challenges facing information professionals continue to change and evolve, it is crucial to keep up with the latest news, updates, and resources so actions can be forward-thinking rather than merely reactive. In the field of ethics, information professionals can take many proactive approaches: - Join and participate

in local, state, regional, national, or international professional organizations. Active participation provides opportunities to learn about the latest trends facing the information profession through committee work and networking. - Attend professional conferences, webinars, and other educational training events to track the latest developments in the field and learn how peers solve common concerns within the field. Also, read blogs, articles, and books to continue learning in informal settings. - Subscribe to newsletters from organizations dedicated to work-related issues, such as ALA's Washington Office Newslines for news about government policies and legislative initiatives, or ALA's Office for Intellectual Freedom's *Intellectual Freedom News* for news about censorship, privacy, and information access. - Build and use professional networks to regularly discuss ethical issues and learn from each other's experiences.

By staying connected and current with relevant organizations, information professionals will be better equipped to advocate for their communities' right to access information and address ethical issues as they arise.

Section 17: Information Licensing

17.1 Origins of Licensing

Since 1990, a professional field for digital resource licensing has emerged as information professionals began addressing new challenges. Publishers and information agencies were accustomed to one-time acquisition of physical resources based on the first-sale doctrine. Continuous technological development presented new value in online resources, bringing new challenges to their accessibility, usability, and transferability. Business relationships had to be reset to adapt to rapid, flexible access to continuously updated content.

Increased online resource subscriptions and declining physical sales ensured access to the latest information. Since information was no longer limited to physical forms, resources were reformatted in ways that could consolidate their accessibility and usability in online environments. Dictionaries and encyclopedias became online repositories; journal articles could be accessed through numerous links in large online indexes from multiple publishers.

Legal contracts or licenses between resource providers and information agencies became the standard, with all members working to unify positions on these key issues related to online information. Specialized information agencies typically have legal teams to support them in acquiring negotiation skills to conduct negotiations with resource providers. As technology and user expectations increase, negotiation points also gradually increase.

In the late 1990s and early 2000s, information agencies and resource providers focused on usage statistics as a key tool to analyze the effectiveness and impact of resource delivery to their users. ICOLC and COUNTER created guidelines for collecting and reporting usage with standardized methods. Over time, compliance with the 1990 Americans with Disabilities Act (ADA) and other accessi-

bility issues entered discussions and negotiations between information agencies and resource providers. The full range of terms now commonly considered in resource licensing will be discussed later in this chapter.

Delivering massive online resources through flexible and user-friendly interfaces has forever changed the world of information agencies in significant ways. The model of independent agencies acquiring dispersed resources is no longer effective. User needs require information agencies to create new ways to expand access to resources. To meet these requirements, information agencies join group purchasing cooperatives to leverage purchasing power to obtain better prices and terms. Resource providers shift spending from print products to digital storage. Since large continuous production costs are no longer needed, business models now focus on resource creation costs. Ultimately, proactive business models will bring more opportunities for group purchasing.

17.2 License Terms

License documents range from short and simple to long and complex. However, four main license terms coexist in documents: use, legal, business, and technology. Through years of experience, the library and information staff community has established best practices to address major licensing issues. However, information agencies should partner with all local stakeholders to maintain knowledge of local licensing needs and negotiate with appropriate language. These stakeholders include purchasers and general counsel.

17.2.1 Use Terms License use terms specify who can use resources and what they can do with them. How many pages can be printed? Is interlibrary loan allowed? Can alumni access these resources? It is important to note that in the United States, use terms supersede national copyright law. Therefore, negotiators should be careful not to give up existing rights under copyright law, thereby limiting users' permissions to use digital resources.

Licenses always include definitions of authorized users who can use resources. Employees, cardholders, faculty, staff, and students are usually core parts of user groups. Other authorized users include broader communities, such as walk-in users or temporary users, alumni, and temporary contract researchers.

Licenses list permitted and restricted uses, establishing what can and cannot be done in resource use. If a statement indicates that uses not explicitly listed are not permitted, the information agency may give up rights normally permitted under copyright law. The table below lists key use term concepts and why they are important.

Table 7.17-1 Use Terms in Licenses

Commercial vs. Non-commercial Use | Restrictions on those for whom resources are available. Typically, users in educational institutions are restricted to non-commercial use. |

Electronic Resources and Course Management Systems | Licensed resources provide resources to students in classrooms by linking or temporarily storing in educational courseware. |

Printing and Downloading | Allows users to obtain printed or digital copies in addition to reading in browsers. The number that can be printed and the ease of printing permitted portions can be issues. |

Remote Access | Allows authorized and authenticated users not on-site to access resources. |

Resource Sharing and Interlibrary Loan | Allows libraries to share resources while complying with U.S. Copyright Act Section 108 and the CONTU Guidelines. |

Scholarly Sharing | Allows users to occasionally share permitted resources with academic colleagues who are not authorized users. |

Text and Data Mining | Allows researchers to use computer-based services to find, index, and extract authorized information and load results into their own servers. The purpose is to discover new knowledge from existing information. |

17.2.2 Legal Terms Other terms in licenses are closely related to legal matters, such as liability, warranties, and jurisdiction governing contracts. How should disputes about licenses be resolved? Under which state laws can agreements be interpreted if disputes arise? Who is responsible if natural disasters prevent parties from fulfilling obligations outlined in licenses? Sometimes these terms need to align with local or national laws. When agreements are not reached through precise language to address these issues, a negotiation strategy is to omit these terms, known as “remaining silent.” Under this strategy, if a dispute escalates, parties will resolve the conflict at that time. Table 7.5 lists legal terms that are common negotiation points and deserve special attention.

Table 7.17-2 Legal Terms in Licenses

Breach of License | Specifies how to resolve breaches by parties or end users and steps to follow if unresolved. |

Publicity | License terms are subject to state agency open records laws and freedom of information acts. Licenses need to understand agencies’ openness requirements. User confidentiality is often explicitly stipulated. |

Dispute Resolution | Steps to follow if licensors cannot resolve conflicts. |

Force Majeure | French for “act of God,” indicating events beyond human control, such as weather-related catastrophic system failures. |

Governing Law and Jurisdiction | Specifies the laws and court systems used to administer the license and resolve any related legal issues. |

Indemnification | Protection through payment for damage and loss. For example, suppliers typically indemnify licensees if third parties sue licensees for copyright violations during resource use. Many state laws prevent public agencies from indemnifying suppliers for user resource misuse. |

Warranty | Guarantees that specific facts are correct. Suppliers warrant they have rights to license all resources and that using specified resources will not

violate any copyrights. |

17.2.3 Business Terms Licenses also establish practical aspects of business relationships. What are the billing requirements and dates? Does the license include one-time purchase or annual subscription? How can an institution cancel a subscription? Under what arrangements can an institution access content after one-time purchase in the future?

The purpose of carefully negotiated business terms in licenses is to ensure all participants understand the conditions governing their relationship now and in the future. Some contracts specify end dates, some provide annual renewal unless a party decides to cancel, and others establish license conditions for permanent access rights, such as unlimited extended annual fees. Table 7.6 provides specific details on business terms.

Table 7.17-3 Business Terms in Licenses

Fees and Payment | Specifies fees to be paid, payment deadlines, and offset credits, such as those arising from significant open access resources added to licensed resources. |

Cancellation Clause | In multi-year agreements, specifies conditions under which libraries can cancel contracts, including budget cuts and dates for notifying suppliers. |

KBART (Knowledge Bases and Related Tools) | For journal resources, suppliers provide bibliographic lists with metadata complying with KBART. |

Post-Cancellation Access | Specifies acquisition types: annual lease, one-time purchase with permanent access rights, etc. |

Perpetual Access Rights | If the license is canceled, content with perpetual access rights remains accessible, including third-party archiving and rights to create/acquire local backup copies. |

Long-term Preservation | Provides long-term access to resources on a known preservation platform, including data format migration as technology develops. Also ensures resources remain accessible even if publishers or hosts cease to exist. Portico and LOCKSS are two established preservation agencies. |

Transfer Code of Practice | When journal resources transfer from one supplier to another, the original supplier is obligated to ensure access and permanent rights transfer to the new site. The Transfer Code of Practice provides guidance. |

Significant Value Reduction | If resource removal drastically reduces product value, clearly specifies remedies for licensees. |

17.2.4 Technology Terms Licenses also include terms addressing technical aspects of how online resources are provided. What are the actual hosting website and resource provider responsibilities for increasing resource availability? How do users obtain support and technical troubleshooting? Are resources available in ways accessible to all users? How is usage data collected and shared?

Can resources be linked to other services to help users discover interesting information?

Users now have high expectations for online availability, linking, and accessibility of digital resources. Table 7.7 lists key technical issues that deserve careful attention from negotiators to ensure online resources obtained meet user needs.

Table 7.17-4 Technology Terms in Licenses

Authentication Procedures | The technology refers to which users will be granted access, typically through password and/or IP address authentication. |

Disability Compliance | Suppliers can state they comply with the Americans with Disabilities Act and provide VPAT forms indicating compliance with federal standards. |

Hosting Platform, Access Requirements, and Compatibility | Establishes technical requirements for accessing content on the hosting site. |

Metadata for Discovery Systems | Suppliers will comply with OpenURL standards and provide persistent linking information for licensed resources. |

Performance Requirements and Remedies | Suppliers are obligated to make licensed resources available for indexing by discovery services used by licensees. Establishes acceptable downtime levels within a year and what remedies should be taken if suppliers do not meet this requirement. |

Usage Statistics | Suppliers provide information about available usage reports. COUNTER and SUSHI are the latest standards for data collection and reporting. |

User Support | The number of hours suppliers provide user support and expected response times. |

17.3 Business Models and Pricing Structures

One of the most critical components of a license is establishing what resources will be accessed, for what time period, by which institutions and users, and for what amount. The combination of these factors is a resource licensing business model. As digital resources, institutional needs, and budgets grow, business models and pricing structures must also change. Recently, several common business models for digital resource licensing have emerged.

While annual licensing is the most common method for a resource, there are other variants. Table 7.8 includes licensing variants and suggests when they are typically used. These variants can be applied to resources licensed through annual subscriptions or one-time purchases with permanent access rights. They also apply to licenses valid for one or several years, or for single institutions or groups. These variants do not always exist alone but can be combined into compound licenses.

Table 7.17-5 Business Models in Licenses

Title-by-title | Access to a title; typically an e-book or e-journal title. These types of licenses are usually negotiated directly with publishers at the individual

institution level. |

Database | Access to an electronic database. Can be established directly with publishers or through third parties. Relationships with individual publishers may include multiple databases covered under the same license. Publishers can bundle multiple databases together and offer more attractive pricing. |

Aggregator Database | Databases of resources from multiple publishers selected based on subjects or scope of interest to be covered. Resource access rights can vary significantly due to publisher embargoes and typically do not provide perpetual access rights or all publisher resources. |

Collection | Multiple e-books, e-journals, or other digital content from a single publisher, typically selected by subject, interest, year, or any other conditions, and sold as a single collection or database. This includes current content and archival content. |

17.3.1 Pricing Models Agreements on how to determine resource pricing are important components of digital resource licensing. Some digital resources have uniform pricing regardless of library size, type, or other attributes, but many resources are priced according to one or more attributes of the license as a whole. The most common are full-time students for academic/college/special libraries and service population size for public libraries. Prices are calculated or tiered based on actual attributes.

Table 7.9 includes commonly used attributes that are typically combined and the types of libraries/information organizations or licensing institutions usually associated with them.

Table 7.17-6 Pricing Attributes

Full-Time Students (FTE) | The number of students enrolled at a given time, usually measured annually. Can also be subsets of FTE applicable to specific schools or study programs for more specialized resources. |

Authorized Users | The number of eligible users of library or institutional resources. |

Service Population | The number of registered cardholders. |

Carnegie Classification | Institutional assignment levels based on established methods; applicable only to U.S. degree-granting institutions. |

Simultaneous Users | The number of users who can access the resource simultaneously. |

Special Users/Seats | Best suited for specialized databases and users assigned to specific users. Although this is a potential model in all types of libraries/institutions, it has largely been applied in corporate libraries. |

Budget | Particularly annual resource or operating budgets. |

Buildings/Sites | The number of buildings or locations (branch libraries or campuses) accessing the resource. |

Hospital Beds | The number of beds in hospitals. |

Faculty | The number of full-time faculty. |

Historical Payment | Current spending levels on publisher resources used as

the basis for determining prices to be paid. This attribute is the broad foundation for publishers licensing e-journal collections to many groups. Often called the “Big Deal.” |

17.3.2 Single Institution vs. Group Licensing The growth of group-based resource purchasing methods has been a hallmark of licensing development. Library groups (most commonly called consortia, but also networks or systems) are diverse. Most institutions are members of more than one group, and these groups can provide licensing options. Multi-consortium membership allows individual organizations to leverage various opportunities for group licensing. All these groups’ licensing activities aim to help organizations extend purchasing power beyond independent purchases. When making purchases, it is important not only to consider price but also to have each group negotiate all license terms before signing any agreement. The lowest-cost license terms may not meet needs in other regions for individual organizations.

Consortia can be based on geography, areas of interest, member attributes, or any other criteria that may help establish beneficial relationships for consortium members. Consortium types range from loosely connected small groups with one or two common goals and no centralized staff or resources to large, highly centralized, and well-funded groups (county and regional systems, state libraries, state education and higher education systems are prominent examples). Groups engaged in licensing are diverse, as are the ways they shape business models.

Through a consortium, each information institution can choose to license resources at lower prices regardless of what other group members decide. This method is typically called “opt-in group licensing.” Opt-in group licensing may include terms encouraging higher participation among members through better prices and terms. Another group licensing method is all-in licensing, where group members may need to make joint decisions, and if all members participate, it can provide the broadest access and best cost-effectiveness across the team. Consortia differ in their use of opt-in, all-in, and other licensing techniques. They also differ in whether licensing administration and payment are conducted directly between each library and publisher or are coordinated through the consortium.

Group licensing can also involve centralized payment by groups representing member institutions. State libraries are good examples because they can provide statewide access to certain resources. Such access may include public, K-12, and college libraries. Other consortia may also fund group licensing wholly or partially, particularly if they are affiliated with publicly supported education or higher education systems.

Section 18: Open Access

18.1 Why Open Access?

The Internet has dramatically changed how people communicate, from how they get news to how they shop, from how they connect with family to how they work. As information agencies keenly realize, it has also significantly impacted how scholars and researchers conduct and share academic and scientific research. In all fields, scholarly output is increasingly digital, requiring new online solutions to optimize individual and collective results. For researchers, the digital environment offers real opportunities to expand the global reach of their work.

This appealing and urgent possibility of expanding knowledge circulation directly led to the open access movement. This movement provides scholars and researchers with a new way to share their output, especially peer-reviewed journal articles, and provides fast, free online access to their colleagues' work anytime, anywhere. Authors, researchers, funders, academic institutions, and publishers are all actively exploring new methods to make more research results available through using the Internet.

18.2 Funding Issues in Traditional Scholarly Communication Systems

Access to information about much research conducted by scholars and scientists is a real barrier to information access. For decades, the primary mechanism for communicating research results has been publishing articles in peer-reviewed journals. Traditionally, researchers wrote articles published in journals to share their research findings. They also contributed their expertise and time to review (and often edit) colleagues' work for journals—all voluntarily and without compensation. However, when it came to accessing and reading articles (both their own and colleagues'), they almost always had to pay subscription fees or per-article charges.

The cost of accessing journal content creates enormous barriers to extensive scholarly communication. Over the past decades, the journal publishing market has undergone major consolidation, with a few large multinational publishing companies dominating the market. Journal publishing has become big business, with annual revenues from English-language scientific, technical, and medical journals totaling about \$10 billion. With increasing commercialization, journal subscription prices have also increased, with many journals costing thousands to tens of thousands of dollars annually, and prices rising rapidly. Research shows that over thirty years, journal subscription prices have exceeded inflation by more than 250%.

Information agencies representing scholars and researchers as primary journal subscribers cannot keep pace with rising costs. This has become a global issue affecting almost all information agencies. Perhaps the most striking illustration occurred in 2012, when Harvard University (arguably one of the world' s best-funded research universities) issued a notice to its faculty that shocked the

academic community. It stated (in part):

We write to convey the unsustainable situation facing Harvard Libraries. Many large journal publishers have made the scholarly communication environment financially unsustainable and academically restrictive. Harvard's annual spending on journals is now nearly \$3.75 million. Over the past six years, online resource prices from two providers have increased by about 145%, exceeding not only consumer price indices but also higher education and library price indices. These journals occupy an increasingly large share of our overall collection budget. The Library Faculty Advisory Council, representing faculty from all schools and consulting with Harvard Library leadership, concluded: We cannot sustain major journal subscriptions, particularly electronic journals published by historically primary providers: the current financial situation makes continuing subscriptions to them unsustainable.

This raises the question: If the situation is truly terrible for Harvard, how will it be for dozens of other academic and research institutions with budgets far smaller than Harvard's? How will scientists and scholars trying to conduct research on those campuses feel? Researchers readily admit that when conducting literature searches to advance their research, they often encounter abstracts of papers they believe might interest them. While reading abstracts is free, they often do not read full texts because their organizations do not pay for full-text access. For them, the usual practice is to skip directly to the next article providing full-text access. They only read articles without barriers, not all relevant articles. This has become the status quo of research, but it should be unacceptable to scholars, educators, and information professionals.

This status quo means some scientists conduct research based only on research results they could previously access, rather than based on all previous research results relevant to their research. They lack information that may be needed to compose their current research. Perhaps more damaging is that instructions they provide to students are based on information they can access, not information students may actually need.

18.3 The Digital Information Explosion Phenomenon

Although financial pressure alone is enough to stimulate information organizations to seek better solutions, the world is simultaneously experiencing another phenomenon that further intensifies the impetus for change: information explosion.

The shift to digital has occurred in almost every field and discipline. From biological sciences to physics, to anthropology to humanities, online work is increasingly conducted, and the amount of data generated by research is growing exponentially. Similarly, the number of research articles published has surged, with nearly 2 million new articles generated annually. The only way to truly understand this massive arrival of information is to find new ways to access and fully utilize these digital documents (and ideally, the data that constitutes these

articles). In today's information environment, simply eliminating economic barriers to access and enabling researchers to read articles is insufficient. With so many articles produced each year, the ability of each individual to sit down and read researchers' papers one by one to cope with this information explosion is inadequate. Scholars and researchers want to be able to find that one article among millions that may be relevant to an unrelated discipline, an article that uses techniques or methods they would not otherwise consider. They want to be able to mine digital article texts to quickly find information they want without reading entire articles. Best of all, they want to be able to access all digital literature to find semantic connections and relationships between research papers that cannot be easily seen when reading only one paper at a time. They want to be able to use new cutting-edge computational technologies (and technologies not yet imagined) to analyze digital articles and find the most relevant literature without having to read each document. They need to be able to apply the web's functionality to this information search, making computers a new "user" category and helping scholars fully unlock the value contained in the surging academic resources.

18.4 Open Access: A New Paradigm

Crisis brings opportunity. These pressures have triggered discussions about how to revolutionize the way academic research is shared, eliminate access barriers (i.e., financial, technical, and legal barriers), leverage the power of the Internet, and propose new systems that better serve scholarship and research. Simply put, the question that needs to be asked is: If we could create an ideal system from the ground up to share scientific and scholarly information, what would it look like?

This question is the driving force behind the conference that ultimately led to the concept of open access. In 2001, the Open Society Foundations (OSF) convened a small conference in Budapest. Participants represented diverse perspectives, disciplines, and geographical and geopolitical regions. The main outcome of the conference was expressing a vision for developing such an optimal system, which participants called an "open access" system. Participants summarized broad issues concisely, beginning the definition of open access movingly, in part as follows:

The old tradition and the new technology converge to make an unprecedented public good possible. The old tradition is the willingness of scientists and scholars to publish the results of their research in scholarly journals without payment, for the sake of inquiry and knowledge. The new technology is the Internet. The public good they make possible is the worldwide electronic distribution of peer-reviewed journal literature and giving it completely free and unrestricted access to it for all. Removing access barriers to this literature will accelerate research, enrich education, share wealth between rich and poor, make the literature as useful as it can be, and lay the foundation for uniting humanity in a common intellectual conversation and endeavor.

This new open access paradigm involves the immediate, free availability of scholarly articles on the public Internet and full rights to use articles in the digital environment without financial, legal, or technical barriers. The drafters of the Budapest Open Access Initiative (which celebrated its 15th anniversary in February 2017) also carefully noted that the only role copyright should play in this field is to allow authors to control the integrity of their work and to ensure their rights are properly acknowledged and cited when others reference their work in their own publications.

18.4.1 First Steps to Achieving Open Access: Building Infrastructure

Open access is a simple yet powerful concept. But can it become reality? The Budapest Open Access Initiative drafters initially envisioned two specific strategies that the scientific research and academic community could adopt immediately. Over the past decade, these two strategies have been crucial to building global infrastructure to support open scholarly communication systems.

The first strategy is establishing open digital repositories where authors can store journal articles to make them freely available to the world—commonly called “self-archiving.” When these open digital repositories comply with specific, unified interoperability standards, search engines and other tools can treat separate archives as a whole, creating a globally networked archive system where articles can be easily found and accessed. These types of interoperability standards, known as Open Archives Initiative (OAI) protocols, have been developed and adopted by many institutions, effectively promoting content sharing and dissemination. Colleges and research libraries and other institutions have adopted this strategy of open digital repositories, with more than 2,600 open repositories currently operating worldwide. In early 2017, an international agreement led by the Confederation of Open Access Repositories (COAR) and signed by representatives of repository networks worldwide was released, emphasizing the importance of repositories as vital components of global open access infrastructure, committing to closer collaboration on interoperability, standards, and globalized services in the repository field.

The second strategy involves another key part of infrastructure—establishing open access journals. For scholars and scientists to truly embrace the open access concept, they need viable, sustainable, high-quality open access journal options in which to publish articles.

Open access journals function the same as traditional subscription-access journals from editorial and peer review perspectives. However, they differ in two key aspects that eliminate previously identified barriers. First, open access journals do not use copyright to restrict access to and use of their published materials. Instead, they use open licenses (such as Creative Commons licenses) to ensure permanent access and full use of articles they publish. Second, open access journals do not charge any form of subscription or access fees. Instead, they use various other methods, such as article processing charges, to cover their pre-publication costs. Since the initial open access definition was proposed, more

than 9,000 open access journals have been established.

New business models supported by new resources continue to emerge to support these journals. On college and university campuses, libraries are using new strategies, such as shifting library funds from paying journal subscription fees to supporting open access publishing fees. University libraries have also established separate funding pools, often called campus open access funds, specifically allocating financial resources to support open access publishing models. Outside higher education institutions, foundations and government agencies funding research are developing policies that allow researchers to include open access publishing fees in research budgets and pay these publishing costs with grant funds. Although many nonprofit publishers are experimenting with new methods to support open access journal publishing, including profits from selling add-ons to basic texts, membership fees, and other revenue sources, the main current model relies on Article Processing Charges (APCs)—payments made before article publication designed to cover publishers' full costs. Although this model's use is growing in North America and Europe, there is increasing debate about whether the APC model is suitable for developing or emerging economies. This debate is particularly evident in many newly proposed initiatives that “flip” large-scale journals from subscription-based models to open access by converting library subscription fees to APC payments.

18.4.2 Other Challenges to Achieving Open Access Although these initial strategies for providing open access have provided a solid foundation for encouraging the transition to new ways of sharing scholarship, they are not sufficient. Over the past decade, it has become clear that building infrastructure alone is insufficient to drive the broad cultural change needed for researchers and institutions to fully embrace open access. More is needed.

1. Predatory Journals

With the popularity of open access journals, a new phenomenon has emerged: the appearance of predatory journal publishers. Predatory publishing refers to a series of exploitative behaviors adopted by individuals or organizations that target individual researchers through email to solicit article submissions and charge authors publication fees without providing any editorial services associated with legitimate scholarly journals, including peer review and editorial commentary. These publications are simply money-making schemes that often employ other fraudulent practices, including listing well-known scholars as editorial board members without permission, mimicking styles of established journals or publisher websites, abusing ISSNs, and fabricating impact factors.

The rapid proliferation of these predatory publications has created great confusion and uncertainty among many scholars about the legitimacy and quality of open access publications. To draw attention to this issue, librarian Jeffrey Beall from the University of Colorado Denver created a list of problematic publishers, widely known as “Beall’s List.” Although this list has recently been discontinued

and was somewhat controversial, it helped raise awareness of the issue and led the open access community to take stronger measures to address it.

These measures include a re-review of the Directory of Open Access Journals (DOAJ), auditing all of the more than 10,000 open access journals indexed to ensure they meet strict editorial and peer review standards, subsequently removing nearly 1,000 journals. Measures also include the collective creation of a resource called “Think, Check, Submit,” which provides detailed guidance to authors on how to determine whether open publications are legitimate and should be avoided. The emergence of unethical journals has made it particularly important to provide authors with information about quality, peer-reviewed open access publication options.

2. Author Rights

Unless authors choose to assign them to third parties through copyright transfer, they hold rights to their research literature, but authors are basically unaware of their rights. They are cautious about open access, not fully understanding the implications of abandoning traditional copyright transfer forms in favor of publishing articles under open licenses. They worry they are being asked to “give up” something that may be valuable to them in the future. They also do not recognize that they are actually enhancing their ability to reach new audiences, who may not only read but also cite their articles. Many authors worry about getting involved in complex legal fields.

Furthermore, although standardized open licenses have been established and widely adopted, particularly open licenses established by Creative Commons, their adoption is not yet universal. Indeed, one of the open access community’s main points of debate is the ongoing debate about establishing the Creative Commons Attribution (CC-BY) license as the gold standard for open access journals.

For open access strategies to succeed, authors need to understand their intellectual property rights and the implications of each available publishing option. While authors want to ensure that audiences who can benefit from their content can access their articles, many authors do not fully understand the value of their work, all the ways various readers can use their content, and which publishing options are best to enable each type of use.

3. Incentives for Publishing in Open Access Journals

For the status quo to truly change, scientists and scholars employed by higher education institutions must be incentivized to make their articles available through open access journals or digital repositories. As long as they worry that they will not be adequately rewarded for making their scholarship publicly available during tenure and promotion processes or in evaluations for research grant funding, they will choose to continue following traditional conventions and publish only in high-impact subscription-access journals.

Higher education institutions must collectively review their priorities and decide

to actively adopt new measures to judge the impact of researchers' contributions to their disciplines. Initiatives to measure the impact of researchers' publications should explicitly consider the added value researchers contribute when seeking open access avenues to share their work.

In the open access environment, new measures are emerging, widely known as "altmetrics" (sometimes called "metrics"), that can provide information about how frequently articles are read and cited and what types of individuals are reading and using articles. Altmetrics can also provide insights into how articles are used. These article-level altmetrics have the potential to provide a rich suite of tools to better understand research articles' utility and value. These tools can be applied to articles in open journals or open repositories.

Information agencies have played an active role in helping change this dynamic and helping authors better understand their publishing options. For example, information professionals working in university libraries can work closely with faculty to help them understand choices about how to publish articles, including how their choices affect their intellectual property rights and options for publishing content in open repositories hosted by their institutions. Research funders are also interested in ensuring broad sharing of research results and usually want researchers to share results through articles published in academic journals. However, these funders must also be educated about open access publishing opportunities so they do not impose inappropriate restrictions on access and reuse. Research institutions have explored the idea of supporting distribution of articles created by their faculty and researchers through institutional policies supported by institutional copyright policies, finding that it increases visibility of institutional knowledge output and also enhances the institution' s brand.

4. New Policy Frameworks

The final challenge involves the need to create new policy frameworks to support the transition to open access. In particular, there is ample evidence that establishing robust policy frameworks at institutional, national, and international levels to support the transition to open access is a critical requirement for ensuring successful transformation. Although an increasing number of open access strategies have been proposed and mandated, challenges remain in successfully implementing these strategies.

Over time, there has been a significant increase in broad understanding of how open access plays a key role in stimulating economic development, innovation, and competitiveness, leading to national and global efforts to develop new policies about open access. In 2005, the international Organisation for Economic Co-operation and Development examined open access issues and considered it a strategic necessity, pointing out that governments will promote innovation by expanding the scope of research results and obtaining better returns on investment in publicly funded research. By doing so, they will maximize social returns on public investment.

Both policymakers and research funders have taken this conclusion seriously. They realize these returns include accelerating the pace of new ideas and discoveries, improving education, enabling entrepreneurs to translate research results into commercial investments and jobs, and helping revolutionize the research process.

In the United States, the National Institutes of Health (NIH) established a landmark open access policy in 2008 requiring all grant recipients to make articles reporting funded research results freely available through NIH's digital repository PubMed Central. In 2013, the White House Office of Science and Technology Policy issued an executive directive requiring two other federal agencies to develop plans to implement policies similar to NIH's.

Policy adoption is global, with new policies emerging from the UK to the EU, from Argentina to South Africa. Perhaps no one has articulated the driving force behind this policy adoption more clearly than Neelie Kroes, European Commission Digital Agenda Commissioner, who successfully led the call to require all research funded by the European Commission to be available under open access conditions. In 2012, she noted:

Open access to research results (including publications and research data) is not a luxury; Europe must have it to compete internationally. In higher education and research, access to knowledge, information, and data is essential and must be used as the foundation for knowledge transfer and knowledge generation.

Because of this growing understanding, national policies ensuring open access to research literature are proliferating, with more than 100 research funders and governments worldwide issuing policies.

These national policies are crucial, but the development of institutional or campus-wide open access policies also plays an important role. Many institutions have realized the advantages of retaining digital assets generated by research and are developing policies to ensure research articles, data, and educational resources generated locally are deposited in campus repositories. Information agencies have played a key role in advocating for these policies and providing continuous professional expertise and support to ensure their successful implementation. However, for open access to become the norm, broader adoption and unified implementation of these policies are needed.

Section 19: Information Privacy and Cybersecurity

19.1 Definitions

Before further discussing information privacy and cybersecurity, we need to define some key terms.

19.1.1 Information Privacy Information privacy focuses on “the right of individuals and organizations to control the collection and sharing of their personal information without consent.” Failure to protect information privacy can

affect the daily lives of individuals whose information is stolen or leaked, damage their professional reputations, and hinder our free exercise of civil liberties. Protecting information privacy requires implementing physical and virtual security measures.

19.1.2 Information Security Information security refers to protecting data in any form from unauthorized access, disclosure, alteration, or destruction. This protection includes assessing and monitoring threats and risks to data, as well as developing policies, procedures, and controls to maintain data confidentiality, integrity, and availability. We can easily see how information privacy and information security work together.

19.1.3 Cybersecurity Cybersecurity is a form of information security. The U.S. Department of Homeland Security defines cybersecurity as “the activities or processes, capabilities, or state in which information and communications systems and the information they contain are protected and/or defended against damage, unauthorized use, modification, or exploitation.” Cybersecurity can be considered information security in online environments. The practice of cybersecurity is essential to ensuring information privacy in online environments.

19.2 The Right to Information Privacy

Information privacy issues exist in a wide range of information environments, including libraries, government agencies, hospitals, corporations, higher education institutions, and any environment that collects personal data. Individuals in most parts of the world, including the United States, Canada, and the European Union, have privacy rights and expect their privacy rights to be protected when they provide or seek information in information environments and when they use websites that claim to have privacy policies and security. Everyone needs the freedom to seek and share information and ideas without censorship or other negative consequences. Information professionals are responsible for managing information and benefit from understanding laws affecting personal data collection, use, and storage.

Although the word “privacy” does not appear in the U.S. Constitution, language in the Bill of Rights reflects concern for protecting privacy. Amendments I, IV, V, and XIV address various aspects of privacy. In 1890, Samuel Warren and Louis Brandeis defined the right to privacy as “the right to be let alone” in their groundbreaking paper *The Right to Privacy*. Brandeis, who later became a U.S. Supreme Court Justice, affirmed this definition of privacy in the context of government action in his dissent in *Olmstead v. United States*.

19.3 Information Privacy Protection in the United States

In the United States, information privacy rights are protected through a combination of legislation, regulation, and self-regulation. These protections mostly

focus on specific industries or business sectors. This approach to privacy protection is called the sectoral approach. Some federal laws provide protection for different sectors of information privacy, including children's online activities, as well as educational records, financial records, health information, and records containing personally identifiable information (PII) maintained by the federal government.

Some federal agencies assist in protecting privacy rights by exercising privacy-related regulatory functions, including the Federal Trade Commission (FTC) and the Federal Communications Commission (FCC). Some agencies participate in developing federal privacy policy, including the U.S. Department of Commerce, the U.S. Office of Management and Budget, and the U.S. Department of Justice. Other agencies, such as the Department of Health and Human Services Office for Civil Rights, have authority to enforce actions. The private sector also provides privacy guidance to association or group members through self-regulation.

19.4 Federal Laws Protecting Information Privacy

Information professionals work in various settings and manage a range of information types, often including personal data. The information they manage, the clients they serve, and their activities related to data collection and sharing may be governed by federal laws protecting information privacy. The following discussion introduces important U.S. laws protecting information privacy.

19.4.1 Children's Online Privacy Protection Act (COPPA) of 1998

COPPA is a federal law designed to protect the online information privacy of children under 13. It regulates the collection and use of information provided by children under 13 to commercial website operators. The law applies to operators of commercial websites and online services such as mobile apps. The act applies to websites not specifically targeted at children but that have "actual knowledge" that information they collect comes from children under 13, as well as some "websites or online services" that have actual knowledge that they collect personal information directly from users of another website or online service directed at children. Website operators subject to COPPA must comply with rules for collecting and notifying users about collecting personal data.

19.4.2 Family Educational Rights and Privacy Act (FERPA) and Protection of Pupil Rights Amendment (PPRA)

Information professionals working in educational environments or accessing educational records should understand privacy protections provided by the Family Educational Rights and Privacy Act. FERPA limits disclosure of educational record information without student consent. Disclosure without written consent is generally only permitted for legitimate educational purposes, health and safety emergencies, and to state and local authorities permitted to disclose records under state regulations. Directory information may be released without consent if students or parents of

students under 18 are notified in advance and given a reasonable time to request nondisclosure.

The Protection of Pupil Rights Amendment amended the Pupil Rights Protection Act in 1978. PPRA applies to educational programs receiving U.S. Department of Education funding. Under PPRA, written consent from parents of minor children must be obtained before children can participate in surveys, analyses, or evaluations seeking information about sensitive topics. The 2001 No Child Left Behind Act expanded PPRA protections, restricting collection and disclosure of sensitive information in federally funded primary and secondary schools. These schools must develop policies about collection and disclosure, allow parents to inspect surveys, provide notice of survey activities, and allow parents to refuse sharing student information for commercial purposes.

19.4.3 Gramm-Leach-Bliley Act and Fair Credit Reporting Act The 1999 Gramm-Leach-Bliley Act applies to private financial records. It requires financial institutions to protect consumer information they collect. Financial institutions must also notify customers about their information-sharing practices. The Fair Credit Reporting Act (FCRA) is another consumer protection law. Enacted in 1970, it ensures consumer reporting agencies adopt reasonable credit reporting procedures and enables consumers to access and correct personal information in credit reports. Under FCRA, consumer credit report use is limited to certain “permissible purposes,” such as employment, consumer insurance underwriting, or other legitimate business needs. The Fair and Accurate Credit Transactions Act (FACT Act) of 2003 amended FCRA: “The FACT Act requires the three major credit reporting agencies to provide consumers with a free copy of their credit report every 12 months,” and allows individuals who may be victims of credit fraud to place alerts in these files.

19.4.4 Health Insurance Portability and Accountability Act (HIPAA) The Health Insurance Portability and Accountability Act of 1996 was enacted to protect health information. HIPAA’s “Privacy Rule” addresses how health information can be used and disclosed. Its function is to balance privacy with the need to transmit health information. Under HIPAA, all individually identifiable health information is considered “Protected Health Information” (PHI). HIPAA includes a Security Rule that mandates PHI must be protected and contains a “breach notification” requirement that notifications be sent to individuals whose PHI has been breached. Information professionals seeking positions in health-related environments will benefit from reviewing HIPAA’s privacy and security requirements.

19.4.5 The Privacy Act The Privacy Act of 1974 regulates the U.S. government’s collection, use, and disclosure of personal information recorded in record systems that allow searching and retrieving data using personal identifiers (such as personal names or social security numbers). It gives individuals

the right to review information about themselves and to amend or correct inaccurate information. Under the Privacy Act, individuals are defined as “U.S. citizens or lawfully admitted permanent resident aliens.” Although the Privacy Act does not extend protection to visitors or foreigners, Department of Homeland Security (DHS) policy extends Privacy Act protections to mixed systems (containing records on individuals covered by the Privacy Act and non-U.S. individuals). This policy gives non-U.S. individuals rights to access personally identifiable information and amend their records, but not exemptions under the Privacy Act, although the policy does not expand or create rights to judicial review. The practice of extending Privacy Act protections to non-U.S. individuals’ records in mixed systems appears to have ended. On January 25, 2017, President Trump signed an executive order requiring federal agencies to “exclude non-U.S. citizens or lawfully permanent resident aliens from protections under the Privacy Act regarding personally identifiable information to the extent permitted by applicable law.”

19.4.6 Judicial Redress Act The U.S. Congress passed the Judicial Redress Act (JRA) in 2015, granting some non-U.S. individuals limited Privacy Act protections. JRA extends certain judicial remedy rights under the Privacy Act to citizens of most European Union countries. These protections apply to information shared with the U.S. government from designated countries for law enforcement purposes. JRA allows those covered by the act to sue for intentional or willful unlawful disclosure of covered records and improper denial of access to or amendment of Privacy Act-covered content in the same manner and to the same extent as U.S. citizens or permanent resident aliens.

19.5 Cybersecurity and Threats to Data Protection

“Information professionals can play an important role in supporting cybersecurity efforts and educating others about information security.” As our dependence on the Internet continues to grow, the importance of cybersecurity continues to increase. The number of people conducting daily activities online, including shopping, banking, remote work, scheduling appointments, and filling out online forms requiring personal data, continues to increase.

The increasing use of the Internet has brought growing dangers related to cybercrime, including phishing attacks, viruses, malware, and more. Media reports of successful cyber attacks continue to increase, and their complexity is gradually increasing.

Given these online dangers, it is imperative to practice cybersecurity and educate others about threats to personal data and the need to practice online security. Individuals need training to understand the dangers of clicking unknown links and attachments in emails and downloading programs and suspicious content from the web. Users need to be aware of the dangers of providing too much information on social media sites and the security threats posed by malware and hackers that can damage entire organizations and put proprietary/business

confidential information and personal data at risk. Information professionals can play an important role in supporting cybersecurity efforts and introducing others to information security.

19.6 Government Cybersecurity Initiatives

Recognizing the importance of information security to economic and national security interests, the U.S. government enacted the Federal Information Security Management Act (FISMA) in 2002. FISMA, Title III of the E-Government Act, requires federal agencies to develop and implement agency-wide information security programs to protect information and information systems that support agency “operations and assets.” FISMA applies to agencies’ own operations and assets as well as operations and assets provided by another agency, contractor, or other source. FISMA was one of the federal government’s earliest cybersecurity initiatives.

19.6.1 Framework for Improving Critical Infrastructure Cybersecurity In February 2013, President Obama issued Executive Order 13636, “Improving Critical Infrastructure Cybersecurity.” The order directed the National Institute of Standards and Technology (NIST) to work with stakeholders, including those from private enterprise, to create a voluntary framework to reduce cyber risks to U.S. critical infrastructure. In February 2014, NIST released the initial version of the Framework for Improving Critical Infrastructure Cybersecurity. The framework represents collaboration between government and industry. It is based on existing standards, guidelines, and practices, as well as input from professionals in security and privacy communities.

Although not mandatory, the framework includes methods organizations should “consider how their cybersecurity program might incorporate privacy principles.” These measures include those consistent with Fair Information Practice Principles discussed earlier. The framework helps organizations assess and improve their cybersecurity programs.

Information privacy and security professionals have begun using the framework to assess and improve their cybersecurity programs.

19.6.2 Big Data Concerns In May 2014, the President’s Office released a report describing findings from a 90-day review of big data and privacy. This study focused on how the private sector, academia, and government use big data. As part of the study, the government solicited public opinions on these issues through a survey. Findings showed that among 24,092 respondents, most had strong reactions to data use and collection practices. They were particularly concerned about data storage and use; transparency of data use; legal standards and oversight; and collection of video, audio, and telecommunications data.

Based on their analysis of findings, the government concluded that “respondents were most concerned about how intelligence and law enforcement agencies col-

lect and use data about them, especially when they know little about these practices.” The report highlighted the potential benefits of big data analysis while acknowledging concerns about data protection in online environments.

One issue is that data brokers are unregulated, and their consumer profiles may contain factual and inferred information. This information may be collected without individuals’ knowledge or consent and may be used in discriminatory ways. There is also no consensus on “do not track” policies, leaving online users unaware of what to expect when they ask not to be tracked.

Report findings indicate the need to address issues related to big data and privacy.

19.7 Basic Measures to Help Ensure Information Privacy and Security

Organizations can take basic measures to help ensure information privacy and security, such as tracking and evaluating how an organization collects, uses, stores, shares, secures, and processes data; conducting privacy audits; and providing training for employees. Documenting these data practices through policies provided to customers or users demonstrates transparency and emphasizes the organization’ s commitment to information privacy and security.

19.7.1 Privacy and Security Policies “A well-written privacy policy explains what information is being collected, how it is used, and with whom it can be shared. It should be easy to understand and easily accessible.” Every organization that collects personal information should provide its privacy policy to customers or users. The policy should document the organization’ s data practices, including security measures, and assure users that the organization takes privacy seriously. A well-written privacy policy explains what information is being collected, how it is used, and with whom it can be shared. It should be easy to understand and easily accessible.

Documenting and following privacy policies helps build good customer relationships and sends a message to regulatory agencies that information privacy is an organizational priority. Businesses often have multiple privacy and security policies for various reasons, including multiple locations, websites, and different services. Some privacy policies are internal, guiding work within the company, while others are designed to communicate information to internal and external audiences. Employees must understand and support all policies shared with customers and other external parties. External policies and internal procedures must be consistent. Privacy programs should cover all privacy practices and measures across the organization to ensure privacy.

19.7.2 Tracking and Evaluating Data Collection, Use, Risk, and Security Tracking and evaluating how an organization collects, uses, stores, shares, secures, and processes data is a necessary initial step in planning privacy policies. Employees from all departments must participate in this process to help

identify where data resides and how it is used. Information collections should also be clearly identified and inventoried, and their sensitivity levels need to be determined. Security measures should be implemented according to risk levels and information sensitivity.

19.7.3 Privacy Audits Conducting privacy audits, or assessing how an organization manages privacy risks, is necessary to obtain baseline evaluations of how organizations protect personal data. Privacy audits require reviewing all privacy-related documentation, including privacy policies, procedures, and checklists. Data flows and data processing practices through the organization will be assessed. Audits may also focus on compliance and check adherence to privacy policies and procedures. Privacy audits can identify areas needing improvement and identify gaps in security or compliance.

19.7.4 Training All employees should receive privacy training upon hiring and at least annually thereafter. Everyone working in the organization needs to receive a copy of privacy policies. In addition to ongoing privacy training, employees must be responsible for implementing the organization's privacy policies and procedures. Regular specialized training sessions focusing on work in various departments and implementing accountability measures can help ensure privacy remains a high priority.

19.8 The Role of Information Professionals

How can information professionals play a greater role in information governance and security? "The role of information professionals is to develop policies, ensure information privacy, and educate others. They should also seek to participate in decision-making and implementation of information privacy and cybersecurity efforts." Information professionals can take leadership roles in information privacy education and management and assist with cybersecurity efforts to ensure privacy rights. They are on the front lines of addressing information privacy and security issues. By educating themselves and others, information professionals can improve privacy and security decision-making and the protective measures organizations establish for collected PII. Information professionals can provide basic understanding of vulnerabilities and measures that can be taken to protect online users, preparing clients and colleagues for threats they will encounter on the web. The role of information professionals is to develop policies, ensure information privacy, and educate others. They should seek to participate in decision-making and implementation of information privacy and cybersecurity efforts. Demonstrating knowledge and showing interest in privacy and security discussions can position information professionals to develop privacy policies and impart professional values. They can apply their expertise in managing information to identify and understand information privacy issues, apply Fair Information Practice Principles, create privacy policies, manage privacy programs, and guide others in privacy knowledge training.

Self-education and raising awareness about information privacy and security create opportunities to demonstrate knowledge, develop policies, and advance careers. There are many opportunities to build information privacy awareness cultures. Information professionals can raise information privacy awareness through various means, including intranet postings, creating informative posters to raise awareness among staff and users, hosting brown-bag lectures on current information privacy or security issues and core concepts, revising privacy notices, and sharing best practices with management and executives.

The privacy and security field continues to grow, and skilled professionals are expected to be in short supply. Acquiring privacy expertise can increase professionals' value, income, and leadership opportunities. There are several pathways to seek privacy education, including the International Association of Privacy Professionals (IAPP), which provides information privacy news, networking opportunities, resources, webinars, and courses for those seeking professional certification in information privacy. IAPP also has an extensive network of knowledgeable members who can mentor others seeking to increase their information privacy knowledge.

Subscribing to information privacy and security news feeds, listservs, and groups can increase baseline knowledge and provide understanding of current issues in the field. Some useful sites information professionals may want to reference include: National Cyber Security Alliance, Electronic Frontier Foundation (EFF), Electronic Privacy Information Center (EPIC), and Center for Democracy & Technology. There are many informative LinkedIn groups that new information privacy professionals can join, including International Association of Privacy Professionals; Privacy Professionals; Cyber Security, Law, Policy & Technology; Cyber Privacy Risk Advisors; and Privacy & Data Security. If information professionals wish to establish themselves as information privacy experts, they should consider obtaining privacy certifications through IAPP.

Section 1: Rereading the Five Laws of Library Science

1.1 Background

When S.R. Ranganathan proposed the “Five Laws of Library Science,” he provided a comprehensive framework and guidelines for evaluating library programs, library activities, and developing library policies and strategies. These laws have proven to be widely quoted even more than eighty years after their publication. In fact, some have even attempted to reformulate these laws to adapt to the current environment constituted by the Internet, electronic resources, multimedia resources, and the resulting information services. Even when these laws were formulated, books were not the only resources—magazines, newspapers, short films, audio recordings, and even micro-videos were already in use.

Like Melvil Dewey, Ranganathan lived in an era of information scarcity. Preservation of library collections was the primary concern of the library profession. “Books are for use” was a driving force, and Dewey’ s classification system was

essentially designed to help library users understand how to access materials. Today, books still occupy a place in our spiritual culture, whether read on paper or computer screens. Our focus has never been on the medium. The difference is that the concepts of “books” and “readers” have expanded and become increasingly complex. Applying Ranganathan’s laws to the present reveals differences between the era in which Dewey and Ranganathan worked and today’s information environment (see Table 8.1). We have moved from an era of content scarcity to one of incredible richness and diversity, created by numerous channels and contributors. These differences are key to changing interpretations of the five laws.

Table 8.1-1 Ranganathan’s Five Laws: Original and New Concepts

Ranganathan’s Original Five Laws	New Concepts in Current Environment
Books are for use	E-books are for reading Netflix is for watching Blackboard is for learning
Every reader his book	Every listener his iTunes
Every book its reader	Every blog its reader Every painter his Photoshop Every Google Maps its user Every student his EasyBib Every digital repository its user
Save the time of the reader	Save the time of the listener Save the time of the traveler Save the time of the researcher
A library is a growing organism	

Interestingly, the fifth law, “A library is a growing organism,” has not changed. Because librarians facilitate more content to promote individual discovery, access, and sharing, libraries are growing. Libraries should provide access not only to external content but also to academic content. Librarians have moved beyond library doors to bring relevant content to user communities and enable the outside world to access content created by user communities.

1.2 The First Law: Save the Time of the Reader

Ranganathan once predicted that once the requirements of the first three laws were met, the fourth law, “Save the time of the reader,” would become more important. Because numerous information service providers offer massive amounts of content, lack of time has become the most urgent problem people face in today’s world. “Save the time of the reader” has become the most important of Ranganathan’s five laws and should serve as a supplement to interpreting the other laws. Recent research shows that in a changing environment, saving time and convenience have become very important to today’s information seekers. As libraries begin to operate alongside other information service providers

(such as Google, Amazon, and Facebook), how people experience library services, especially online services, has become more important. Here we focus on three aspects of time: - Time simply as time, measuring the time users need to achieve desired results - Time as convenience, or the effect-based value users derive from their library experience - Time as a substitute for the entire service system, transcending the actual quality of content, materials, and resources

1.3 The Second Law: Every Reader His Book

Over the past eighty years, technological evolution has affected our world and our libraries. Reshaping the information landscape, nevertheless, the basic principles of Ranganathan's second law have penetrated today's world deeply. He believed that library collections should be based on individual needs, accompanied by professional, knowledgeable librarians ready to guide, direct, and assist information seekers when they seek information. Applying Ranganathan's second law to today's digital, networked world, what would it look like? In this world, the relationship between libraries and users, materials, and programs is very different from the past. Rubin interprets this law as: first, librarians should have primary literature about those they serve; second, collections should match the community's special interests. "Every person" means libraries should serve everyone in the community; "his or her book" refers to content. "Every reader his book" is a daunting task requiring understanding community users' information needs and preferences and anticipating and matching what they will need in the future. Our restatement of this law now is: Know your community and its needs. Interpretation of this law has shifted from demands for physical materials and digital content to growing needs by different users for new skills, new services, and new collaborations. For example, these needs may be data management, device support, and media expertise. Expanding programs and services to meet these new needs will maximize library impact.

To meet the requirements of the second law, today's librarians should become part of the communities they serve and better understand the library's community and its needs. This involves four main tasks: - Traditional outreach: Enables librarians to grasp what is happening now - User research: Provides librarians with systematic approaches to answer specific questions, such as what services are used and what are not - Building cooperative relationships with users (also called embedded librarianship) helps librarians gain deep understanding of user needs - Running analytics: The ability to provide forward-looking decision-making based on historical data from multiple different data sources

Ranganathan's second law is clearly applicable today and will expand its role in the new digital environment in which libraries operate. "Every reader his book" now means knowing your community and its needs, reinterpreting libraries' new services and librarians' new skills. This remains key practice today. Knowing your community and its needs is a crucial step in developing these new programs. Moving forward in new directions will help libraries maintain their transformative position, which is central to our shared future, just as it has been central

to our shared past. The needs of the 21st century require librarians to serve the public good, develop new habits and ways of thinking, and continue playing the traditional roles they have played. It is imperative to expand and extend libraries' presence in communities by providing new services needed by constantly changing user groups.

Moving from “Every reader his book” to knowing your community and its needs, and through leadership, collaboration, and a range of supporting services can bring great value to our communities.

1.4 The Third Law: Books Are for Use

The third law emphasizes the importance of preservation for use, meaning that all library procedures and actions, as well as library staff attitudes and behaviors, should achieve this goal. However, many facilities considered novel in Ranganathan's time are now common and taken for granted. Librarians working in today's increasingly complex information and technology infrastructure must provide proactive, reliable services, and must connect not only with users in physical libraries but also with users on the Internet, so current and future users know how to reach the library and what resources are available beyond books. The simple phrase “Books are for use” has sparked much scholarly discussion about what Ranganathan truly meant when he proposed it in 1931 and its contemporary significance. Some emphasize librarians' service roles; others emphasize the evolution of new resource formats and delivery mechanisms. Today, our interpretation of this law is: Develop the physical and technical infrastructure needed to provide physical and digital materials, because it is not just about the availability of physical and digital materials but more importantly about the physical and technical infrastructure that enables libraries to capture and deliver these materials. As librarians continuously build infrastructure, it is important to build user awareness of these changes and maintain their trust. Although libraries enjoy great institutional reputations within the communities they serve, this does not necessarily mean library usage will increase. Librarians need to consider the following suggestions: - Increase personal-level trust through face-to-face work - Understand and internalize users' interests - Increase visibility of library work - Leverage libraries' social influence

1.5 The Fourth Law: Every Book Its Reader

As the previous law states “Every reader his book,” the corresponding principle is that every reader has his book. “Every book” essentially means that everyone everywhere will have access to useful communication materials. Discussions and selection criteria about what literature libraries should store and provide are rampant and controversial. Ranganathan believed librarians could not reduce the content available to users.

In today's complex information environment, many people use powerful new tools to discover, access, and use information, with information resources pro-

vided to users on a massive scale. Today, every user is no longer just a reader but a judge, commentator, (dissemination) channel, content creator, and even a librarian. “Every book” no longer means “every book in the library” but applies to content in various forms and media. Libraries have begun adapting to a large number of new workflows and are finding new ways to support this law, methods that both align with Ranganathan’s original intent and fit the new environment.

1.6 The Fifth Law: A Library Is a Growing Organism

The four elements libraries focus on in today’s environment are: collections, librarians, infrastructure, and users. Based on current and potential user needs and behaviors, libraries need to continuously develop and expand the meaning of “growth” in today’s highly connected, competitive information environment. Rereading Ranganathan’s Five Laws of Library Science, in the new information environment, libraries need to focus on three key aspects: - **Relevance:** Librarians should leverage advantages of non-library services, knowing which users have already incorporated them into their workflows, to influence or attempt to change their choices and practices. Understanding differences and user preferences provides good clues for how to improve library services. Librarians should ensure they regularly research users’ actual usage of services. - **Presence:** Librarians should measure user awareness of library services by tracking clicks or page views on websites and conducting impact surveys and interviews. - **Unique Functions:** Librarians need a set of unique skills that can be applied to various services, which they must demonstrate through instruction, consultation, and collaboration. Being user-friendly is important because it translates into positive experiences. For librarians, it is important to incorporate basic user service metrics into library “growth.”

If Ranganathan’s law that a library is a growing organism is true, we need to understand what “growth” means. How do we measure what is invisible in user retrieval in an environment where “convenience is king”? We suggest that librarians consider increasing attention. Perhaps librarians’ development in other areas should also be considered. We encourage professional discussion and suggest additional career development. Because one thing is certain: If we do not know how library users grow and succeed in their lives and learning, we will not know whether our results are positive or negative. Our interpretation and reinterpretation of Ranganathan’s Five Laws of Library Science are shown in Table 8.2.

Table 8.1-2 Interpretation and Reinterpretation of the Five Laws

Ranganathan’s Original Vision	Our Interpretation and Reassembly
Save the time of the reader	Embed library systems and services into users’ existing workflows

Ranganathan' s Original Vision	Our Interpretation and Reassembly
Every reader his book Books are for use	Know your community and its needs Develop technical infrastructure for digital materials
Every book its reader	Increase discoverability, access, and use of resources in users' existing workflows
A library is a growing organism	

Ranganathan' s Five Laws of Library Science have greatly influenced our view of libraries and librarians' work. The five laws provide a framework for our research activity areas and also provide a perspective for re-examining the information environment. The purpose of this section is to help interpret the five laws in the context of currently available resources and services and related user behaviors. To illustrate how libraries and librarians can better connect with these behaviors. Our goal is to place research directions in an environment relevant to librarians, library researchers, and information scientists, making changes in practice and developing plans for future research.

Section 2: Changes in the Information Environment and User Information Needs

2.1 Challenges in Information User and Service Research

2.1.1 Changes in the Information Environment 1. Changes in Scholarly Communication Models

In the past, after producing, manufacturing, or writing new knowledge 成果, knowledge producers protected their 成果 through relatively closed methods such as publishing, patent applications, or trademark registration. With the development and popularization of information technology, the overall trend in global academic communication models and strategies is moving toward open access.

From a corporate development strategy perspective, open dissemination of knowledge 成果 helps establish new industry standards. From an individual research perspective, open publishing allows broader users to use knowledge 成果, promoting knowledge producers to become authorities in their fields. From national and socio-economic perspectives, governments or national research funding currently prefer open strategies. There are two strategies: The first is intellectual property ownership control strategy, mainly using literature, patents, software copyrights, etc., to give creators financial and reputational returns as incentives for scientific innovation. The second is open sharing initiative control strategy, mainly through open access to scientific papers, open sharing of scientific data, open-source release of research tools, crowdfunding and crowdsourcing of funding and personnel, etc., enabling creators to quickly

expand influence and publicity to have more followers, participants, and funding, thereby incentivizing scientific innovation.

Open access to academic papers as a carrier of 成果 has two main forms during the open access process: 1. **Gold OA**—immediately free to everyone upon publication 2. **Institutional repositories**—still follow traditional publishing models, but content must be deposited in the author's institutional repository (such as their university, research institute, or department). Different institutional repositories typically require that within one year after publication, content must be open access, giving everyone access capability.

Current core issues in open access publishing include usage issues, rights friction, and comparisons of systems or services.

Specific questions include: - Are commercial repositories better or institutional repositories better? - Should institutional repositories be used for management or analysis? - If national policy guides open access, how should traditional commercial repositories transform to support? - How should commercial repositories interface with institutional repositories? - For users, how to use and choose content from relatively dispersed institutional repositories?

2. Open Science

Open science needs to make full use of existing big data sharing platforms and measures, promote more researchers to engage in scientific data management plans and scientific data sharing, combine data science and citizen science, etc., to create new knowledge and scientific research value for the socio-economy. The foundation of open science is open access to scientific papers and open sharing of scientific data, so in addition to the academic papers discussed above, scientific data is also worth discussing. In addition to research papers and data, open science also includes software, code, communities, crowdfunding and crowdsourcing, citizen science, data scientists, etc., with connotations and extensions constantly changing.

(1) Changes in Scientific Research Forms in Open Science

Traditionally, authors deliver papers or research products to publishers. If authors want to obtain high-level research 成果, they still need to purchase access. If they have no money to purchase or their institution cannot purchase, they cannot view the content, creating class distinctions in academia, forming barriers between intellectuals and ordinary citizens, creating knowledge gaps—areas that information user service research can explore.

After open science emerged, research forms changed. First, the appearance of preprint platforms or open peer review mechanisms allows authors to post paper “drafts” on platforms for all readers to comment on, then attract good journals to solicit contributions, turning manuscripts into formal publications. This both protects priority in paper publication and allows readers to know authors' new ideas and progress in a timely manner for rapid knowledge dissemination, aligning with open strategies. However, this process does not go through relatively

rigorous peer review mechanisms. Second, peer review mechanisms traditionally mostly used double-blind review, where submissions are reviewed by experts anonymously. Now there is a method that allows papers to be discussed publicly. This form requires public rules and methods, and there are still many issues requiring consensus, such as: Who is qualified to review? Is the review accurate (this is a metrology issue)? If such reviews are successful, should there be reasonable evaluation and reward mechanisms for those who contribute labor (this is another topic)?

The development trends of open access, open data, and open science, and changes in research models are not just specific tool technology upgrades or replacements but are adaptations to science and technology policies and management mechanisms in the evolution of global political and economic situations.

(2) Transformation of Research Mechanisms

When discussing the transformation of research evaluation mechanisms and research publishing mechanisms, the research mechanisms of scientists are also changing.

1. **Changes in research tools:** The emergence of open-source research communities has led researchers to shift from choosing commercial software packages to open-source software for new research technology development. Therefore, the latest research tools can be obtained in open-source research communities. Similarly, some commercial organizations are also trying to enter open-source communities, and open-source communities are willing to crack commercial organizations' methods and content for more people to use.
2. **Changes in knowledge transmission:** In this exchange process, knowledge transmission has also changed. In the past, knowledge transmission and teaching were more often one-on-one in classrooms or laboratories. Now there are free or paid courses online, as well as open topics such as various innovation competitions provided by institutions.
3. **Changes in communication mechanisms:** Communication mechanisms are no longer just email exchanges; often they aggregate relevant scholars' content through transmission or online communities. This allows relevant papers and data to be presented directly to readers, and enables researchers to know what experts in their fields are doing before forming complete academic papers. This communication mechanism, with continuous evolution and extension of tools, has formed various paradigms different from the past, directly presented in Innovation 101.

Table 8.2-1 Digitalization, Opening, and Community Development of Research Models (Compiled based on Innovation 101 related materials)

2. Changes in User Needs

The trends of digitalization, opening, and community development in research

models require all sectors to make full use of data science such as cloud computing, big data, and artificial intelligence. When studying changes in user needs, cloud computing, big data, artificial intelligence, mobile services, etc., are all closely related to the future. Data sharing exists in different disciplines, and different users have different requirements, governance, services, management methods, and degrees for data. Infrastructure is now in place. Libraries need to support user information services by implementing policies for data acquisition, sharing, and reusability, and by continuously searching for and practicing support. They cannot serve all users with the current set of rules. If suitable information services are not developed, then documentation and information agencies will lose data opportunities because users will spontaneously complete the work themselves. This is the challenge we face.

Additionally, in citizen science, problems encountered can be solved through crowdfunding and crowdsourcing. There is a relatively mature system abroad, but it has not yet fully emerged domestically. This is also a good research challenge and opportunity, which will not be elaborated here.

3. Transformation of Service Capabilities

(1) Transformation of Knowledge Structure

The traditional academic knowledge structure is a T-shaped structure, that is, a vertical and horizontal interlaced knowledge structure. The “vertical” represents the depth of professional knowledge in a certain field, and the “horizontal” represents the span or breadth of knowledge related to a certain field. It requires us to pay attention to both the breadth and depth of knowledge, that is, to have profound attainments in a certain specialty while also having extensive knowledge. Now, we need to be not only T-shaped talents but also π -shaped talents—on the basis of a solid knowledge structure, we must have our own specialized fields and capabilities in data processing and analysis.

(2) Transformation of Service Capabilities

The transformation of service capabilities can be mastered from the following aspects: business knowledge, machine learning/big data knowledge, mathematics/operations research, programming, and statistics. Identity awareness should pay attention to: data business users, data manufacturers, data developers, data researchers, etc.

2.2 Opportunities in Information User and Service Research

After understanding major opportunities in information user and service research, research needs to be grounded, finding entry points in research groups, institutional strategies, and national development, rather than searching for topics aimlessly. It is recommended to find research topics in information user and service research from three perspectives.

2.2.1 Meeting National Socio-Economic Needs First, grasp the trends of national socio-economic development. The full text of the government work development report each year is worth understanding. The official website of Xinhua News Agency will also have related content, which provides guidance for reforming organizational management mechanisms. Although you may not be a manager of a research institution, the government development report may provide you with practical opportunities, such as developing WeChat public accounts connected to policies and other applications close to scientific research. The 2018 government work report mentioned three aspects related to us: management system reform, research institution development, and industry development.

1. Management System Reform

- Encourage enterprises to lead the implementation of major scientific and technological projects, support the integration of innovation among research institutes, universities, and enterprises, and accelerate the transformation and application of innovation 成果. National scientific and technological investment should tilt toward people's livelihood fields...
- Reform the scientific and technological management system, and accelerate the transformation of performance evaluation from focusing on process to focusing on results.
- Give innovation teams and leading talents greater autonomy in personnel, finance, and material resources and decision-making power on technical routes.
- For scientific researchers undertaking major scientific and technological research tasks, adopt flexible salary systems and reward measures.
- Explore granting scientific researchers ownership and long-term use rights of scientific and technological 成果.

2. **Research Institution Development** Provide comprehensive innovation and entrepreneurship services, promote the construction of “mass innovation” demonstration bases, encourage large enterprises, universities, and research institutes to open innovation resources, develop platform economies and sharing economies, and form an innovation and entrepreneurship pattern that combines online and offline, coordinates industry-university-research-application, and integrates large, medium, and small enterprises, creating an upgraded version of “mass innovation.”

3. Industry Development

- Accelerate the construction of philosophy and social sciences with Chinese characteristics, prosper literary and artistic creation, and develop journalism, publishing, radio, television, film, archives, and other undertakings.
- Strengthen the protection and utilization of cultural relics and the protection and inheritance of cultural heritage.

- Build new types of think tanks.
- Strengthen Internet content construction.

There is much we can do in information user service research around these three aspects. For example: The state encourages innovation and entrepreneurship. Scientific researchers can start businesses with institutional approval. They can combine information, literature, and data resources with research work in research institutes and business, making effective organization and correlation of data from all three parties an important core content of innovation and entrepreneurship platforms. The report requires building think tanks related to national development policy recommendations. The Chinese Academy of Sciences itself is an important think tank, and the information support part of the Academy comes from intelligence services, which previously relied on the Documentation and Information Center. Now some research institutes have also established intelligence research and analysis teams. This requires scholars in the Documentation and Information Center to consider how to innovate service content and how to better embed themselves in disciplinary think tank activities, which are new fields. National socio-economic needs are also major focal points.

2.2.2 Meeting Organizational Development Strategy Needs

1. Grasp Organizational Development Strategy

Whether working in universities or research institutes, or studying at the graduate level, we need to consider organizational development strategies. As long as we are in an institution, our work and research topics always revolve around organizational development strategies. If we only consider our own services or promotions, we are passive and face difficulties.

For example: Scientific data management plans frequently appear in foreign literature, and Chinese scholars have also discussed them. However, in actual work, we find that although plans contain much content about scientific data sharing or big data and data centers, the requirements for data governance, data management, and infrastructure are different from the paths, logic, and standards we initially imagined for social science research. In this case, the research and services you design may ultimately be useless rather than fruitful. Therefore, we must find research points based on understanding organizational development strategy needs.

2. 13th Five-Year Plan of the Documentation and Information Center of the Chinese Academy of Sciences

Strategic positioning: “Integrate into scientific research, support innovation, be demand-driven, and sustain development.” Centering on national scientific and technological development needs and the center’s “Pioneer Action” plan, build a big data scientific and technological knowledge resource system, carry out universal literature information services and intelligence services covering the

innovation value chain, and become an authoritative national scientific and technological knowledge service center supporting China's scientific and technological development. By 2020, basically achieve proactive, precise, and ubiquitous resource organization and knowledge services. The intelligence service system covering the innovation value chain and its dependent data resources, methods, tools, and platforms will be further expanded; the institute-coordinated knowledge resource guarantee and intelligence service mechanism will be more sound; semantic knowledge organization, knowledge link calculation, and precise services will have new breakthroughs in methods, with preliminary reliable service capabilities; journal publishing and scientific culture communication services will initially have the ability to radiate services throughout the academy.

In the "13th Five-Year Plan," establishing an intelligence analysis system supporting research institutes, including comprehensive disciplinary support for researchers in research institutes, is closely related to actual work and topic selection, and is also closely related to information user and service research, requiring understanding and grasping.

2.2.3 Meeting Personal Career Planning Needs

1. Data Engineer/Data Analyst/Data Steward

Tony Hey proposed three data-related career plans in 2015 for our consideration: - **Data Engineer:** These people have basic abilities to write operational code, have machine learning backgrounds. Large companies may have data engineer teams within the organization or seek third-party experts to complete data engineering work. We need to consider how to achieve program automation, some code and content that makes it convenient for everyone to handle bibliographic metadata content work or web data mining, exploration, and discovery. - **Data Analyst:** Explores data through statistical and analytical methods. During our learning stage, we can try to master related tools and methods, understand analysis techniques, or at least know the basic data processing procedures before data analysis. - **Data Steward:** Considers people who manage, plan, and preserve data. They can be information specialists, librarians, archivists, etc. If data has value, professionals are needed to manage data, make it discoverable, and usable long-term. From the data steward perspective, we can consider how to manage the data lifecycle regarding policies and laws, tool usage methods, and provide good data services.

2. Data Scientist

Modern data scientists can extract meaning or insights from massive datasets. Data scientists' work includes: - Organizing existing raw data and building models to predict future data - Not just collecting and reporting data, but also viewing data from multiple angles and giving it meaning - Identifying the right business problems and providing solutions through best data applications (through visualization, e-sports, or blogs)

Data scientists' work relies on: analysis/predictive modeling/statistical analysis and modeling/data mining/sentiment analysis capabilities and hypothesis testing. Data scientists can help organizations: improve data accuracy/reduce expenses/develop strategies/reduce risks/provide personalized products and services/improve operational efficiency, etc.

Modern data scientists need to have capabilities in: mathematics and statistics/programming and databases/specialized domain knowledge and soft skills/communication and visualization abilities, and each capability requires continuous learning and knowledge accumulation behind it.

3. Information Literacy Education

If we want to provide a new set of information literacy education, whether the planning of these contents helps our graduate student groups and young scientists, enabling them to conveniently know resource acquisition, use resources, conveniently produce scientific research outputs, and embed them into service workflows, are all issues we can think about and extend. Including some former classmates who cross industries after graduation to serve scientists in research institutes, if they know development needs earlier, they can plan better.

Section 3: Literature Review for Information User and Service Research

3.1 The Core of Literature Review

A literature review is a research outcome formed after determining research topics, based on extensive reading and understanding of literature in the research area involved in the topic, through comprehensive analysis, summarization, and organization of the research status in that field (including previous academic viewpoints, research 成果 and levels, discussion focuses, existing problems and possible causes, etc.), new levels, new developments, new technologies and new discoveries, development prospects, and other content, and proposing one's own views and research ideas. Its characteristics are: first, "comprehensive," which requires comprehensive analysis and summarization of literature materials to make materials more concise, clear, and logically clear; second, "review," which requires making specialized, comprehensive, in-depth, and systematic discussions and corresponding evaluations of the summarized literature, rather than just "piling up" relevant field academic research.

When writing a literature review, the focus is on understanding the content, significance, and impact of others' scientific research 成果. When retrieving and reading others' research 成果, we can refer to two dimensions: the geographical scope of research 成果 and the relevance of research 成果. The geographical scope of research 成果 involves literature published by foreign scholars, literature published by representative Chinese scholars, and researchers' own understanding. The relevance of research 成果 also includes three aspects: background literature, related literature, and core literature.

3.2 Key Points of Literature Review

3.2.1 Research Layout for Various Sub-themes and Sub-questions Before starting research in a certain field, researchers' primary task is to determine the topic. Research topics in the field of information user and service research can be launched from three main angles: 1. **From information services to users:** For example, targeting a certain or certain type of service in libraries, thinking about how to enable various users to use the service. Research how to make library work more efficient or increase employment positions, or optimize existing business workflows. 2. **From users to information services:** If libraries clearly know what user groups they want to serve, the question is how to better meet the needs of various users. User needs have different classifications: (1) Users' needs are very clear. In this case, researchers can relatively easily and quickly determine topics and launch research. (2) Users' needs are unclear. In this situation, researchers can indirectly understand user needs from some "external" information. For example, what needs have been brought by national socio-economic development changes? Researchers can find some researchable content from these social needs. 3. **From the perspective of people (users):** Discuss the impact of information on people, how people process information, and how to enable people to better use information. Putting users in the perspective of human beings, not just limited to users of so-called information systems in library and information science, or users of a certain resource, or general book borrowers, but a very broad field.

3.2.2 Important New Theories, Methods, or Technologies No matter in which discipline, literature review is a very necessary component. By reviewing existing research, discovering existing problems, and achieving innovation based on previous work. Innovation points include new theories, new methods, and new technologies. 1. **New theories:** New research must revolve around specific problems in specific fields, not extensions of existing research. 2. **New methods:** The main purpose of literature review is to discover unsolved problems. We can try to use existing methods to solve new problems we encounter. When old methods cannot solve or cannot solve new problems well, it is necessary to discover deficiencies in existing methods and then improve them to produce new methods. 3. **New technologies:** With the progress of science and technology and the times, new technologies continue to develop. Scientific research should also actively and reasonably apply new technologies.

3.2.3 Important Corrections or Extensions to Existing Theories, Methods, or Technologies Research can also be combined with previous research 成果. On the basis of existing work, we can correct or extend possible problems in existing theories, methods, and technologies that have taken shape. No matter what extent the research problem is solved, no matter what the specific research content is, summarizing research conclusions and 成果 of new methods and new problems can very likely produce new fields.

3.2.4 Important Cross-disciplinary Integration with Other Fields' Theories, Methods, or Technologies Research can also cross-integrate with other disciplines. There are two basic ideas: First, starting from information user and service research, combining with other disciplines or fields, introducing theories, methods, and technologies from other disciplines that can be used for reference, thereby generating innovation. Second, using the practical foundation of other disciplines (such as management, sociology, psychology, economics, etc.) as guidance and theoretical sources, using content from other disciplines to establish hypotheses, using statistics or other methods for empirical investigations, solving current problems faced by libraries, and obtaining reliable conclusions. When doing this type of research, if there are two contents that can be cross-researched, then researchers can find some core literature in these related literature.

3.2.5 Other Suitable Content Analysis How research 成果 will ultimately be reflected in specific work and business practices is a content that needs consideration. For frontier field research, we need to consider how to expand institutional services in practice, such as how to make people better discover and understand services provided by institutions, or how to make services more satisfying to users, what services abroad are worth learning from domestically, etc. Whether this research develops new practices that create new employment opportunities for society.

Service objects are also a aspect that needs consideration. When considering the user issue, we must first consider whether there are user problems. If there are no users, we should consider how to attract more non-users. If there are service objects, we must consider user stratification issues. In addition, the issue of differentiated services for users is also worth exploring.

3.3 Preliminary Exploration of Material Clues

3.3.1 Chronological Order After determining the research theme, we must collect relevant materials purposefully, that is, references. Generally, we first choose literature related to the research theme from recent years to read, which can help researchers quickly understand current research hotspots, frontiers, and trends in related fields. Second, we can appropriately relax time restrictions and retrieve some earlier literature with high citation counts, which can help researchers understand more mature research. Finally, we select early but very classic and most representative articles as basic knowledge accumulation. From background literature to related literature to core literature, there is a transition from “strong universality, weak professionalism” to “weak universality, strong professionalism.”

3.3.2 Geographic Distribution The geographic distribution of references is generally divided into foreign and domestic parts, and the domestic part can be further divided into research 成果 from representative scholars and researchers’

own understanding of research problems. By reading foreign literature, we understand what research hotspots and frontiers currently exist internationally in related fields. Then when reading domestic literature, we can discover differences and identify our own shortcomings, thereby learning from others' advantages and summarizing our own deficiencies, providing theoretical guidance for future development.

3.3.3 Thematic Classification When retrieving literature, it can be divided into three types by theme: background literature, related literature, and core literature. Using research on data management services as an example:

1. **Background literature** mainly introduces current social situations, era development backgrounds, international and national dynamics (such as the current big data era, artificial intelligence era, strategies for big data development issued internationally or nationally in certain years, etc.), and literature introducing basic knowledge of the thematic fields involved in the research.
2. **Related literature** can help discover problems, pointing out what libraries or information institutions still need to do under current social development backgrounds, and what improvements scholars in the industry have made and what optimization suggestions or methods they have proposed for these problems, or entirely new observation perspectives. For example, some scholars suggest that due to the massive growth of data knowledge, data should be regarded as an important resource in resource construction, not just literature resource construction. In terms of services, in the past people focused on literature delivery and literature tool usage. Now people need to pay more attention to the use of data management tools to assist some national data management methods or institutional data management, and even the organization and collection of libraries' own data. Some scholars also suggest adding some data-related content in embedded services and discipline-based services, such as adding some data literacy education in library education or information science education, aiming to let users know what is "good data," "bad data," "dirty data," how to handle "dirty data," and how to use high-quality data (such as how to cite them).
3. **Core literature** refers to innovation based on some scientific research 成果 closely related to the research theme. No matter what research is done, research conclusions and 成果 can be compared with existing 成果. That is to say, new research must be different from previous research, but it must reflect what research level the new research has reached and roughly what scope it is in.

3.4 Strategic-Tactical-Technical Theoretical Framework

When researching problems, we can also consider using a strategic-tactical-technical theoretical framework to formulate ideas. Strategy is a long-term plan considering overall goals, tactics are only one means to achieve strategy, and techniques are some technical means to implement tactics.

1. **Strategic thinking:** Strategy is a long-term plan and a lofty goal. The time to plan strategy, formulate strategy, and use it to achieve strategic goals is relatively long. What strategy needs to study and solve is mainly the estimation of domestic and international situations and analysis of political, economic, scientific and technological factors of both sides. If strategy fails, tactics have no effect at all.
2. **Tactical thinking:** Tactics are a guiding method, including basic principles for doing things and strategic deployment, coordinated actions, action guides, and technical guarantees. Local tactics can achieve local victories, and local tactics can also affect major strategies. However, tactics cannot replace strategy because only by focusing on strategy will we know where tactics come from, so that we won't have local failures that lose the meaning of the whole matter.
3. **Technical thinking:** Techniques are some skills needed to complete tactics. When using these skills, we must consider some tactical issues, that is, how to complete goals in the fastest way. For example, if a library's strategic goal is to achieve digitalization and networking, that is, to put all its services online and let users know, if we study this problem from the perspective of information user and service research, we should clarify what types of services the institution has, what the layout of each direction on the website is, how to measure user experience, what the website's usability evaluation is, etc., and study how the specific work of business information is publicized on the website. Another example is when building digital resources, the issues involved may include: what metadata exists, what description frameworks exist, what services exist, etc.

3.5 Around a Controversy or Debate

Scientific research can also revolve around a current controversial issue or a topic of intense debate in related fields. Such topics generally refer to the process where two or more people cannot reach a common conclusion and express their own views to each other due to different understandings, purposes, or values. Researchers can summarize the opinions of all parties in the debate, indicate which views they agree with and which they have different understandings of, and explain their own views on the issue.

3.6 Ways to Understand/Break Down Various Articles

3.6.1 Basic Structure of Research Papers Research papers are articles that conduct in-depth analysis and discussion of a certain (some) problem or phenomenon and obtain meaningful conclusions. The basic principle is clear structure, established research standards, and precision. The basic structure of research papers can be divided into four parts:

1. **Introduction:** Attracts readers' interest in this paper and provides an outline and stimulates reading interest for the main text. This part must clearly explain to readers what problem this research aims to explain, what new discoveries it has, whether it has academic value, and the rationality of this research 设想. Thus, readers can clearly understand why the author chose this topic for research and the latest development status of the research. The introduction should explain the background, significance, and purpose of the research, as well as the current research status.
2. **Research Design and Methods:** Research methods refer to the tools and means used to discover new phenomena, new things, or propose new theories and new viewpoints in research, revealing the internal laws of things. Common research methods include observation, experimentation, questionnaire surveys, statistics, historical research, etc.
3. **Research Results:** Refers to the creative results obtained by scientific researchers through a series of mental and physical labor such as experimental observation, investigation and research, and comprehensive analysis within the scope of a certain scientific and technological research project or topic research, which are confirmed to have academic significance and practical value after review or appraisal. It meets three requirements: First, the scientific research 成果 has creativity and advancement; second, the scientific research 成果 must have social value and be recognized by society; third, the scientific research 成果 must undergo technical appraisal or review.
4. **Discussion and Conclusion:** After the demonstration process is over, the author should conduct an open discussion on the research problem, summarize the advantages, defects, and problems of predecessors, and also briefly sort out and summarize the demonstration process and results. The discussion should interpret the results, compare them with previous research, and explain the significance of the findings.

3.6.2 Basic Structure of Applied Papers Applied papers refer to articles that establish models based on theories in a certain discipline (generally more specific fields), then substitute relevant data or set up experiments to verify them, adopt some specialized research methods, find specific laws in a certain field, and propose suggestions, etc.

1. **Current Development and Application Needs:** Proposes the de-

velopment trends, social needs, current contradictions and problems in a certain field of the current discipline, proposes possible solutions, and points out the main content of the research.

2. **Application Environment and Implementation Conditions:** Points out the environment applicable to the proposed solution and the conditions and requirements for implementation, analyzing the feasibility of the solution.
3. **Implementation Design:** Collects data samples and related materials, designs experiments and conducts verification.
4. **Implementation Effect:** Observes experimental results and analyzes experimental effects, evaluates the advantages and disadvantages of the solution, analyzes the causes of disadvantages, whether the solution can be improved and how to improve it, etc.
5. **Application Innovation Summary:** Summarizes the innovation and advantages of the research, while also correctly recognizing its own deficiencies and problems. If current defects are not easy to implement improvements, reasonably look forward to possible optimization solutions in the future.

3.6.3 Review Papers Review papers are articles that organize, synthesize, and evaluate published materials, and examine current research progress to clarify problems. In a sense, review papers have a certain degree of guidance, including the following content: defining problems; summarizing previous research to make readers understand the current research status; identifying various relationships, contradictions, gaps, and inconsistencies in literature; suggesting follow-up steps to solve problems. The organizational form of review papers is to review according to logical relationships rather than research processes.

Review papers mainly include three types: systematic review, bibliometric analysis, and meta-analysis.

1. **Systematic Review:** Research steps include determining the problem and literature search scope, conducting literature analysis, and summarizing research conclusions.
2. **Bibliometric Analysis:** Research steps include proposing research problem analysis design, using metrological analysis, interpreting analysis results, and drawing research conclusions.
3. **Meta-Analysis:** Research steps include pointing out research status and analysis purpose, analyzing data overview and proposing research test methods, and obtaining research results.

Section 4: Common Statistical Analysis for Information User and Service Research

4.1 Data Types

According to the measurement level of data, basic data types are mainly divided into nominal data, ordinal data, interval data, and ratio data.

- **Nominal Data:** A type of categorical variable, the lowest level of data. It classifies data according to category attributes, with categories being equal and parallel. This data carries no quantitative information and cannot be sorted among categories, such as gender, blood type, etc.
- **Ordinal Data:** A type of ordinal variable that can not only divide data into different categories but also compare superiority among categories through sorting, such as classifying products as first-class, second-class, third-class, substandard, etc.; test scores can be divided into excellent, good, medium, pass, fail, etc.
- **Interval Data:** A type of interval variable with actual measured values with certain units. It can not only know that there are differences between two variables but also accurately calculate the actual gap between variables through addition and subtraction operations. It has no absolute zero point (the zero point is artificially set).
- **Ratio Data:** A type of ratio variable, the highest level of data. Its data expression form is the same as interval data, both being actual measured values. The only difference between ratio data and interval data is that ratio data has an absolute zero point, such as height, weight, blood pressure, blood sugar, etc.

4.2 Sampling

Sampling, also called sampling, involves extracting a portion of sample units from all samples to be studied. The basic requirement is to ensure that the extracted sample units are fully representative of all samples. The purpose of sampling is to estimate and infer the characteristics of all samples from the analysis and research results of the extracted sample units. It is an economical and effective working and research method commonly used in scientific experiments, quality inspections, and social surveys. Sampling is mainly divided into probability sampling and non-probability sampling, as shown in Table 8.4.

Table 8.4-1 Classification of Sampling

Probability Sampling	Non-Probability Sampling
Simple random sampling, stratified sampling, cluster sampling, multi-stage sampling	Convenience sampling, judgment sampling, voluntary response sampling, purposive sampling, quota sampling, snowball sampling

Probability Sampling: - **Simple Random Sampling:** Each individual in the population has the same probability of being selected into the sample. - **Stratified Sampling:** We first divide the population into strata with similar backgrounds, then conduct simple random sampling within each stratum. - **Cluster Sampling:** Also called cluster sampling. It merges units in the population into several mutually non-overlapping and non-repetitive sets, called clusters; then uses clusters as sampling units to extract samples. When applying cluster sampling, it is required that each cluster has good representativeness, that is, the differences among units within the cluster should be large, and the differences between clusters should be small. - **Multi-Stage Sampling:** When the population is large, first extract some clusters, then extract several sub-clusters from them, and finally only conduct simple sampling on the bottom-level clusters.

Non-Probability Sampling: - **Convenience Sampling:** Researchers conveniently extract people they encounter by chance or choose those closest and easiest to find as survey objects according to actual situations. - **Judgment Sampling:** We believe a certain thematic website can represent the entire group concerned with the theme, and conduct sampling on that website to obtain user samples. - **Voluntary Response Sampling:** People voluntarily answer through mail or online questionnaires to obtain samples. - **Purposive Sampling:** We subjectively select users as samples, such as extracting some samples from academicians, associate researchers, and graduate students to represent the user group of the Chinese Academy of Sciences. - **Quota Sampling:** Based on various factors that may affect research variables, the population is stratified, and the proportion of elements with various characteristics in the population is found. Then, objects that meet the requirements are selected according to this division and proportion. - **Snowball Sampling:** Based on a few user samples, they introduce other users, gradually increasing the survey sample.

Precautions for Sampling: The purpose of sampling is to obtain relatively comprehensive and accurate samples. Therefore, the following situations should be avoided during sampling: - **Non-response:** In actual operation, people may be unwilling to provide feedback due to time issues, questionnaire types, and distribution methods. Therefore, before distributing questionnaires, the entire sampling process should be reasonably designed. - **Response Bias:** When designing questionnaires, user privacy protection issues should be fully considered. If the questionnaire involves some private issues, attention should be paid to designing the questionnaire in a relatively gentle way so that people are willing to

reply with real situations, so that the questionnaire can truly and effectively reflect problems. - **Wording Effect:** Survey methods or content settings should be as objective as possible and should not have certain directional interventions that affect user responses. Avoid the questionnaire itself affecting user response situations. - **Low Coverage Rate:** Sampling must ensure that the sample has strong representativeness of the overall situation and can reflect the behavioral characteristics of the overall users or other research subjects. That is, we should try to avoid the phenomenon that the sampled users do not completely cover the people who need to respond. - **Giant Questionnaire:** When designing questionnaires, user acceptance and comfort should be considered. The content should be as concise as possible and have strong pertinence. Generally, the time should be controlled within about ten minutes.

Note: In research reports, the process of determining sample size and sampling methods should be explained in detail. In addition, it is necessary to explain how to avoid sampling leading to overgeneralization, invalid sampling, and invalid responses, and to provide specific sampling design plans and specific implementation situations.

4.3 Descriptive Statistics

Descriptive statistics is a method that uses charts or mathematical methods to organize and analyze data, and estimate and describe the distribution state, numerical characteristics, and relationships between random variables of data. Descriptive statistics is divided into three parts: central tendency analysis, variability analysis, and confidence intervals.

Central Tendency: Also called “data central location” or “central measures,” it is a representative value of a set of data. It can represent a certain characteristic of the population, indicating the common nature and general level of the research subject under certain time and space conditions. Central tendency is an important statistical analysis indicator used to describe public opinion phenomena, commonly including mean, median, mode, etc. They have different measurement methods in different types of distribution series. For variable series, since the entire variable series fluctuates up and down around the mean, the mean reflects the central tendency of the population distribution and is an important characteristic value indicating the population distribution. Therefore, based on the mean of the variable series, we can understand the central tendency and general characteristics of the research population. Measurement methods mainly include numerical average measurement and positional average measurement.

Variability: A quantitative measure of the degree to which data in a distribution are dispersed or clustered together. In statistics, our goal is to measure the variability of a specific set of data or a distribution. Simply put, if data values in a distribution are the same, it has no variability. Variability mainly has the following measurement indicators: - **Range:** The simplest indicator

to measure the degree of variation, that is, the distance between the minimum and maximum values. Range is used to check the correctness of data coding and to determine extreme values, but it cannot fully reflect the actual degree of dispersion of the phenomenon. - **Variance**: The difference between each data point and the mean, then calculate the square of each difference, then sum the squared values, and finally divide by the sample size minus 1. Variance is used to explain the degree of dispersion of data relative to the mean or average. It is not easily affected by extreme values and can better reflect the actual degree of difference of the whole. - **Standard Deviation**: The square root of variance. Standard deviation is a measure of the dispersion of a set of data averages. Standard deviation is the most commonly used measure of difference to describe the dispersion of data.

Confidence Interval: Refers to the estimated interval of overall parameters constructed from sample statistics. The confidence interval shows the degree to which the true value of the parameter has a certain probability of falling around the measurement result. It gives the credible degree of the measured value of the parameter. The confidence interval is a commonly used interval estimation method. The so-called confidence interval is an interval formed by taking the confidence upper limit and confidence lower limit of statistics as the upper and lower boundaries. For example: a 95% confidence level means that people who choose this confidence level hope that the average value is correct 95% of the time, with a 5% possibility of making mistakes.

Note: In research reports, the calculation of confidence intervals should be a routine task when reporting average values. The setting of confidence levels should consider: the precision required for the problem to be solved in the research, the settings of other scholars in the same field, and empirical rules generated from actual business.

4.4 Comparing Means

The mean is the most commonly used statistic in statistics, used to indicate the central position where various observed values in data are relatively concentrated. It represents the number of units contained in a sample, that is, the sum of all data in a set of data divided by the number of data in the set. It is an indicator that reflects the central tendency of data.

Independent Samples: If two samples are independently extracted from two populations, that is, the elements in one sample are independent of the elements in another sample, it is a comparison between different samples. It can also be simply understood as: there is no correlation between various experimental treatment groups, which is an independent sample.

Comparison of means of independent samples: - **Confidence intervals do not overlap**: At the selected confidence level, there are significant differences between the means of two independent samples. - **Confidence intervals overlap slightly**: At the selected confidence level, there may be significant differences

between the means of two independent samples, and independent sample t-tests are needed. - **Confidence intervals overlap significantly:** The two means are no longer significant. - **Independent sample t-test:** This test is used to test the difference between data obtained from two groups of unrelated samples. In theory, whether the means of two groups of data have differences in direction (one-tailed and/or two-tailed of normal distribution).

The statistical formula for independent sample t-test is: $[MATH_{\{FORMULA\}}]$

Paired Samples: Data from the same sample on different products or solutions, comparing each subject with themselves. Paired samples focus on the differences of each subject under two comparison conditions. In paired sample tests, the sample sizes of the two series being compared must be equal, otherwise missing values will occur. Paired sample t-test: Tests whether the difference between the means of two samples and their respective populations is significant.

The difference between paired sample t-test and independent sample t-test: Independent sample t-test is used for comparisons between groups (i.e., different subjects receive different experimental treatments). Paired sample t-test is used for comparisons within groups (i.e., each subject receives all experimental treatments).

Multiple Samples: Comparison methods for means of multiple samples mainly include: **ANOVA:** Can determine whether there are significant differences between two or more samples. **Single-factor ANOVA:** Suitable for testing one variable of multiple samples. To understand whether there are significant differences in means between two samples, t-tests can be conducted on the values of two groups of samples.

4.5 Non-parametric Tests

Concept of Non-parametric Tests: Non-parametric tests are an important part of statistical analysis methods. Together with parametric tests, they constitute the basic content of statistical inference. Non-parametric tests use sample data to infer the distribution shape of the population when the population variance is unknown or known to be small. Non-parametric test methods do not involve relevant population distribution parameters in the inference process, hence the name “non-parametric” tests. They are mainly used for research problems related to nominal data and ordinal data. For example, differences in shopping habits between men and women; differences in academic website information search tool evaluation and usage behavior among experts, ordinary users, and novices, etc.

Non-parametric tests are also called distribution-free tests because: the comparison of means assumes that data is normally distributed, and the variance of data is similar (homogeneity of variance). However, nominal data and ordinal data are not normally distributed, so the same assumptions cannot be made and the same processing cannot be carried out.

Methods of Non-parametric Tests: - Chi-square test (χ^2): A common form of non-parametric test, mainly testing the probability that the distribution results of different samples are caused by random factors. In other words, whether the difference between observed values (Observed Value) and expected values (Expected Value) is only caused by random factors. The chi-square test method can infer whether there is a significant difference between the overall distribution and the expected distribution or a certain theoretical distribution based on sample data. It is a goodness-of-fit test, usually suitable for analyzing overall distributions with multiple categorical values.

The chi-square test is based on the χ^2 distribution. Its null hypothesis H_0 is: the observed frequency has no difference from the theoretical frequency. The basic idea of the test is: first assume that H_0 holds, calculate the χ^2 value based on this premise, which represents the degree of deviation between the observed value and the theoretical value. According to the χ^2 distribution and degrees of freedom, the probability P of obtaining the current statistical quantity and more extreme situations when the H_0 hypothesis holds can be determined. If the P value is very small, it indicates that the deviation between the observed value and the theoretical value is too large, and the null hypothesis should be rejected, indicating that there are significant differences between the compared materials; otherwise, the null hypothesis cannot be rejected, and it cannot be considered that the actual situation represented by the sample has differences from the theoretical hypothesis.

4.6 Sample Size

Sample size is a very important concept for scholars in sampling surveys. Determining sample size is the foundation for all survey research. When determining sample size, we must consider the purpose of the survey, the nature of the survey, and precision requirements (sampling error), as well as the feasibility of actual implementation, control of non-sampling errors, and budget constraints. Because if the sample size is too large, it will cause great waste of manpower, material resources, and financial resources; if the sample size is too small, it will make the sampling error too large, making the survey results far from the actual situation and affecting the survey effect.

Sample size (sample size) refers to the number of units contained in a sample, generally represented by n . It is a very important concept in sampling inference. The size of the sample size is directly related to the accuracy of the inferred estimate. That is, under the condition that the population is determined, the larger the sample size, the smaller the representative error of its statistical estimate; conversely, the smaller the sample size, the larger its estimate error. Sample size is an element in selecting test statistics. According to sampling distribution theory, under large sample conditions, if the population is normally distributed, the sample statistic follows a normal distribution; if the population is non-normally distributed, the sample statistic asymptotically follows a normal distribution.

Section 5: Information Behavior Models

5.1 Thinking About Building New Models

More than a thousand years ago, Liu Zongyuan, one of the Eight Great Prose Masters of the Tang and Song Dynasties, taught us the method of writing articles in *Reply to Wei Zhongli on the Tao of Teaching*: The first key point in writing articles is to understand Confucian thought, next to understand the Four Books, and then the Five Classics. Only in this way can we master all schools of thought and then write good articles. Although we don't engage in such great scholarship, the same principle applies when doing research on information behavior theory. Each teacher has their own unique ideas. Only by understanding how a teacher thinks can we comprehend how a model is generated. By making horizontal comparisons between different teachers or different models, we can clearly understand all models and achieve so-called mastery of all schools. At this time, we can begin to consider what kind of model we want to create. There is a skill in this process: initially follow the research direction of a teacher you are more interested in. During the process, you may discover research directions of other teachers that interest you more, and then we can follow the newly found research direction. Repeating this process, we can slowly walk our own path. This process is fundamentally different from the literature review we did before. This learning process requires us to have our own thoughts, to create, innovate, and produce our own 成果. At the same time, the network environment is constantly changing, and new needs are constantly emerging. For example, scientific researchers will generate new needs during the research process. At this time, two situations will arise: 1. They have found better knowledge services elsewhere, so they will not seek our help again, and what we need to do is to learn what new knowledge and services the other party has; 2. New knowledge services have emerged, but not all users have turned to those new services, so what we need to do is to study what we can do when new changes appear. At this time, information user service research becomes particularly important. In this process, we must rely on profound and careful user surveys to illustrate and prove that our simulation of this situation is reliable.

5.2 Information Resources and Connection Points

We may have various different resources on hand, such as expert resources, friend resources, network resources, etc. Among these resources, some are not linked to libraries and other places, so at this time we need to consider whether their outgoing and incoming connections are linked to other places. In addition, we also need to consider the issue of data licenses. Licenses include two types, CC-BY and CC-BY-SA. The specific meaning of the former is that we can use the data, but we need to add author attribution after use, while the latter requires following the same principle when publishing. We often encounter commercial licenses, which mean that when an institution purchases a batch of electronic resource access rights, the resource party will state that the resource is only

provided to users of that institution's IP address. When we consider a model, in addition to considering where resources come from and which people they may be connected to, we must also consider the permissions of resource rights holders themselves, because this factor will also affect users' information behavior. This is a research direction that almost no one has涉足 ed.

5.3 How to Understand Differences in Information

Different disciplines may have different understandings of information. Regarding the definition of information, different disciplines may have two different situations: The first situation believes that information is known, can be interacted with, and is closely related to research activities. The other situation is completely opposite, believing that information is unknowable, cannot be interacted with, and is linked to research activities through intelligent connections. Therefore, in the traditional concept of information management, data and materials become information, and information further becomes knowledge and wisdom. Later, after entering the era of big data, our understanding of data has undergone some changes. Data itself can generate new knowledge and information. From the perspective of information management, knowledge is a highly aggregated, abstract concept. Differences between users will lead to different views on models. Men and women may have different views on the same thing, and undergraduates, graduate students, and doctoral students may also have different reactions to the same thing, as will special groups in special fields. Therefore, if your subjects themselves come from different disciplinary fields, you must fully recognize the differences in information between different groups. Don't overturn models based on chemistry surveys from a social science perspective, and don't criticize psychological models from a chemist's perspective. We need to see who the subjects of the model are and what the research focus is. But it is worth mentioning that under other relatively stable conditions, we can substitute the user group of implicit assemblage into a model derived from analyzing and investigating the user group of working assemblage, and analyze whether the users of implicit assemblage have different characteristics in that model. This is a very meaningful research.

Figure 8.5-1 Resources Available on the Assemblage Continuum

5.4 Differences in Thinking and Research Methods

First, as researchers, we ourselves will have differences in how we think about problems. Although we advocate taking into account various thinking and research methods, such differences inevitably exist. In addition, our research subjects will inevitably have differences in many aspects, such as the processes of seeking, searching, or behavior. At this time, we must consider a problem: the Humanities Model and the Science Model are different. In other words, humanities problems develop based on a core material, and then divergent research is conducted on this basis. For example, when we have a very important rare literature, we need to find various related literature and information to enrich the

interpretation and understanding of this literature. Another way of thinking is a problem-solving model centered on problems. When we have some problems in our hands, we need to find possible solutions to these problems to try to solve them. This model requires special attention in one situation: when our research subjects themselves come from different disciplinary fields, or when the thinking of research subjects is different. For example, if we conduct a survey on all students of the Academy of Sciences, but the research results focus on the scientific field, then we ignore students in the humanities and social sciences. If this research exists as a survey of the Academy of Sciences, it becomes unfeasible because such research results do not conform to the real situation of most students in the Academy of Sciences. If we only do part of the research (such as research on all students in a certain college), we need to add corresponding explanations in the research to indicate that this research only involves research in a certain aspect or only targets a certain college. In addition, when our model studies literature written by others, we must also clarify in advance whether the literature is research surveys targeting special groups or special fields. If we cannot clearly understand the limiting conditions of the literature, it will cause errors in our research.

Figure 8.5-2 Two Modes of Information Access

5.5 Ways to Integrate Other Disciplinary Research 成果

In information user and service research, there are many research 成果 from other disciplines that can be used for reference and integration. These possible ways to expand by integrating various other disciplinary research 成果 include: First, scholars use cognitive psychology to design user information retrieval theory; second, scholars use postmodern sociology (feminism, cultural studies) to investigate information retrieval; third, scholars use information retrieval to investigate business management; fourth, medical units use information retrieval models to investigate nurses, patients, patient families, and potential patients; fifth, user research related to information retrieval, such as: user satisfaction, system use and gratification, information needs, user anxiety and complaints, information literacy education and learning, information use; sixth, web users behavior, etc.

Section 6: Web Search Behavior

6.1 The Context of Web Search

Web search is an information query activity using the network as a carrier. It is the process of using certain tools and retrieval systems, adopting corresponding methods and techniques, to search for specific information from a large number of network resources. With the rapid development of Internet technology in the 21st century, millions of search processes are conducted worldwide every day, and the vast majority of network information searches are achieved through search engines.

This section briefly introduces the technical background, users, search engines, and development trends of web search related to web search. Figure 8.3 shows the theoretical framework used in this chapter to study web search behavior.

Research Questions: 1. How do users conduct web searches? 2. What are users' intentions when conducting web searches? 3. How do users discover, select, identify, present, and obtain relevant or potentially relevant information?

Technical Context of Web Search: First, we need to distinguish between the terms Web and Internet. A computer network refers to a computer system that connects many computers and their external devices with independent functions in different geographical locations through communication lines, and realizes resource sharing and information transmission under the management and coordination of network operating systems, network management software, and network communication protocols. The largest computer network is the Internet, which is composed of many computer networks interconnected through many routers, so the Internet is also called a "network of networks."

The Internet began in 1969. Under the agreement formulated by ARPA (Arpanet, U.S. Department of Defense Research Projects Agency), four main computers at UCLA (University of California, Los Angeles), Stanford Research Institute, UCSB (University of California, Santa Barbara), and the University of Utah in the southwestern United States were connected. It was initially applied to providing military communication infrastructure. The Internet is an international computer network formed by connecting two or more computer terminals, clients, and servers through computer information technology according to certain communication protocols. Internet technology is mainly used for interpersonal communication, such as sending and receiving emails, as well as obtaining information for work and hobbies.

Today, most people regard the network as a computer network or a way to connect information systems. The development of the network is astonishing, and its huge scale in the future is also difficult to estimate. Therefore, research on network user behavior in this technical environment has certain value.

6.2 Web Search Engines

Web search engines are specially designed information retrieval systems for the network's hypertext environment. They are online query systems for network resources composed of a series of technologies. This query uses servers of different websites to help users query information.

Horizontal search engines (comprehensive search engines) represented by Yahoo are called first-generation search engines, mainly facing the general public and providing comprehensive services for ordinary users. Vertical search engines (thematic search engines) and meta-search engines (aggregated search engines) represented by Google and Baidu are called second-generation search engines. Vertical search engines provide personalized services for professionals and spe-

cific users, while meta-search engines are emerging search engines with broader development space.

Working Principle of Search Engines: Web search engines usually provide information from content collections that respond to users' specific query needs. Web search engines include four basic modules: crawler, indexer, search engine, and page repository, as shown in Figure 8.4.

Figure 8.6-2 Architecture and Working Principle of Web Search Engines

The entire process of web search engines in information search is: web page authors submit URLs and introductions, which are placed in certain positions in a hierarchical structure after directory classification. When users search directories, they browse directories by clicking categories in the hierarchical structure to view content under them. Typical search engines use automated methods to automatically track indexes and complete the work of creating directories. Search engines that use automatic tracking indexes have three different components: spider programs, scanning the Internet, and finding web pages. Spider programs, also called "web tracking index robots," each time they visit a web page, they record any URLs linked in that web page and repeat the same process for all URLs they extract until there are no more URLs to access. Index search engine programs scan the title and all text of the web page each time the spider program visits a web page, and list the URL and its text in a huge database by directory classification. These indexes use effective algorithms and database technology to minimize redundancy. Search engines accept search keywords submitted by users, search in the database, and display each URL connected to this keyword in the search results page according to what they think is the most relevant correlation degree.

Document Ranking Methods: The basic methods of matching and ranking used by web search engines refer to matching relevant terms in queries and finding results that contain at least some of the same terms. With the development of search engines and the growth of user needs, ranking tasks have become increasingly complex, and more influencing factors need to be considered, such as the length of web page URL links, the complexity of query sets, the PageRank value of web pages, etc., all of which affect web page ranking. Currently, some commonly used techniques in matching and ranking algorithms include: 1. **Click-through Analysis:** Analyzing the frequency of user clicks on relevant data to select a specific search frequency distribution page as the document ranking method. The system analyzes the URLs accessed by searchers in log records. The URLs most frequently accessed by searchers when conducting specific queries or using specific terms will be ranked higher in the search results list. 2. **Link Popularity:** Link analysis is a method to determine which pages are suitable for specific topics based on the number and quality of links pointing to specific documents. Link popularity is the inspection of links pointing to network documents. Most web search engines will use link popularity analysis as part of their ranking algorithm. 3. **Term Frequency:** The numerical calculation of the frequency of terms appearing in network documents. Usually, higher

generation frequency indicates a greater possibility that the document is related to the query. Function words that have little or no relationship with document content or meaning, web search engines can retain stop-word lists of such words, which will be excluded from indexing and search processes. 4. **Term Location:** The prominence of term location indicates the importance of the term to the document. Therefore, most web search engines will give more importance to certain terms (such as those appearing in titles, keywords, image captions, bold, and other special formats) compared to terms appearing in document body text or even footnotes. 5. **Term Proximity:** The distance between two or more query terms in a document. If terms appear near each other, the document is more likely to be related to the query. Considering that most web searches use short search terms, focusing on nearby term names may retrieve relevant areas and is more conducive to improving the recall rate of search results. 6. **Text Formatting:** Using specific HTML codes in its ranking algorithm, including bold terms, emphasis tags, but the most effective is using anchor tags. That is, when information providers generate web pages, documents will contain multiple links to other web documents or specific locations in documents. Readers of the documents will see these links as clickable text. This clickable text is called anchor text. Search engine designers have found that these anchor texts and tags are important metadata sources about documents at the specified addresses.

6.3 Human-Computer Interaction

Human web information behavior mainly manifests in two types: (1) purposeful information retrieval; (2) purposeless information browsing. Search behavior begins with information needs, caused by users' uncertainty about a certain state. This need is the search task, and a search task may have multiple characteristics. This information retrieval behavior is called purposeful information retrieval. Usually, when people retrieve resources, they mostly have direct and clear purposes, searching for resources they like, are interested in, or are closely related to their majors and research directions. Of course, there are also information browsing processes without clear purposes and retrieval requirements.

From the perspective of human-computer interaction, web behavior is influenced by factors from both users and systems, specifically including behavior subjects, search tasks, information systems, and search environments, all of which affect it. Among them, behavior subject-related factors include cognition, emotion, domain knowledge, search experience, gender, etc. Kuhlthau and others believe that users' cognition and emotion are core factors in web information search behavior. Each stage of information search is closely related to users' cognition and emotion. Kim and other scholars believe that search behavior begins with search tasks (or needs), so search task type is a key factor affecting search behavior. Its influencing factors are mainly manifested in: - **Task Factors:** Refer to the characteristics of the current task, such as task complexity, urgency, and importance. - **Contextual Factors:** Refer to the resource conditions available and constraints that exist for consumers to solve current

tasks, such as time and energy that can be invested, reference groups that can provide help, etc. - **Individual Factors:** Such as demographic characteristics, personality and lifestyle, cognitive characteristics, knowledge and ability, emotion and experience. - **System Factors:** Such as website characteristics (information content, information organization, navigation design, website style), network characteristics (speed, stability). - **Environmental Factors:** Such as culture, language, social concepts, policies and regulations, available information/purchase channels. - **Search Process:** Information search is a continuous and dynamic process. At different search stages, due to changes in personal information knowledge and emotional states, users may show different behavioral characteristics.

6.4 Web Search Information Behavior Research

Single Website Search Studies: Single web search behavior refers to the process completed on one page, that is, the specific web information search process after determining the access address of information resources. This information search process generally has a relatively clear purpose.

Information Foraging Studies: In 1995, Peter Pirolli from Xerox PARC proposed the information foraging theory in a conference paper to explain the information-finding behavior of computer documents organized in hierarchical structures. They borrowed optimal foraging theory from ecology and anthropology to simulate the trade-offs between the costs and energy gains of organisms searching for, selecting, and consuming food. Web page information-finding and information visualization interaction models developed based on information foraging theory have also been used for information system design guidelines, guiding user interface automation design and developing usability evaluation tools.

Children' s Web Search Behavior: Children' s web search behavior is achieved on web search tools designed specifically for children that are beneficial to children' s entertainment and learning, displaying only content suitable for children. It uses information filtering technology to filter out pornographic, violent, and adult information, providing children with a clean information harbor and safe network space. To be suitable for family and school use, some ordinary search tools have also added various filtering functions, which can be used by minors under the guidance of parents and teachers. Currently, research on children' s web information search behavior has discovered differences in information search behavior in individual, age, and gender aspects of children, but further research and exploration are needed on children' s cognition of network information, specific differences in information search behavior, and the impact of some human-computer interaction factors on their search effects.

Web Search Training and Learning: Web search has strong practicality and personalized characteristics. The efficiency and success of exploration largely depend on searchers' information awareness, subject knowledge, network knowl-

edge, language ability, analysis and identification ability, and other factors and their unique search experience. Anyone can benefit from web search and can explore and summarize search modes and methods suitable for their own needs in search practice. Web search is a practical activity to find knowledge and information, and it is also a process of interaction between search and learning and self-improvement in search. Therefore, training and learning on web search content are essential.

Web Search Evaluation: Search result evaluation is the evaluation of the value of search results and the screening and selection of search results to eliminate the false and retain the true. Search result evaluation is different from network resource evaluation. The former only evaluates the value of relevant search results to guide searchers to select and use specific results with higher quality such as accuracy, reliability, and authority in existing result lists. The latter focuses on the ordering of network resources, evaluating, indexing, and organizing relevant resources according to certain standards to facilitate public utilization of specific network resources. In web search practice, this section outlines the usability and effectiveness of search tools in evaluating the interaction between humans and web search engines. We usually evaluate and select search results from two aspects: result sources and information sources.

6.5 From Information Retrieval to Social Tagging

In the network environment, information retrieval refers to users obtaining useful information from digital resources (including digital libraries, the World Wide Web, and various databases). The connotation of information retrieval constantly changes with the development of the times. Social tagging can describe user choice types by reflecting users' preferences for network resources from new directions. That is, social tags reflect some topics that users are interested in, and users' interest directions can be inferred using topic preferences such as tag usage. Currently, a large number of studies on social tagging systems have confirmed that tags can very accurately represent users' judgments and preferences for web page content and can also describe resources well. This article will determine specific research data collection and analysis methods mainly based on existing empirical research methods of information search behavior:

Combination of Laboratory Research and Analysis Methods: That is, the combination of data collection procedures (such as interviews, observations, experiments) and data analysis methods (such as statistical methods, benefit-cost analysis, discourse analysis). For example, interviews and verbal protocol analysis of small network user groups, etc., by investigating and recording users' search behavior and analyzing their potential search habits. However, laboratory research has many disadvantages, including difficulty in obtaining demographic samples of typical network user groups. In addition, it is difficult to recreate the dynamic and complex network environment in controlled laboratory research. Elements of this complex environment include: 1) continuously increasing content collections; 2) continuous deletion of content collections; 3)

rapid algorithm and index changes of network information retrieval systems; 4) impact of payment forms on retrieval results; 5) some content providers' indicated efforts to subvert the effectiveness of the retrieval process.

Combination of Collection Methods and Research Data Analysis

Methods: Research methods combining data collection methods and analysis methods, such as transaction log analysis, verbal report method, questionnaire survey. Transaction log recording has always been a commonly used data collection method in information search behavior research. Transaction logs are electronic records of interactions between users and systems, a commonly used method to capture characteristics of interactions between researchers, staff, and information retrieval systems. Transaction log files can record any operations on the database and save the recorded results in independent files. For each database update process, transaction log files have very comprehensive records. The database state before the update can be restored based on these records. It includes data such as the Internet Protocol (IP) address of the client computer, user queries, search engine access times, and referring sites. Transaction logs achieve a good balance between collecting a large amount of user data and being unobtrusive. Network servers record and store the interactions between searchers (i.e., browsers on specific computers) and search engines on search servers (i.e., transaction logs) in log files. Typical transaction log formats are access logs, referrer logs, or extended logs. The widely used file type is the extended file format.

Statistical Methods and Transaction Log Analysis: Statistical methods and transaction log analysis are the two most important quantitative research methods in web information behavior research. In addition to common correlation analysis and regression analysis, newer structural equation model methods have begun to be introduced and used, but the number is very small. Currently, the data sources used in transaction log analysis are mainly server-side transaction logs. Once the server collects data, it must be analyzed to obtain beneficial information. Web transaction log analysis uses these transaction logs to answer research questions related to interactions among searchers, web search systems, and web content. Currently, the value of client-side logs has begun to be valued. In terms of specific analysis methods, transaction log analysis methods currently mainly use statistical methods, and it is very necessary to introduce Web usage mining methods into transaction log analysis.

Logs are a commonly used concept in computer science. Logs are used to record various events that occur when the system is used. Studying system logs can help make the system easier to use. Understanding the advantages and limitations of web transaction log analysis is very important. The advantages of transaction logs are threefold: First, transaction log analysis provides a method to collect data from a large number of users, and users can conveniently interact with the search system to collect a large amount of information. Second, users can collect these data relatively cheaply, with costs basically only including software and storage. Third, data collection is carried out in a relatively private environment,

so the interaction represents the relatively stable information search behavior of searchers. Finally, transaction logs are currently the only method to obtain a large amount of data in complex network environments. However, transaction logs also have the following limitations: inaccurate log records, lack of user search motivation records in logs, relatively difficult log analysis, incomplete log record data, and challenges faced by search engines in privacy protection, etc.

6.6 Research Questions on Search Terms

Single or Multiple Terms and Operators Constituting Web Queries: Whether single terms or multiple terms in a query or a series of queries, how to segment words?

In second-generation web search engines, we need to consider and focus on sentences rather than terms. For example: opendata, do you segment it into open or data or open data, or use Data sharing, or use opendata or Data sharing for searching, or use research data sharing, many words can be used to search for one thing. The situation where users accurately know to use certain words for searching and the situation where users know many words can be used for searching but only vaguely search are different.

Research hotspots and research frontiers are also the same. Research hotspots generally know a very accurate word, while research frontiers are that these words are still drifting, and many different words are needed to find the needed content. This is a very interesting research problem on terms. For example, SARA storm and H7N9 are proper terms, and we won't use many other words to search them. But words like "earthquake," although also proper terms, need to add other words to retrieve the accurate information needed.

Subjects of Web Search Terms: Log analysis conducted on small user groups or user groups that have been distinguished and segmented, what subjects do the terms they use represent? What are their topics or viewpoints?

There are two types of research: one is that I have a very clear subject path and then look for problems; the other is that I stand outside this field, make records, and then summarize. This is an inductive and deductive process, and this book is an inductive research. Web users' search terms can be summarized into what kind of subject, which is something that can be studied.

Based on massive data, topic words or text mining and analysis were research hotspots in 2014 (ten years after 2004). However, the problem ideas we can use and consider can start from the sentence on page 55. Studying web search, studying information, studying users' behavior is not a single isolated consideration of this problem. What needs to be considered is a research direction closely related to the entire discipline or computer system development and user needs. The content proposed above is all classic research problems. We should not only look at what problems the author discovered at that time, but more importantly, look at the author's research 思路. If we don't find a subfield, especially

specific content in that subfield (such as Commercial social studies communication), without literature review and comparative analysis, there is no way to get results. Now we can do some corresponding analysis for given data. Although it is drawn using other people's models and is not an innovation, we can do repetitive, experimental science-like analysis on other people's models, correspondingly make a model, and this model is feasible in this environment. There is still no breakthrough innovation because we haven't found a subfield. Now we can do some corresponding analysis for given data. Although it is drawn using other people's models and is not an innovation, we can do repetitive, experimental science-like analysis on other people's models, correspondingly make a model, and this model is feasible in this environment.

Where Do Search Terms Come From?: What terms do users use for searching? And how do users filter and discard to finally determine their search terms? Users generally rely on their own experience, but such terms are generally more colloquial or straightforward. Studying the sources of users' search terms helps improve and perfect the thesaurus design. The sources of users' search terms may also be the part of users' real search needs that users may not be able to express. Research on the sources of search terms helps conduct in-depth analysis of users' real needs and more accurately grasp users' intentions.

Why Users Choose One Term Over Another: Why users choose this term instead of another is related to personal knowledge structure. There is a difference between the knowledge structure we think users have and the knowledge structure users actually master. We don't understand users' needs and intentions, so we cannot clearly interpret why users use this term instead of another. If we use analysis methods to distinguish, then we have ways to promote the so-called precise search that was being done in 2017. It has never become a single isolated engineer. An engineer should be able to improve efficiency, save money, save time, and save costs. Essentially, the key core of being the most efficient and economical engineer lies in information organization. The core of information organization lies in human information, which is to satisfy humans or users, or whether we can detect their intentions.

Factors Affecting Searchers' Decisions: Users' decisions include not only the selection of search terms but also search strategy decisions and result screening decisions. Throughout the entire process from starting the search to obtaining the optimal results, users are constantly making decisions. There are various factors affecting users' decisions, and different processes have different influencing factors. Analyzing the influencing factors of each process helps explore the path of users' entire search process and the psychological process. One user's log will affect other search term tables, or affect users' next search strategy reactions. This reaction is two-way: one is the reaction the machine gives to the user, and the other is the user's next reaction to the machine. Therefore, whether these works or records can be completely described, one method is to point a camera at a person, see what they do, and then record it; another method is to infer, guess, and then draw possible results through log analysis.

6.7 Main Discoveries on Search Terms

Shift in Topic Interests of Web Search Engine Users to Commercial and Information Content: For all web search engines, searching for information about people, places, or things has increased. Searching for business, travel, employment, or economic topics has steadily increased.

Increasingly Diverse Information Problems of Web Search Engine Users: There are many different term inputs and searches, indicating users' diverse information needs. Through analysis of terms and queries, diversity is becoming more and more significant. Web users are searching for more and more various topics. Generally, when encountering problems they don't understand, most users choose to search on Baidu. Users' queries are becoming more daily and life-oriented, and the problems and topics they search for are becoming more and more diverse. Problems are also more colloquial, such as "why is it like that," "what would it be like if," etc. The difficulty of proposing keywords for problems is higher.

Significant Increase in Non-English Terms, Numbers, and Abbreviations as Web Search Terms: The use of non-English terms is because although in an English environment, there are situations where non-English terms or emerging terms are needed, or searches from other languages, or having such a need (non-English terms). Poor English leads to input errors, and these situations may affect judgment. For users, only when they use their most familiar language can search effects and user experience be better. However, the preferred non-English language is French, followed by Spanish, with German ranking third. Italian and Russian also have high occurrence rates.

Major News Events and Holidays Affect the Use of Search Terms: When major events or hot topics occur, the search volume of terms will be relatively large. These topics of high interest to users distort the analysis, and attention to popular programs and entertainment industry artists may suddenly increase at certain time nodes. Google can predict stock trends through big data, track or follow hot topics in a timely manner. Although search terms are on foreign websites, and although the time of search terms is weeks ago, these ideas are still common and can be used for reference. Objective analysis is conducted through data to obtain results. On this basis, more data can be obtained for analysis to make the results more accurate. This is a process of continuous circulation and continuous improvement.

6.8 Main Discoveries on Search Queries

Average Query Length Is Slowly Increasing, Approaching Three Terms: The use of query operators and query length are two major trends in query research. Queries of 1 to 3 words accounted for 84% of all queries in 2002 and 73% of all queries in 2001. The percentage of one-word queries increased by 11%. The frequency of queries with more than three words dropped sharply, with almost no cases of using 4 terms per query. Users' query lengths are

generally controlled within three words.

Phrase Operators Are the Most Popular: Web searcher systems have many databases and large index tables. To find materials, precise searches or writing a string of search terms are needed. Either teach users this precise search method or improve the search service system. If all users don't like to use these search symbols, it is necessary to develop a word segmentation system to solve the problem that users don't know how to segment words, a better recommendation algorithm, or better ranking rules based on big data, based on users' previous logs and search conditions at time nodes, based on strengthened recommendation algorithms.

Web Search Engine Users Usually View Two or Three Documents per Query: In the list of search results, users generally only download a few documents and then judge whether they are useful. Users only pay attention to a few documents they think are more in line with their needs, and generally don't have the patience to look through many pages.

Increasing Use of Web Search Engines as Navigation Shortcuts: Users won't spend too much time staying on a web page or a search system, a search platform, or a browser, and are usually impatient. Therefore, users will use multiple search platforms or systems for searching, and search engines will more often be seen as navigation or lists of more search platforms. So, will users use multiple databases and sub-databases of major websites for searching? If they encounter some immature platforms or platforms without unified resource lists, will users choose to give up or use various different browsers? The establishment of such platforms and the integration of resources help users achieve one-stop searches without crossing multiple platforms, providing convenience for users.

Over Time, Some Searchers Are Conducting Continuous or Longitudinal and Multi-task Searches: Over time, users tend more toward coherent, criss-cross, and multi-task searches. Users will continuously pay attention to an event or a piece of information, and connect one piece of information to other related information, forming an information network or knowledge network. Such a search process will form a certain search path and the user's focus. For such users, search engines can more easily provide targeted recommendations.

Users Usually Submit Short Queries: Users generally hope to retrieve the content closest to their needs by inputting a short word they know. Because queries and query formulas (including query length, query operator usage, and repeated queries) are very important for web search engines to solve users' information problems. How web queries structurally analyze users' short query words to solve this problem, and how to detect users' intentions and needs from short words are research priorities.

Web Search Engines Are Being Used to Locate a Range of Information: Web search engines are not only used for queries. Behind user queries, users' log search paths and search processes are recorded or cached for analyzing users' search habits, thereby recommending more suitable information and con-

tent for users. Transaction logs capture the language users submit as requests as the preferred language for retrieving web content. For example: In order to improve system performance and topic trends, some researchers have focused on users' repeated queries or frequently occurring queries in multiple searches. In the field of web system performance, caching of repeated queries has been widely studied to improve web search engine performance from the perspective of response time.

Minimal Growth in Natural Language Queries: Overall, various studies show that general web search engine users have very little activity in natural language queries. However, web queries and request format query structures seem to have some common patterns. Although a small part of web search engine users still tend to use questions or request formats, further research is needed to connect question and request web query structures with users' gender, communication style, or interaction style, and to study why some users generate natural language. Users rarely ask "which," "when," or "do" questions. Users sometimes may ask for subjective opinions and are more likely to ask for information directions. The most common form of request format queries is "find information about..." . Most users only input one question format query and then check the results.

Some Common Web Query Patterns on Web Search Engines: Specific query term usage can provide selectivity needed by most web users. In unfamiliar and data-less situations, how to start operations? Import a batch of data, improve strategies and methods, how to determine the direction of improvement. The above are all directions that can be chosen or things that need attention. Whether in the past, present, or future, each point can be studied in detail. Clarify the structure of the book and the content of each part. The content proposed is all classic research problems. We should not only look at what problems the author discovered at that time but more importantly, look at the author' s research 思路.

6.9 Search Sessions

Premises (Assumptions) of Search Sessions: 1. Terms are the building blocks of web queries, and queries are the building blocks of web search sessions. Terms are the cornerstones, and queries are the process of combining cornerstones to obtain a wall. Cornerstones are scattered, while walls are neat and form a piece of results. People can view user sessions on web search engines as a series of interactions between searchers and web systems within a specific period.

2. During web search sessions, users can submit queries, view result pages, click URLs, view web documents, and return to web search engines for re-queries. In the web search process, users will repeatedly perform multiple operations. Users can submit queries, view result pages, click URLs, view web documents, and return to web search engines for re-queries. The

process of users repeatedly searching is also a reflection of users' query adjustments and psychological paths, as well as a process for users to gradually find their search needs. In the continuous search process, users gradually refine their search terms, gradually narrow their scope, and find their search direction.

3. User perception is a key determinant of web search engines. A product, no matter what technology you use, what implementation architecture, what process logic, what is ultimately presented to users is actually user perception. Perhaps what you do is very simple, but user perception is very full. Perhaps what you do is very complex, but user perception is insufficient. The quality of any website or product depends on user perception effects or user experience. For example, websites in native languages will be more friendly, and users will have more comfortable use experiences. Being close to users' usage habits, which tags are placed on the left and which tags are placed on the right, will all affect the convenience and smoothness of user use.

User behavior has multiple steps. Some say it is linear, some say it is circular, and some say it is composed of multiple blocks. If we use log analysis to analyze data, we can draw it out. Although drawing it out uses other people's models and is not an innovation, we can do repetitive, experimental science-like analysis on other people's models, correspondingly make a model, and this model is feasible in this environment. There is still no breakthrough innovation because we haven't found a subfield, especially specific content in that subfield (such as Commercial social studies communication). Without literature review and comparative analysis, there is no way to get results. Now we can do some corresponding analysis for given data. Although it is drawn using other people's models and is not an innovation, we can do repetitive, experimental science-like analysis on other people's models, correspondingly make a model, and this model is feasible in this environment.

Main Discoveries of Search Sessions: 1. The Number of Queries per Web Search Session Is Increasing: For U.S.-based web search engines, the percentage of single web query sessions is decreasing, indicating that session length is increasing. Currently, users tend more toward coherent, criss-cross, and multi-task searches. In a session, there will be multiple queries, repeated queries, or linked queries. This phenomenon reflects the depth of users' search level, not just a single question-and-answer search, but exploratory search.

2. **Web Search Engine Users View Fewer Result Pages per Session:** In the fast-paced era, users are eager to find what they want as soon as possible, often browsing. The number of views between the first, second, and third pages of results decreases sharply. Few users view more than four or five pages of results. The percentage of AlltheWeb.com searchers who only browse one page of search results (5% to 25%) is significantly higher. Compared with 1997, users viewed fewer result pages in 2001. In 2001, more than 84% of users only viewed one result page. Searchers seem

unwilling to enter the second or third result page. The vast majority still cannot see the first result page. Based on data from AutoWeb, typical users view an average of 8 web documents per session. Therefore, how to display the most relevant content on the first result page is the research focus. Some advertisers often purchase the most prominent positions on the first result page for publicity. How search engines coordinate this issue, displaying the most relevant content without harming their own interests, requires website designers to plan the design structure of web search engines.

3. **Most Major Web Sessions Last Less Than 15 Minutes:** Research shows that typical web sessions are about fifteen minutes. The increase in single web query sessions has led to shorter sessions for all users except a small group (about 4%) of very persistent users. The vast majority of web site web search session durations for search engine users are 15 minutes or less, although the average is several hours.
4. **Average Searchers View About Five Documents per Session, Spending Four Minutes or Less per Document:** A large proportion of web search engine users view no more than 5 web documents per session. Typically, web searchers will spend about 5 minutes or less evaluating a web document, possibly only 15% of the time or less than 30 seconds.
5. **Most Q&A Sessions Include “Where” Queries:** Users generally expect to find what they need somewhere, so when searching, they generally include “where” search information.
6. **Agent Sessions Include Very Simple Queries and Multiple Interactions per Second:** Web searchers’ sessions are dynamic and constantly evolving. Overall, at the session level, the percentage of sessions with only one query (i.e., users submit one query and then leave) on each web search engine has decreased, but still accounts for a relatively high proportion. There are still scenarios where users submit a query and get results or no results and then leave or give up, and there are many. They may also submit a query and already have their own conclusions before there are results, and they will not continue. This process may only take a few seconds.
7. **Longer and More Complex Multi-Task Sessions Usually Include Three or More Topics:** The percentage of single query sessions has dropped sharply, and the percentage of longer web search sessions has correspondingly increased. Users’ searches may have multiple goals or topics, and their information-seeking behavior occurs in a broader range. Some sessions contain two or more topics. Over time, some users conduct continuous or repeated web searches on the same topic. Some users also participate in longer and more complex multi-task web search sessions, which include queries related to various topics.

Section 7: Differentiated Services

1. Traditional Environment Information Behavior Research

Research on information behavior in traditional information environments has been relatively comprehensive. Reviewing the developmental stages of information seeking research reveals several representative models, most of which implicitly assume users as a homogeneous mass audience. When confronted with new forms of online user information behavior, their explanatory power is limited by the information behavior process itself, making it difficult to accommodate both environmental and user factors simultaneously, resulting in insufficiently accurate analysis. Therefore, there is a need to integrate this empirical research tradition with perspectives from other disciplines to facilitate the observation, analysis, and interpretation of online user behavior and its applications.

(1) Main Types of Information Searching Understanding users' characteristics, preferences, and needs is fundamental to supporting their information requirements. Research conclusions that require confidentiality need not disclose implementation details or technical routes publicly; they can remain as internal communication materials. Intelligence obtained from other students and departmental colleagues must undergo proper analysis to determine whether it involves core critical technologies, whether it represents a focus of social attention, and its actual value—all requiring comparison, weighing, and verification. During the 2003 SARS outbreak and the 2009 H1N1 pandemic, Chinese Academy of Sciences scientists made substantial contributions to detection and prevention efforts. Faced with complex foundational knowledge, it is necessary to search expert databases and various resource repositories from different perspectives and cyberspaces based on relevant retrieval needs. Some users do not frequently use blogs but agree with their academic functions and recognize their role in organizational behavior and personal decision-making. Under research teams, users discover unforeseen problems through information exchange and gain clearer understanding of expected research outcomes. The ways in which new ideas and problems emerge in this research process differ from common assumptions. In actual scientific research, there are capability constraints, time limitations, and continuous tests of personal knowledge reserves. Once reorganized, funding and manpower budgets may exceed original research plans, requiring adjustments to both organizational behavior and personal decision-making to ensure greater rigor while avoiding duplicate research.

(2) Psychological Drivers in Information Searching A professor supervising five or six students requires close team coordination while maintaining frequent communication with senior students. Teams simultaneously maintain connections with several research institutes; within each institute, not everyone can work on the same project simultaneously, and different progress rates yield different outcomes. System policies are unknown beforehand—what resources to develop, what suggestions to adopt, and what competitive pressures to face

all require independent research. Information resource construction content, information service formats, whether they can be promoted, whether policy resources provide support, and whether efficiency is high or low must all be planned before implementation, including internal group support, coordination of intra-group competition, and more accurate future prediction. Other institutes' specializations, such as chip technology, are unfamiliar, unskilled, and unknown territories. Information search behavior cannot wait until other institutes ask questions; results must be discovered in advance and intelligence documents organized. These are not difficult—take it easy. Compared with enterprises and commerce, research institutes' information search accumulation differs in characteristics but shares similar basic behaviors and universally applicable principles. Users' internal psychological environments should be refined as much as possible, attempting user classification by observing several aspects. Facing different research paths, it is possible to preset research conclusions and propose continued exploration spaces. Research ethics cannot be ignored and must be elevated to a high level of importance. For multiple or identical papers, summaries must be made. Whether different psychological behaviors stem from specialization must be tracked through mutual reference. For different research projects, it is necessary to distinguish whether they are instructor-led or topic-led.

(3) Information Searching Methods Social scientists' mindsets differ from engineering scientists'—they are divergent. Their use of online information also differs from engineering scientists, possessing unique characteristics. The focus of information service research teams lies in scientific research; models must be designed beautifully. They can be found individually, by the team together, from previous seniors' notes and literature, or from literature in the field. Research topics can be found through group cooperation or individually, differing from fellow students. Topic searching is primarily self-driven, relying on both the group and individual capabilities. Group communication through networks can be passive or interactive, through images or text, in one-to-one or P2P versions. Analyzing user needs does not require hour-long lectures; face-to-face communication can be quick. Users are living people—what services to provide and what systems and products to design require careful consideration. The focus should not be on what materials one possesses but on what communication methods to use with users to provide corresponding support services.

(4) Types of Communication and Dissemination Facing emerging university research groups and existing university research groups requires embedding into university research collectives. Model design should be quick and brief, not relying on imagination and judgment. Compile information bulletins updated at least monthly, customized to find corresponding resources and raise funds to support project development. Research topics requiring understanding of domestic and international practices necessitate designing systems targeting international frontiers and collecting information resources. Our documentation

and intelligence center has excellent resources that must be well-oriented toward CAS senior leadership and research teams to study their needs. For ancient literature experts in history disciplines, corresponding models must be designed to discuss what special resources to provide and how to deliver customized services. Providing customized information services first requires strategy formulation, then selecting correct tactics and determining appropriate techniques. For different scientific research, whether to provide policy recommendations or support rigorous scientific research requires substantial research to understand group status, one's own institution, and master one's own capability status. Understanding the basic status of various research teams and having profound grasp of user needs enables proposing effective proposals that gain general agreement from served research teams. Analyzing different users' information needs and conducting scientific research on information services is precisely what needs to be done.

2. New Information Environment Information Behavior Research

Users increasingly inhabit new information environments where their information behavior differs from traditional environments. Collecting survey results from various institutions yields the following summary:

[TABLE:8.7-1]

The table reveals that most discussions merely address how Google and similar resources have changed the game in user behavior, attitudes, and workflows. However, responses from a differentiated user perspective on how to alter service strategies have yet to emerge. Discussions about search engines or digital libraries assume service objects are singular, unchanging, and mass-market users. Re-examining this perspective raises doubts: do users possess different, variable, personalized, or unconventional behavior patterns and psychological characteristics? Therefore, more detailed research from a "personas" perspective is needed to study users' online information behavior.

3. Web 2.0 and Personas Theory

(1) Background of Personas Theory Since Web 2.0 emerged, digital environment technology applications have moved increasingly toward interactive design, spreading Web 2.0 thinking to nearly all digital domains. Following the Web 2.0 wave, after CNNIC published large-scale survey results of domestic network content providers in early 2006, domestic library and information science scholars began discussing concepts like Lib2.0 and IA2.0.

(2) Definition of Personas In this context, Alan Cooper (2005), as a proponent of personas, defined them as: "Precise descriptions of users and what they want to accomplish" [1]. Personas, as a relatively novel research approach, are equally suitable as an effective, capable, and sustainable research method

for innovating library services and related command, management, communication, intelligence, and monitoring systems. Although it is a user classification method, its difference from traditional user classification lies in first considering users' overall online behavior for classification, then considering special behaviors, needs, and system requirements of individual personas, rather than classifying users directly from system functions. This greatly enhances integration of user behavior surveys, information service strategies, interactive design, and information system construction, saving costs and improving efficiency. Personas theory provides operable research and engineering methods that help understand complex behaviors in complex environments and summarize these behaviors into certain structures and patterns.

(3) Advantages of Personas Theory [FIGURE:8.7-1]

Creating and using personas for theoretical and empirical research on user information behavior in network environments offers several advantages: Personas aim to provide comprehensive recommendations for business strategies, marketing communications, website construction, and embedded driver development through quantitative and qualitative research practices; They integrate and require multiple research methods to study user goals, behaviors, and viewpoints, thereby enhancing research depth and facilitating result generalization; They consider future applications and impacts from the research outset, requiring researchers to possess interdisciplinary teamwork capabilities, thereby enhancing feasibility of translating research results into productivity; Research results can clearly reveal several typical users; User types summarized from behavioral activities can become recommendations for HCI (Human-Computer Interface), UCD (User-Centered Design), and 2.0 transformation; Past user research differed according to purposes of website design, service strategy, product marketing, and technology development. Through interdisciplinary personas research, personnel from other departments can share the same user impression rather than working in isolation; They enable senior managers, frontline librarians, and programmers writing code for web libraries to have consistent discussion objects regarding understanding user characteristics and behaviors.

In summary, both empirical and theoretical perspectives demonstrate the advantages of personas as a research orientation and its novelty in exploring online user behavior.

4. Differences Between User Research and Personas Research

This section views “differentiated users” as several personas obtained through behavioral analysis—depicting differentiated user behaviors and characteristics through virtual characters. These personas contain their own distinct features that differentiate them from one another. Real individuals (specific interview subjects) are categorized as “similar” to a particular persona because they possess certain important attributes contained within that persona, which distinguish them from attributes of other personas.

In other words, understanding of differentiated individuals comes from understanding typical users, as many individuals belong to certain user types, though their behaviors are not entirely similar. Their similarities constitute the primary factors in their behavior and judgment, and these shared characteristics are unique to this type. Through systematic empirical research, personas can be created and used to clearly describe regularities in user behavior, not only distinguishing actual behaviors and needs of different user types but also providing several recommendations for service innovation and reform.

Compared with user research, personas research presumes service objects are individuals rather than the masses. In digital library systems and technology fields, personas models pursue combining functions of different systems rather than pursuing a single perfectly functional system. The motivation for personas research is caring about everyone who needs help, not just those who use a particular system. The function of personas models is to aggregate every opinion that teaches how to improve the system, rather than requiring readers to learn from librarians how to “skillfully” operate it.

[FIGURE:8.7-2]

5. Differentiated User Research in Library Science in the New Environment

In the new information environment, users extensively employ “informal” information exchange channels for information searching, communication, and application. Therefore, libraries can consider how to develop and optimize corresponding service content and methods.

[FIGURE:8.7-3]

In the network environment, determining what research orientation is suitable for knowledge services to supplement or innovate existing theory and practice has become an important and cutting-edge topic. Reviewing relevant literature reveals that personas is a universally applicable research orientation across various fields with strong specificity, capable of accurately describing service objects and providing concrete recommendations. Therefore, in the network environment, determining what research orientation is suitable for knowledge services to supplement or innovate existing theory and practice has become an important and cutting-edge topic. Reviewing relevant literature reveals that personas is a universally applicable research orientation across various fields with strong specificity, capable of accurately describing service objects and providing concrete recommendations. From related research, unresolved difficulties can be identified, reflected in research questions, methods, and content, summarized as follows:

- (1) In foundational literature, many explore behavioral processes, but few systematically grasp the overall network information environment, and psychological and sociological research for deeply explaining user behavior

is relatively lacking.

- (2) From background literature review, existing user behavior research reports provide valuable reference materials. However, despite their importance, they struggle to clearly depict service objects for digital libraries and provide recommendations for digital library system and technology issues from service strategy perspectives.
- (3) From related literature review, existing personas are mostly market or industry research-oriented. Although they can describe behaviors of website or database users and design webpages with interchangeable interfaces, they lack research on innovating library services and related command, management, communication, intelligence, and monitoring systems. They also lack thematic relevance with Web 2.0 and other network information environments. Furthermore, research on online user behavior lacks certain theoretical foundations, making their sustainable research characteristics underdeveloped and invisible.
- (4) From core literature review, although existing personas in digital library or library and information science research have completed qualitative or quantitative empirical research to some extent, no large-scale comprehensive research combining qualitative and quantitative methods has emerged. Moreover, there is a lack of deriving overall innovation and reform service strategies from differentiated user behavior.

In the new information environment, differentiated services for users require reconsideration from another angle to discover the following questions:

- (1) From a research question perspective: What do users do? What do users want? What do users like? What do users think? What do users need?
- (2) From a research method perspective: Although existing literature mentions combining qualitative and quantitative research methods, few actual empirical studies exist. In terms of research techniques, existing literature discusses variance analysis verification based on users' social attributes (gender, education level, age, etc.), factor analysis and cluster analysis based on user behavioral characteristics, interviews with typical users, and suggestions for deeply studying other observation aspects not previously considered. What is relatively lacking is: comprehensive exploration integrating different research methods to create an entirely new technical approach combining all the above methods.
- (3) From a research content perspective: Within library and information science, discussions cover how personas assist in optimizing existing digital library functions, mining potential users, and designing and planning digital libraries. However, they lack exploration of systematically differentiating user behaviors both broadly and deeply to serve as high value-added research that can be adopted for service strategy, marketing communications, website construction, and software development that rely on user

behavior research. Such research holds groundbreaking significance for deriving new service strategies from user behavior models.

Section 1: Information Behavior Theory

1. Activity Theory

(1) Origin and Development of Activity Theory Activity theory (or cultural-historical activity theory) originated in the Soviet Union as a Marxist alternative when behaviorism dominated Western psychology. Its roots lie in the proposition of normalized consciousness derived from daily life norms and numerous everyday activities—whether leisure activities like walking dogs or watching TV, domestic activities like window washing, or work-related actions like cycling to the office, using spreadsheets for cost calculations, or searching for information using Google.

All human activities have cultural dimensions: we enact them within social norms (unless intentionally violating them, as in criminal behavior, where criminals follow their own norms). As Bedny et al. note, because culture influences consciousness, human behavior cannot be reduced to various animal behaviors.

The Russian term describing human activity is *deyatelnost'* (deyatel'nost), translated as “activity,” though as Kuutti points out, the Russian term implies reforming something, so “activity theory” means studying human behavior patterns that take action to create change. It should therefore be more accurately translated as “theory of reforming activity.”

Lev Semyonovich Vygotsky first proposed activity theory, and his ideas continue to be widely applied in developmental psychology and educational research. Subsequent theoretical development was established by his two students Alexei Nikolaevich Leontiev and Alexander Romanovich Luria, along with later researchers. Since Luria became interested in brain function and shifted efforts to develop neuropsychology, most developments were undertaken by Leontiev.

[FIGURE:9.1-1] illustrates the earliest period of theory development. The diagram shows a tripartite relationship between a person (subject), an object toward which action is directed, and tools or devices used in the action. In Vygotsky’s original formulation, “tools and devices” were replaced by “psychological tools,” referring to language, writing, mathematics, maps, and other symbolic structures. However, clearly many activities also employ physical tools. Zinchenko notes: “The psychological theory of activity focuses on real (concrete) tools and objects that people place between themselves and nature.”

Kaptelinin addresses other linguistic issues related to “objects,” highlighting understanding of activity theory. He writes that Leontiev used the Russian “predmet” more than “ob’ekt.” Both translate from English “object,” but “predmet” has special meaning: “The concept usually also means an entity involving someone’

s purpose or interest.” That is, activity theory is not concerned with any object but with their human meaning. Leontiev developed the cultural-historical dimension of action, the concept of labor division expressed in actions, and more importantly: the vertical relationship between activity, action, and operation. In fact, Engeström reproduced activity theory developed by Leontiev, as shown in Figure 9.2.

[FIGURE:9.1-2]

In Figure 2, Engeström added several concepts: rules and norms, community, and labor division developed by Leontiev. These rules and norms impose formal and informal, legal and traditional constraints on ongoing activities. For example, social workers implementing actions might say they assess potential adoptive parents according to organizational procedures and guidelines, which may derive from statutory law. Community may be immediate work groups or teams that are part of the subject, or broader organizational communities, or society at large. Labor division simply involves expanding activity performance through collaboration and shared tasks with others. This expansion, in fact, shifts activity theory’s focus from individuals and consciousness to activities within communities and their development.

Wertsch et al. define the goal of cultural-historical psychology (or sociocultural psychology) as: “elucidating the relationship between human psychological functions,” an idea originating from Marxist social views. Zinchenko notes that Leontiev shifted consciousness research to object-oriented activity when developing activity theory. The reason is the Marxist position that consciousness resides in human participation in activities. Nardi mentions: “Activity theorists claim that consciousness is not a set of discrete intangible cognitive actions...and it certainly has nothing to do with the brain, but is situated in daily practice. What you do is who you are, and what you do is firmly and inseparably embedded in the social matrix, where each individual is an organic component.”

Although Leontiev shifted his focus from consciousness to activity, this connection remains: Zinchenko writes: “Vygotsky’s consciousness is mediated by culture, while Leontiev’s mind and consciousness are mediated by tools and objects.” Reviewing Luria’s life, Scribner recounts the cultural-historical context of Vygotsky’s work and his colleagues’ primary production of cultural-historical theory: “The history of the Vygotsky-Leontiev-Luria school reveals the cultural-historical context of their work, particularly that these scholars clearly embraced a revolutionary project of continuously transforming society based on ideals of equality and social justice (though this project later suffered dramatic failure). Far from being an external influence, this was integrated into the core of their work, into its methodology, producing much scholarship.”

Activity theory’s development in the West has largely remained within Engeström’s initial work in education. Because he reproduced Leontiev’s work in the above diagram and developed concepts of contradiction and disturbance. Leontiev discussed individuals in society and contradictions existing in both

individual development and social development. However, as we will discuss below, Engeström developed this idea into one of activity theory's mainstream concepts.

(2) Principles of Activity Theory

1. **Unity of Consciousness and Activity.** This principle originates from Vygotsky's team's work on consciousness in Moscow. The idea is that consciousness or "mind" is connected to the external world through human activity. As Kaptelinin notes: "The most fundamental principle of activity theory is the unity of consciousness and activity. The 'consciousness' expressed here refers to the human mind as a whole, while 'activity' refers to human interaction with objective reality. This principle therefore claims that the human mind has a special component of human-environment interaction. The mind is a special 'organ' that emerged in evolutionary processes to help organisms survive. Thus, it can only be analyzed and understood within the context of activity."
2. **Object-Orientedness.** Objects referred to by human activity are "reality" determined by science and/or reality determined by socioculture. Therefore, we have objects of the "real world," such as raw materials—for example, wood carving is the activity of transforming a wooden board into a carved work—and we have socially constructed objects, such as in peer circles where individual members may seek reform by introducing new members.
3. **Internalization/Externalization.** Given the unity of consciousness and activity and object-orientedness, our psychological processes must be created through internalization of a series of our external activities. Our consciousness is constituted by our activities acting on the external world, while our understanding of the world is determined by our activities in the world. Language is our means of internalizing externally derived experiences.
4. **Mediation.** Simply put, activity is mediated by tools, but "tools" are not simply chisels and planes for woodworking, but mental tools of language and symbols. Moreover, including various sociocultural phenomena such as rules, norms, and labor division, Engeström's view of activity theory (developed earlier by Leontiev) can, in a sense, also be seen as "tools" that may constrain or be constrained by the structure of our interaction with objects.
5. **Hierarchical Structure of Activity.** This principle is Leontiev's main contribution, defining activity, action, and operation and their relationships with motive, goal, and conditions, as shown in Figure 9.5.

Leontiev established the following relationships: Activity is necessarily related to the concept of motive; there is no activity without motive. "Non-motivated"

activity is not activity without motive, but activity where motive is subjectively and objectively hidden. The nature and “formulation” give rise to individual personal activity actions. We call a set of processes an action if it is subordinate to the performance that must obtain a result, that is, if it is subordinate to a conscious purpose. Similarly, just as the motive concept relates to the activity concept, the purpose concept relates to the action concept. And actions are not special “units” but are included in the structure of activity. Human activity cannot be separated from action forms or action coherence. For example, work activity exists among numerous work actions, school activity exists among numerous school actions, etc. If actions constituting activity are stripped away, activity will also cease to exist. Finally, actions also have an operational aspect (how to do, what methods can achieve), which is not determined by the goal itself but by conditions for achieving its target object.

These levels are not immutable. Leontiev writes: “Activity may lose the motive that caused it, in which case it may become an action realizing a completely different world, a different activity; conversely, an action may become a separate stimulus force and may develop into a separate activity; finally, an action may be transformed into a means for achieving some goal, entering operations for realizing various actions.”

The idea of hierarchical structure—activity-action-operation—is not universally accepted. For example, Chaiklin suggests that breaking down activity (or practice) into different levels destroys important conceptual advantages, as the systematic activity perspective provides analysis of computer-based system practice. He cites Leontiev to support this view: there are no other activity “fragments” of reform types in this world, because this is not reform of activity but its destruction.

On the other hand, Bannon further uses the concept of functional modules to decompose processes. Actions are viewed as having motor and cognitive aspects; functional modules are sets of information processing activities related to established actions. Bannon et al. write: “...information processing functional mechanisms or stages can appropriately be conceptualized as functional modules, provided they can be regularized and have well-defined relationships with other functional mechanisms for feedforward and feedback.” They propose a “general framework for analytical elements and units” as follows:

Activity → Task → Action → Operation → Functional Module

Given the cognitive nature of functional modules, observing their operations may be difficult. However, it is feasible, for example, to consider what sets of functional modules (or information processing procedures) are employed when someone undertakes the task of searching web pages with a search engine and identifying result entries related to all activities (buying a book, booking flights, studying literature, checking news, etc.).

Finally, the development principle means understanding how an activity develops over time in its cultural-historical context and how actions affect objects.

This principle is often mentioned as “Vygotsky’s developmental principle” since its emergence in his educational development work with children. However, in many ways, current research centers focus more on activity system development than on children’s minds. Engeström believes development or “reform” emerges from activity system results (or, more often, participants in the system) responding to and handling contradictions (see below). He views this as a continuous process and uses the term “expansive cycles” to describe continuous cycles of change.

The essence of activity theory at the operational level is summarized by Bannon and Anderson in a statement, with lines in Figure 2: “...activity runs from: subject, motivated by purpose, producing output through reforming objects. Objects may be shared by communities, shared by actors working together to promote ideal results. Tools, rules, and labor division mediate relationships between subjects, communities, and objects.”

However, today we need to add contradictions and tensions, if not as principles, then certainly as basic elements of activity systems.

As mentioned earlier, Leontiev (referencing Ilyenkov’s earlier work) identified fundamental contradictions arising between personal meaning construction and social meaning construction through activity. We can understand why this occurs: individuals within activity systems, regardless of whether the system is socially constructed, directly experience objects, and because they depend on personal cultural-historical backgrounds, people with different past experiences may encounter different experiences. Conflict arises between social expectations of activities and how individuals experience them and how experiences change their understanding of activity objects.

According to Engeström: “Contradictions are historically accumulated structural tensions existing between and within activity systems...When an activity system adopts new elements from outside, it typically intensifies secondary contradictions where old and new elements collide. The disturbances and conflicts produced by these contradictions also innovatively attempt to change the activity.”

Engeström identified four levels of contradictions or tensions (see [Figure 4: see original paper]): First, contradictions occur within each component element of every activity system (subject, object, etc.); these “primary” contradictions cause secondary contradictions between elements (e.g., between community and subject as a member). Third-level contradictions appear between existing activity systems and what Engeström terms “central activity leading to more advanced culture.” Finally, fourth-level contradictions occur between central activity systems and their “neighboring” activity systems, as shown in Figure 9.6, where Engeström’s suggestions relate to each node in the activity system diagram.

[FIGURE:9.1-4]

2. Activity Theory in Information Behavior Research-Related Fields

Since Engeström, modern activity theory has been widely used in educational research and also applied in information systems research, particularly in human-computer interaction research. Given these fields' general relevance to information behavior, we will focus on several details in these domains.

Activity theory has been introduced into information systems development or system design by many authors. For example, Danish researcher Susanne Bødker advocates adopting activity theory for many reasons, including: “Analyzing system design as an activity system allows focus on different levels of overall activity. We can focus on materials and tools used by a group of programmers, or we can focus on overall project groups related to organizational units. What is the purpose of their activities, what do they do to achieve their purposes, and how do they do it? What are the actual social and physical conditions of their work? The characteristic of this analysis is applying system design tools and techniques at many different levels. And it points out multiple places where computer technology can be applied in the design process.”

Kuutti and Arvonen compare five activity theory-based approaches to system design: Activity Analysis and Development, Activity Checklist, Activity-Oriented Design Method, Jonassen and Rohrer-Murphy' s framework, and Martin and Dathe' s framework. They conclude: “The investigation found that among AT-based methods, as with AT concepts, there is a lack of comprehensive treatment throughout the development stage. Another finding is that only one method has been verified in real-life system development.”

The aforementioned Korpela et al. developed the ActAD framework, defining information systems development as: “The process of some collective work activity that facilitates new information technology means, that is, through analysis, design, implementation, introduction and continuous support, and process management, etc.”

He explores various practices of mobile information systems and directly mines elements of activity theory during interview processes. Therefore, we ask: In the history of organizational innovation, what innovative cultural backgrounds can predict technological changes—for example, how innovation advocates contribute to organizational success, how end users promote innovation, rules and conditions for technology application (particularly important in police forces where legal guidelines direct all actions), how informal behaviors of affected work teams influence innovation, and innovation motivation. For example: Mobile systems were introduced into police forces to reduce time spent at police stations, enabling more time patrolling the streets. How the overall activity system affects other activity systems in the organization: For instance, providing police control rooms and basic communication technology where information supervision is needed.

Deep understanding of information needs and usage related to new technol-

ogy implementation and evaluation processes affects establishing organizational innovation mechanisms; otherwise, opportunities are easily missed. In this regard, work by the AIMTech group (including its doctoral students) includes: A study of information exchange on oil drilling platforms, information processing by police officers using mobile devices, overall assessment of activity theory' s applicability, and the innovation process of British police officers using mobile technology.

Finally, Spasser introduced activity theory into the information science world by developing the North American Flora Digital Library. His first paper involved using collaborative services for information sharing, noting: "...By adopting an activity theory framework to conceptualize design, use, and computer tool-based collaborative services, we can characterize normative boundary protocols. We will be in a better position to meet users' full range of needs and socially construct object-oriented, as well as all work activity, artificial interfaces."

In his second paper, Spasser combined activity theory with social reality theory in the North American Flora' s cooperative publishing process and wrote: "Contradictions between different objects are particularly profound problems in advancing project coordination strategies and developing collaborative consensus." Later, project reconstruction was based on discovering solutions to these contradictions.

3. Activity Theory in Information Behavior Research

Activity theory has recently interacted with information behavior research. Although Yoram introduced concepts, his works did not explore its potential for information behavior research theory. Although Gu Shao did not reference activity theory in her work, note her "mediation" category: "The mediation zone is where information users can suggest and collaborate to avoid isolation while highlighting their uniqueness...Mediation in this zone can prompt users to further complete tasks."

Incorporating the idea of mediation zones into research is relatively easy. Gu Shao applied the idea of information searchers "using various technical means" to school librarians' skills in handling user information, which can be used for information literacy education planning. Recently, Wilson explored activity theory' s application in information seeking behavior research by reviewing previous studies and tracing application frameworks. He demonstrated, for example, that protecting a child' s social welfare involves multiple activity systems of different institutions, and how information flows circulate and how information seeking becomes a collaborative activity involving labor division. As an inter-institutional communication conceptual tool, as Engeström said, information exchange is a third-generation activity theory conceptual tool.

Wilson also noted the shift from activity theory' s graphic model to a process model embodying rules, norms, and activity division. Other researchers in this field occasionally mention activity theory but lack analysis or have no analysis.

For example, Attfield and Dowell simply mention activity theory in their study of journalists' information seeking behavior, reminding everyone that search behavior often involves not a single goal but multiple goals. However, overall, their paper does not adopt activity theory as an analytical framework.

Re-examining early activity theory research can reveal possible missed early analyses. Consider this example, returning from pure theoretical discussion to social workers' information exchange behavior, allowing me to reconstruct a rich account in exhaustion: The social services department (community) tasks itself with caring for children in the broader social sense (local authorities), assigning a social worker to each "case" (assessing a child in a family environment). The object is the child being assessed; the motive (similar to law) is child welfare; the goal is ensuring child safety. Actions taken include visiting the child's family, observing the child's treatment, seeing if the child is clean or bathed (observing any bruises, etc.), observing relationships between child and parents, and making recommendations based on assessments. In the initial activity, mediating artifacts are physical tools like pens and paper for handheld recording, and abstract tools like social workers' practical experience and theoretical knowledge of similar cases. Feedback from the preliminary action results takes the form of feedback from subject to community (in the form of his or her guardian), on the basis of which further actions may involve new activity systems. For example, a case conference (another abstract artifact) may reflect representatives from social services departments, the child's school or nursery, the child's doctor, and, if parents are "known to the police," relevant community personnel (examples of clear labor division). Results of that action may be a decision to place the child in welfare homes (which involves another activity system). Initially, placing the child at home before further assessment may lead to their adoption (another activity system). Further results may involve litigation cases against parents for child abuse, involving yet another activity system.

Our interest in information behavior would lead us to explore the nature of information available to different groups in different activity systems, the nature of information created during activity development (case records, case conference minutes, etc.), technical systems established for managing different information sources, information flow from one activity system to another, and the extent to which different interests of different groups in different activity systems may hinder information exchange. In fact, this issue was rarely explored in Wilson and Streatfield's original survey, but adoption of an activity theory framework immediately draws attention to exploring many contextual issues affecting information behavior and exchange.

Another example involves mediated information searching. The inquirer provides this background for information search activity: "For many years, I and most other colleagues have been researching property rights of coal mine waste soil. Now we mainly focus on landfill construction issues. Today, the Environmental Agency has been requiring us to integrate best practice literature for handling coal mine waste soil, not only for landfills but also for other ground

work and construction. As part of these documents, we need to compile all literature obtained from all different information sources.”

Here we see, in activity theory terms: motive—an external requirement from funding agencies for documents on best practices for handling coal mine waste soil; a statement about “goals” (preparatory content before document completion) and explanation of labor division throughout the project. Similarly, this plural usage indicates that search tasks are the main content of labor division. Although in-depth case exploration is not this research project’s purpose, it is easy to see that an activity theory framework would allow continuous tracking of case progress to explore how people divide labor in information seeking (and information creation) activities, what informal norms activity groups establish to divide work content, share work results, and understand labor division.

The aforementioned AIM technology research group also uses activity theory as a theoretical framework to implement information behavior research in different contexts. For example, besides the previously mentioned paper by Allen et al., activity theory has been applied to study police officers’ information behavior involved in “traffic stops” (e.g., tracking and stopping suspicious or wanted vehicles), demonstrating activity theory’s ability to assist micro-level analysis.

Undoubtedly, the proportion of activity theory applications in many areas of information research may grow, as the framework provides numerous ways to address problems and is very helpful for defining contextual information about activities. However, we should not consider it a theory without criticism; in fact, it has faced severe criticism in many areas. Some criticisms are quite foolish! Nardi mentions: “Recently, a major American human-computer interaction journal refused to publish several papers on specific issues of activity theory. The concern is that activity theory is difficult to understand because we have not seen its actual benefits in concrete empirical research, and the benefits of spending time learning it are also doubtful.” This view is laughable: researchers and even practitioners should refuse to adopt an investigation and analysis model because it is “difficult to understand.” Other criticisms are more illustrative; for example, Tomi claims activity theory is “a dead end for seeking to understand human consciousness.” They believe “taking activity as the unit of analysis prevents us from distinguishing many qualitatively different underlying psychological mechanisms that are considered the same activity when observed externally.”

More diverse criticisms of activity theory appear in a volume of the *Educational Review* journal, where three papers mention fundamental issues—what is considered EAT (Engeström’s Activity Theory). “Engeström’s activity theory” is too complex to detail here, but Avis argues that activity theory cannot address power issues in political institutions and violates reality by proposing the hypothesis that organizational change is a conflict-free, apolitical process. This is a powerful argument; Engeström’s model indeed does not mention power relations in organizations. Pihl also expresses concern about Engeström’s activity theory’s political stance, arguing that in transforming Soviet activity theory, he has

essentially cut off connections with Marxist philosophical foundations. Overall, Engeström's activity theory neglects consideration of cultural-historical factors. I can understand this view because, although Engeström calls this theory CHAT or Cultural-Historical Activity Theory, his theory often lacks examination of organizational culture or activity history. Finally, in the third paper, Bathurst expresses reservations about the coherent yet controversial views of these Soviet scholars on activity being transformed into research models. In understanding this concept, he writes: "I must now honestly admit that I am not quite sure I truly understand the concept of activity. I am not sure what matters can be labeled 'activity theory,' nor am I sure there is any stable view of what the 'activity method' is or could be. I wonder if we are really trying to say that activity is the essence of consciousness."

Despite various criticisms of activity theory, what conclusions should we draw about its usefulness as a framework for information behavior research? First, whether philosophical or ontological issues, "these questions may have an activity-based concept" is reasonable. Engeström's exposition of activity theory provides information behavior researchers with a framework that will help develop clear statements about the nature of investigated problems and ensure that all relationships within the activity system are understood.

Second, researchers should remember activity theory's origins and its nature of development within the Soviet system: it was stillborn at birth, and its development process was even more chaotic. During the theory's development, parts of Vygotsky's ideas were lost, or at least submerged in Leontiev's reorganization of these ideas. In my view, Vygotsky's key insight was that activity and consciousness are interconnected: our actions on objects affect our perceptions of objects, and changes in perception may affect how we understand and deal with objects.

Second, signs are the most important devices in human activity. When physical devices can act in this way in object transformation, it is useful to remember his distinction between tools and signs. Tools exist outside the human body and are used to transform activity objects, while symbols exist inside the human body and are our means of communicating with others about specific objects, specific activities, and tools used. These tools and signs are shared by community members where activities occur. We can view this social sharing as the basis for labor division and the evolution of rules and norms guiding tool use.

Third, we should not forget what CH in CHAT refers to: tools, signs, activities, objects, actions, and operations all originate from specific cultural-historical backgrounds, which may be the activity under investigation, the system or organization where the activity occurs, or society as a whole. It is demanding to ask researchers to observe all of this, but at minimum, we can require that he or she knows the context and is always ready to examine the importance of cultural-historical background to the investigated activity.

Section 2: Critical Theory

1. Main Theoretical Ideas, Philosophical Foundations, and Leading Figures

Habermas is the most influential and comprehensive second-generation theorist, with basic second-generation theorists centering on Habermas' s "communicative rationality" to clarify the theoretical and normative foundations of today' s Frankfurt School projects. His work focuses on universal pragmatics ideas, skills or communicative competence required for participation, and people' s liberating interest in being forced or refused full participation in the public sphere. Review of some of his major works suggests how critical theory can be applied to continuous information search situations and systems.

His work *The Theory of Communicative Action* centrally reflects Habermas' s achievements: reshaping people' s daily speech act capabilities, emphasizing universality of action and language activities. It mainly includes system and lifeworld, communicative interaction, needs for science and communicative competence, and ideal language environments.

The lifeworld has three components: **Culture**: "The knowledge store that people engaged in communicative action use in their understanding of something in the world, representing facts independent of human thought and common references for determining truth." **Society**: "The legitimate order forms that people engaged in communicative action collect," composed of intersubjective relationships. **Personality**: "Acquired abilities enabling a subject to speak and act, thereby participating in mutual understanding processes in given contexts and identifying themselves in moving interactive contexts."

Communicative competence covers a person' s knowledge and abilities, as a member of a given sociocultural community, to use all available symbolic systems. Individual limitations, purposes, and abilities to interpret other participants' linguistic hints largely determine interaction outcomes and should be part of any information system design.

Challenges to empiricism and technical interests lead some to consider it one-dimensional, and emphasizing universal potential and individual liberation denies the victims required by many postmodern theories (e.g., Butler). Kompridis claims Habermas has abandoned social change and critique of capitalism. Seyla Benhabib, often representing critical theorists, combines Habermas-inspired theory with communication ethics and feminism and cultural relativism, although other feminists believe Habermas does not pay enough attention to these theories.

Despite different forms of linguistic analysis, what truly dominates research and practice is the essence of knowledge forms and phenomena? How can others' work, especially literary theory and aesthetic theory, be used to understand interpersonal relationships in a world of continuous technological development? How does language achieve its own purposes? What types of "pragmatic needs"

and “communicative competence” are needed to participate in computer-based public domains? What is the nature of interpersonal and intergroup negotiations, and how does critical theory address conflicts? What is the relationship between “truth” and modernism, postmodernism, and poststructuralism and other theories used in research fields? Can research field members critically reflect on their own choices and the entire research field’s non-critical assumptions? What are the consequences of abusing scientific methods? Can they “deceive” researchers and the public into self-suppression? How do epistemological conditions of knowledge vary according to different theoretical approaches, and ultimately, what are the ethics and responsibilities of knowledge and knowledge institutions in modern democratic societies?

2. Application of Critical Theory in Information Behavior Research

Critical theory or critical theory research programs encompass entire societies. If focusing on information seeking behavior, emphasis depends on researchers’ interests, with information influenced by society or identifiable groups or subsystems within society. When applied to the information industry, critical theory questions the legitimacy and practices of institutions, subsystems within these institutions (such as practitioners and managers), interpersonal relationships between practitioners and the public, and technology-based efforts such as information retrieval systems and visualization interfaces.

Critical theory should be seen as a potential method to resist abuse of empiricist measurement in the information industry or mass media channels. Critical theory also guides us to question how social institutions rationalize knowledge, requiring us to cultivate the ability to lead demand consciousness by overcoming social problems.

(1) Theory and Practice in Our Scientific Civilization Scientization of politics—the trend of applying empirical techniques to predict and control democracy and publicize it; critique of instrumental rationality—the use of information resources in work and information systems that intentionally or unintentionally mislead or avoid responsibility for truth or falsehood; better understanding of historical impacts of realism, contemporary philosophy, and critique of information organization.

(2) Knowledge and Human Interests Researchers can act by abandoning information research and information seeking behavior to ask historical hermeneutics: what are the actual interests of science? How do knowledge, knowledge institutions, and technology-driven mass media channels affect individuals’ release of interests?

(3) Communication Theory Communication theory spans symbolic interaction and pragmatic analysis, enabling close dialogue between critical theory and Heidegger, Gadamer, and media research norms. This has sparked huge

controversies involving poststructuralism, hermeneutics, critique of the Enlightenment, and critique of history and politics.

Critical theory should be applied as a participation or communication model in all learning fields to break away from the “black box” model of user seeking behavior. Therefore, information seeking behavior researchers can consider the ethics, authenticity, and potential universality of information-related behaviors.

(4) Theories Used in Information Research Critical theory’s broadest theory has led to much contemporary theory and research, such as cultural studies, literary theory, gender studies, postcolonialism, postmodernism, semiotics, identity theory, cultural anthropology, and linguistics. It is increasingly necessary to consider how some more closely related critical theories are applied. Some tend to borrow these theories in useful and informative ways to critique institutions, work results, behaviors, and technology. However, this discussion is not very inclusive, and arguments are usually not accurate reflections of theorists’ ideas. For example, Floridi’s combination of information and critical theory, though popular, remains to be verified.

Section 3: Personal Construct Theory

1. Main Theoretical Ideas, Philosophical Foundations, and Leading Figures

Personal construct theory emerged in the 1950s as both a personality theory and foundation for clinical psychology. It is built on the core premise that humans construct their own knowledge and understanding of the world through active cognitive construction and meaning creation, parallel in some ways to the scientific process. Personal construct theory focuses on people’s general methods for understanding and mastering society.

Kelly views individuals as agents who design and modify conceptual templates called personal constructs, enabling them to explain, predict, and cope with phenomena encountered in the world.

Individuals construct meaning from experience and refine it over time. Overall, Kelly’s theory focuses on how humans interpret the structure and function of their experiences and the organization of personal construct systems and their changes over time. Kelly’s supplementary methodological contribution in his theory is called the Kelly Grid (repertory grid), involving researcher-elicited dichotomies or personal psychological constructs. This heuristic method is also applied in clinical psychotherapy contexts to transform individuals from states of psychological conflict or inconsistency to higher levels of self-awareness and cognitive integration. Through Cole’s application of human information behavior theory in work, personal construct theory promotes information scholars’ understanding of knowledge development processes in information contexts and

enables information professionals such as librarians and school librarians to more effectively design and support information users' learning experiences.

This theory provides Kelly's contrast to behaviorism, viewing individuals as passive responders to environmental events. The theory is also positioned by Kelly himself and secondary sources as contrary to earlier psychoanalytic and psychodynamic theorists who viewed individuals as "passive responders to internal unconscious forces." Personal construct theory's basic assumptions demonstrate central agency and autonomy in the theory. The assumption proposes that "a person's processing is channeled by the way he anticipates events." Through channeling, Kelly conceives human psychological processes as operating through structured path networks that are flexible, frequently modified, and can facilitate and limit a person's range of action.

Kelly believes humans are scientists seeking foresight, with a general tendency toward real events in the future. Overall, in personal construct theory, humans do not react to the past as much as they anticipate and extend into the future. Through foresight, prediction, and preparation, they "beat the world." Future expectations provide constraints between our planning of current meanings. Thus, in the theory, "a person understands his own nature and the world's nature in business, and tests this understanding in how to guide them and make them see immediate and long-term futures." These authors note that for Kelly, the science and invention of personal constructs share the same core characteristic as art—imagination. In personal constructs, people imagine and anticipate future events, characteristics, and possibilities.

2. Corollaries of Personal Construct Theory

Outlining the theory's premises, Kelly defined 11 corollaries under the above basic assumptions, elaborating his views on human prediction and imagination disposition. Each corollary is briefly described below.

In Kelly's **Construction Corollary**, we predict future events based on our interpretations or constructs of recurring themes from previous similar experiences. Kelly says: "In construction, people notice characteristics in a series of elements that characterize some elements and are particularly different from other elements in differentiation processes." In the subsequent **Dichotomy Corollary** stage, similarity and contrast are inherent to the same construct. He proposes that this construction process differs from linguistic expression. Kelly says, "Prediction does not mean tomorrow is a repetition of today, but that we can safely predict tomorrow's events will replicate today in some aspects." Thus, we predict by interpreting replications of given events. Our personal constructs are essentially visions, interpretations, and meanings produced by our experiences of given understanding units. Also consider how we expect constructs to represent our preferences to move forward. Our personal constructs anticipate future applications. Subsequent corollaries are described more briefly and can be found in detailed form in Kelly's research.

The **Individuality Corollary** stipulates that people have different experiences. Therefore, we interpret events differently. We are based on common experiences and based on the common point that others' experiences differ from ours. According to the **Organization Corollary**, we organize our personal constructs in a relational system where some constructs are in superordinate positions and others are subordinate. This organization allows us to minimize incompatible structures. This system develops, but not as easily as individual constructs constituting the system itself. People must make decisions about remodeling the system: how much must be dismantled to accommodate new experiences?

Kelly states that choices must be made between maintaining system integrity and replacing its defective components. In some cases, predicting events will be more effective if the system is preserved. But in other cases, remodeling will improve anticipation and enable better preparation. Here, one can begin to imagine the role information may play in future expectations.

In the **Dichotomy Corollary**, Kelly proposes that all personal constructs are dichotomous, meaning we interpret events in an either/or manner. Kelly calls these dichotomous construct directions. Construct concepts require identifying two dimensions (or states) of a concept. The two dichotomous directions are considered chronologically because when one supports its construct as replication experiencing two consecutive events in time, there must also be an opposite way—that is, a third event may not be a replication of the first two instances. In this formulation, event aspects are constructs, and changes in first and second event aspects with possible third event changes represent dichotomy.

Specific directions or constructs may or may not be related to other events, or related to what Kelly terms the range of convenience. His Kelly Grid method is largely based on this Dichotomy Corollary. According to the **Choice Corollary**, we choose alternatives in dichotomous structures that we believe expand our future choice ranges in advantageous ways. Kelly says we assume “whenever a person faces an opportunity to make a choice, he will tend to choose the alternative that seems to provide the best basis for anticipating subsequent events.” Kelly believes individuals tend to develop in directions that make their systems more explicit. However, one can think of many instances where we actually do the opposite; Kelly points out that internal conflict is often a problem, balancing “the reliable certainty of a narrow world and the uncertain possibilities of life adventures.” We make choices that lead us to be increasingly certain of fewer things, or “vaguely aware of more and more things on a foggy horizon.” Kelly himself positions the Choice Corollary in contrast to “hedonism and incentive theory,” contrasting his behavior with psychoanalytic terms. He notes that in personal construct theory, “there is continuous movement toward anticipated events, not a series of barter trades for temporal satisfaction. This movement is the essence of human life itself.” In his comparison (which has been criticized as oversimplified), he believes this movement is neither external rewards nor complex psychological development and psychosexual drives, but a fundamental human tendency to accumulate knowledge anticipating future events.

Kelly's **Range Corollary** shows that constructs are limited to specific ranges of convenience—that is, they are not relevant to all situations. Those outside a given concept or direction's range of convenience and its dichotomous conditions are not considered part of the contrast field but are simply irrelevant zones. His **Experience Corollary** states that as a result of experience, we continuously modify our personal constructs. As expectations or hypotheses are continuously modified according to the unfolding sequence of events, the interpretive system undergoes gradual evolution. Kelly notes that in this regard, hypothetical learning occurs. However, the **Modulation Corollary** shows that not all new experiences lead to modification of personal constructs. If structures are permeable to some degree, they can be changed through experience. However, concrete or impermeable structures can resist modification regardless of our experiences. People with new perspectives need experiences that must be interpreted for any meaning, requiring conscious reflection. Kelly says: "People cannot learn concrete things merely by feeling stimuli imposed on them; they can only learn frameworks designed to allow them to see such stimuli." According to this idea, the **Fragmentation Corollary** says our behavior is sometimes inconsistent because our construct subsystems can easily accommodate incompatible elements and conflicting functions. The Modulation Corollary implicitly tolerates inconsistencies between subsystems. Depending on the superordinate and subordinate characteristics of systems invoked in given contexts, the impermeability of specific structures can stop learning.

The **Commonality Corollary** supplements the Individuality Corollary, showing that our personal constructs tend to be similar to those of others' construct systems to the extent that we have had similar experiences to others. Kelly describes an "expectation similarity" in personal sharing of their expectations. They participate in future expectations based on personal constructs built on common experiences with others. Finally, the **Sociality Corollary** shows that we can communicate and function in social processes involving others because we can interpret their constructs. We not only observe others' behavior but also interpret what this behavior means to them. We need not share the same prospects, but we must be able to understand theirs. And this understanding can be mutual. In other words, commonality is not a necessary condition for sociality.

Kelly constructs knowledge structures in personal construct theory, and the metaphor of individuals as scientists has clear conceptual connections to cognitivism and constructivism. One immediately thinks of Piaget's theory, which titled his work "To understand is to invent." However, Kelly says that in his theory's overall view of people, "the classic tripartite division of psychology into cognition, affect, and politeness has been completely abandoned." In this theory, he believes cognition, affect, and behavior are all integrated and interrelated dimensions of a person's learning and personal construct development processes, subsequently providing insights and conducting research that plays roles in both education and healthcare. This holistic approach influenced Kuhlthau's treatment of information search processes, involving the same three dimensions.

3. Kelly Grid Technique

To conduct empirical research on his theory, Kelly developed the repertory grid method for research that can be upgraded to clinical psychotherapy techniques. The method is mainly built on the Construction and Dichotomy Corollaries, introducing a subject to reveal dualities in their mental models. The method is primarily based on the Construction and Dichotomy Corollary, introducing subjects to reveal dualities existing in psychological patterns. Researchers help individuals identify, define, and limit specific aspects. In interview environments, using grids allows researchers to understand a person's inferences, interpretations, and how they assign meaning and significance to their experiences. Through heuristic processes, researchers or clinical psychologists better understand implicit concepts in participants' worldviews.

When introducing this technique, Fransella, Bell, and Bannister use the interesting example of participants having the view of "cold eyes" vs. "warm eyes." Participants are asked about physical characteristics of appearance and connections between human despicable and generous qualities. In this example, the authors consider a four-variable chi-square grid conceivable, where participants count individuals they know who have been assessed for facial attributes and individual positioning (stingy or generous). Here, the theme triggers his or her experience of the world in establishing associations or relationships between cold eyes, meanness, and warm eyes, generosity.

This theme can then serve as the root judgment entering the grid, previous associations, and nature previously mainly judged intuitively, masking our implicit theories of the world. With repertory grids, expert interviews aim to develop conscious and unconscious understanding of these theories. In therapy, discussions make these implicit theories more conscious to subjects, allowing therapists to help identify themes that may limit their freedom of choice and realization possibilities.

Bell's research shows that in the 1960s, the grid technique began attracting attention when Bannister and Fransella published studies on its use with schizophrenia patients in the UK. From the 1980s to early 1990s, the method was more widely applied in the UK than in the US, but according to Bell's citation analysis in the PsycINFO database, research on the technique has begun to decline. However, it continues to be used in psychotherapy contexts, and Fransella's work chapters include discussions of grid theory and grid technique still being applied for various purposes including nursing, family therapy, police force training, teacher education, and organizational change.

Reviewing Kelly's original magnum opus, Jerome Bruner praised the theory on its book cover, describing it as "a truly new starting point, making an outstanding contribution to personality psychology." However, he also noted: "Professor Kelly seems to have paid little attention to previous theories. Missing citations include works like Piaget's 'The Child's Construction of Reality,' Werner's early works, and works by Sullivan, Lewin, and Allport—who lived around

him and were good citation targets.” Others have pointed out that “limitations of ideas and viewpoints allow it to be applied to work originating from other traditions, but it is not sufficient as a complete theory.” Kelly has also been criticized for superficially handling proposed distinctions between personal construct theory and existing psychological viewpoints, particularly psychoanalysis. However, Neimeyer shows that Kelly’s mistake was failing to find intellectual support from compatible phenomenological and existentialist thinkers, possibly because he lived in a small Quaker university in the rural Midwest, lacking firsthand knowledge of traditional theories when proposing his early academic career theory, making it less possible that Kelly’s work errors and desire to distinguish his theory were due to oversight.

Kelly’s biography notes that his rural roots in theory building and somewhat one-sided ideas away from education are attributed to his representation as almost a folk hero. Neimeyer discusses Kelly’s childhood in rural Kansas, raised by his highly religious parents as “the last family on the American frontier” in the Bible Belt. Fransella notes that Kelly was influenced by Dewey, Vaihinger’s “as if” philosophy, and pragmatic philosophy of constructive alternativism. He viewed Moreno’s psychodrama work as a prototype for Kelly’s use of role-playing strategies in personal construct therapy methods. Neimeyer notes: “Kelly’s childhood self-reliance seems reflected in the form and content of his theory.” That is, Kelly attributes agency to individuals in our ability to cultivate our own knowledge and reshape personal structures through deeper understanding and self-correction of contradictions to develop greater freedom and self-determination.

Kelly’s contributions to psychological theory were recognized by core figures including Bruner. Kelly suddenly died in 1967, having established his academic position after the late 1950s, first at Fort Hays Kansas State University, then Ohio State University, and finally in 1965 at Brandeis University, where he actively engaged in lecture careers at the invitation of Abraham Maslow. Since then, he held leadership positions in the American Psychological Association and cultivated loyal graduate student teams in the US and Europe to refine his original works. His work has now been overshadowed in psychology by the cognitive revolution (perhaps partly due to his untimely death), but his theory still sees the following, especially among experienced constructivist technique clinical teachers in the UK.

4. Influence of Personal Construct Theory

Personal construct theory has influenced academic achievements in multiple fields and disciplines, including information science, clinical psychology, educational psychology, organizational development, and market research. Kelly’s work strongly influenced information scientist Carol Kuhlthau’s information search process model, as well as the inquiry model and design for school library usage instructions under her guidance.

During her doctoral studies at Rutgers University in the 1970s, Kuhlthau first discovered this theory when considering the interaction between information seeking and learning phenomena. The theory was included in reading lists for educational psychology doctoral seminars offered by the Graduate School of Education. She also discovered that the cognitive construction process described by Kelly's theory was closely related to library information user opinions and school library environments she was investigating at that time. Her doctoral dissertation cited Kelly's literature review, outlining Kelly's basic assumptions and corollaries, as well as major theoretical principles related to assumptions in the information search process, which became the main content she continued to investigate and report in empirical papers.

Kuhlthau's subsequent career academic achievements basically positioned information seeking within the knowledge construction process. She drew on constructivist theory to help explain information user participation, thereby accumulating knowledge and asking about the entire construction process of behavioral meaning. She noted: "At least for oneself, this is personal constructs from a personal perspective or creating something new by taking collected information as the research center, which fits with the concept of construction." Her research was unique at that time because it strengthened discussions in the information behavior field when introducing learning theory perspectives. Kuhlthau's work *Seeking Meaning* summarizes the theoretical foundations of her research. She tested each theory and identified relevant domains to make information seeking unique. She drew on Dewey's construction ideas, including the ability of individuals to transfer knowledge through action and reflection. Situational information seeking in the second part drew on Dewey's reflective thinking model's intelligent stages during the campaign process: stages where learners conceptualize problems. Later, she established Kelly's concepts of continuous personal development ability and learning ability through personal construct evolution. She cited the predictive function in Kelly's work as central content in the construction process, where prediction drives behavior that confirms or negates behavioral constructs.

Kuhlthau used Kelly's holistic approach to human psychology described above as a blueprint for developing the information search process, conceptualizing information seeking as three distinct dimensions of cognition, affect, and behavior. In this way, she again contributed to the field's research on the interaction of thinking and feeling as collaborative operational aspects of learning, which were usually not involved in more cognitive information processing models of information behavior in the 1980s. Figure 9.2 provides Kuhlthau's model as a reference point, explaining how these three complete domains operate at model stages. Research on the entire process shows that when encountering more complex tasks where goals require considerable information seeking, construction, and learning, people are likely to experience processes described in the model.

[FIGURE:9.3-1]

5. Uncertainty Theory

Kuhlthau's uncertainty principle may be the most direct influence of Kelly we can see. He discussed and proposed the basis for the uncertainty principle. When Kelly "described personal experience in the construction process, a dynamic, uncertain process was revealed." She also noted: "When [Kelly] described people at work, through a series of choices among alternatives, these choices could be anything but were obvious and direct, especially in early stages." In this way, Kuhlthau maintained her influence in the information behavior field; she noted: "Users' emotional experiences may have profound impacts on the construction process," discussing cognitive states where uncertainty leads to anxiety and lack of confidence emotional symptoms. She noted that in early stages of the information search process, individuals may hold vague and unclear ideas about a topic or problem, triggering these characteristics. She noted that the state of knowledge transforms into clearer, more focused thought, just as the process moves in parallel with increasing confidence feelings. Outlining the premises of the uncertainty principle, Kuhlthau drew on Kelly's patterning method, presenting it as a set of corollaries, restated below. Like Kelly, she focused on factors such as confusion, doubt, and possible threats, especially threats that may exist in early stages of knowledge construction, as well as inherent anxiety and difficulty in personal construct change processes.

(1) Process Corollary The information search process includes people's active seeking of understanding and meaning construction of information encountered over time. Like search progress, this typically experiences a series of transformations from vagueness and anxiety to clarity and confidence.

(2) Formulation Corollary Formulation is thinking, developing an understanding and extension, and defining a theme for information that emerges in early search stages. Formulation of focus or guiding ideas is key. In information retrieval processes, when general topics become uncertain and from a specific perspective, the key point becomes the transformation from uncertainty to understanding.

(3) Redundancy Corollary The interaction between seeking expected or redundant information and encountering unexpected or unique results leads to potential stress in the information search process. Redundant information integrates with what users already know and is easily identified as relevant or irrelevant. Unique information is new and expands knowledge, not fitting useful, human structural needs reconstruction. Too much redundant information leads to boredom, while too much unique information also causes anxiety. Lack of redundancy in early information search stages may be the root cause of uncertainty anxiety. As redundancy increases, uncertainty may decrease.

(4) Mood Corollary Mood, expressing a person's position or attitude, affects personal information retrieval. Kelly proposed that extroverts value outward

exploration and discovery, seeking answers, while introverts tend to find answers inwardly for problems. Emotions are likely to fluctuate and change during information retrieval behavior. Extroverts are likely to gain advantages early in information retrieval, while introverts are likely to gain advantages later. Extroverts prefer broad information retrieval methods, while introverts prefer retrieval within a fixed range.

(5) Prediction Corollary ISP theory refers to theory that predicts future actions based on a person's previous series of choice tendencies. Predicting future search behavior based on past experiences using information sources, content, and search strategies is reliable. Through the above, choices users make at various stages of information retrieval can be predicted. People often judge whether currently retrieved information sources and content are relevant based on their own expectations of information content. Different people have different judgments of information relevance, so there are no specific rules limiting this.

(6) Interest Corollary People's interests can increase their information retrieval behavior. Personal interests and knowledge backgrounds affect information retrieval behavior. Personal interests may increase information specificity, reducing uncertain information retrieval behavior. Information retrieval behavior increases as people's interests grow. Kuhlthau noted that after people have found focus and have some understanding of that content, later interest will increase. According to Kelly's basic prediction corollary, there is a clear connection between information redundancy and prediction corollary. He agrees with Bruner's view that they see the role of prediction or anticipation in identifying information redundancy: "There is a unique place in our system that issues cues limiting how much new information we can obtain." Early ideas are vague and scattered, with high information uniqueness and low redundancy. At any stage, a person wants to avoid too much uniqueness (or redundancy) information. Both Kuhlthau's and Kelly's concepts further deepen their information search process theories.

Kelly explained how emotional experiences affect information construction. Information is chaotic at the beginning and slowly sorted out later. Chaos causes inconsistency and incompatibility between new information and existing information. Due to information chaos, it makes people question their ability to absorb new information. Chaos may interrupt new thinking and discard new information. Regarding this, Kelly proposed another theory. People may integrate existing information and new information to form preliminary hypotheses. Although Kelly's previous views were not novel enough and encountered bottlenecks in practical work, it can be clearly seen that Kelly's information behavior views are similar to Kuhlthau's.

As discussed in the above quotations, when individuals form new expected hypotheses, Kelly's views show that individual tendencies choose to test them against future situations or actions, that is, opening possibilities for learning

choices, which means decision-making and new construct development processes. Kuhlthau cited elaborate choices, which broaden understanding of a Kelly concept, to represent this hypothesis generation and testing process, where new information plays a driving role. The stakes seem high here—abandoning construction due to confusion and doubt will hinder integration and growth, while making elaborate choices (bold exploration and experimentation) can broaden one's horizons. Views on the potential role of scaffolding and intervention in this process begin to emerge.

6. Application of Personal Construct Theory

Besides its clear influence on Kuhlthau's project, a few additional research reports have also verified that personal construct theory can be directly applied. Hunter, Caputi, and Tan theoretically propose summaries of information systems and discuss techniques applied in human behavior project network research aimed at understanding end-user behaviors in adopting information systems. Research has begun discussing how to introduce human behavior project network techniques into various information systems research work.

Human behavior project network techniques record large amounts of information and footnotes generated by participants during interviews, which are useful for researchers to pan for users' ideas and behavioral patterns. If researchers want to understand user ideas from specific perspectives, it is necessary to describe different thinking patterns according to different participant types. They cite three studies that have applied human behavior project network techniques, where users' knowledge acquisition methods differ due to their different background knowledge.

Section 4: Personality Theory

1. Activity Theory

A person's personality may be the same as everyone else's, may be the same as some people's, or may be different for everyone. Since the emergence of humans, it has been known that people differ in thinking, perceiving, and behaving. According to personality (individualization) theory, over time these differences eventually form fairly stable patterns. The importance of personality differences and their consequences in various situations has also been historically recognized. For example, Plato noted that when selecting a king to rule an entire country, his personality and possessed qualities are very important evaluation indicators. Currently, there is no clear interpretation of personality differences. Even today, despite advances in biochemistry, genetics, and other disciplines providing increasing theoretical support for basic biology, people still do not know the exact mechanisms behind forming different personality types. There always seems to be a significant connection between personality

and physiology. Based on early theories, four basic personality temperaments were developed and linked to basic biology. The theory proposes that choleric temperament results from yellow bile. Such people are extroverted, enthusiastic, and energetic. Conversely, phlegmatic personality is caused by phlegm—such people are relatively quiet. Optimistic mindset has much to do with blood (sanguine), and melancholic personality is dominated by black bile. Describing people with these personalities as a whole, in the form of personality typology, reveals more detailed specific characteristics of various personalities in greater detail. Anyone has some unique personality that is the cause affecting his/her behavior. To roughly understand how personality differences affect people's behavior, consider using similarities between personalities to group numerous individual personalities into manageable categories. One of the early famous personality behavior research organizations, the personality behavior classification theory around 300 BCE, embodied classification thinking that also played a key role in the rise of modern personality psychology.

Entering modern society, scientific research in the personality field in the 1930s further evolved and developed based on predecessors' work. The lexical hypothesis was one of the driving forces of this stage's development, encoding core parts of personality traits into natural language because these personality traits would have social importance and be sufficient for language expression. Some believe that by organizing feature descriptors in taxonomy, core dimensions of personality traits will emerge. Early lexical encoding research categorized 18,000 terms into four major categories, being particularly interested in distinguishing combinations of each person's personality characteristics. Focus on common characteristics laid the cornerstone of modern personality theory, proposing core dimensions shared by humanity. Personality characteristics are divided into hierarchical structures from large to small categories, from broad conceptual superordinate categories to specific features including subordinate categories. He believes human personality characteristics have different hierarchical depths and meanings: the core of individualization remains constant throughout environments, while the outermost level (extension) is most susceptible to change.

Despite predecessors' interest in personality differences and structures, the personality psychology field has not been without progress. With the rise of social psychology in the 1960s, another challenging period in personality research history followed. This was an era spirit moving from egalitarianism to democracy and equality. Personality differences and their influence on behavior were certain and hierarchical. However, personality research was criticized as lacking theoretical depth and empirical contributions, this criticism coming from some failed studies that could not demonstrate any influence of personality traits on behavior.

Situational explanations became frontier issues. In highly influential statements, environment's influence on behavior was greater than personality traits. The subsequent 30 years are sometimes called the "Dark Ages" in personality psy-

chology history. In the late 1990s, the tide turned again, with personality psychologists proposing increasing theoretical evidence for personality's biological foundations. Consensus in this field on core dimensions of personality traits (the Big Five) paved the way for major scientific advances.

2. Current State of Theory

After years of intense debate, personality trait research has stabilized into a research field: most scholars agree to establish core hypotheses supported by strong research evidence. Personality traits are regarded as continuous research dimensions that remain relatively stable over time. Personality traits are obvious in daily life and have genetic and physiological foundations.

However, personality is uncertain. Personality trait expression and influence depend on circumstances, which may change or even reverse typical reactions. In any case, personality traits are predictors of behavior. When comparing people's reactions in broad contexts, we find similarities. Therefore, personality traits can be used as indicators of behavior patterns. Below we elaborate the field's core principles:

- **Stability:** Personality traits remain stable throughout the life cycle
- **Heritability:** Personality traits can be linked to genetic structures
- **Universality:** Personality traits can be expressed in multiple situations
- **Interactionality:** Situational factors moderate personality trait expression

(1) Stability Nearly fifty years of research shows that our personality remains consistent throughout our lifespan. Personality traits may form and change slightly according to life events and personal development. However, these changes usually affect superficial personality features rather than core personality traits. Major life changes, trauma, or deliberate efforts often produce profound changes in personality traits. That is, maturity over time also often brings some improvement in personality traits. Cross-cultural research shows that as we mature, negative emotions, extroversion, and openness to experience tend to decline, while self-esteem, conscientiousness, and agreeableness increase.

(2) Heritability Increasing evidence illustrates the genetic and physiological foundations of personality traits. An overview of 145 studies shows that personality traits can be explained through genetic disposition. People who share genetics, like twins raised in different environments, tend to show similar traits. Therefore, genetic influence seems stronger than environmental influence in shaping personality traits during childhood.

During personality development and formation stages, personality traits seem to be influenced not only by heritability but also by learning and social environment. Social influences from cultural norms, education, and role models all help

shape our personality traits. As an example of interaction between inheritance and social influence, there are individual differences in reward and punishment brain systems, which may affect whether a person develops a primarily positive or negative mindset. However, children with physiological tendencies toward negative emotions may learn effective coping strategies from parents, which helps offset potential negative effects of this tendency.

In the research history on this point, there is not yet a set of physiological mechanisms through personality traits. We can only conclude that they seem to develop and manifest through various mechanisms. It may also be that assumptions of causal models or direct correlations between personality traits and their physiological foundations are essentially wrong, because any trait appears to be constituted by broad mechanisms. For example, multiple pathways linking negative emotions (neuroticism) to vulnerability have been described as “neurotic cascades.” One way to conceptualize consistency in personality traits is to view them as functional rather than structural, because they reflect a person’s core goals and strategies for coping with life challenges. As Matthews states: “The coherence of personality traits is functional rather than structural. Personality traits are a whole, representing higher-level models or assemblages constituted by many parts, not determined by any single component.”

(3) Universality The universality of personality traits is another core hypothesis, emphasizing that personality traits influence behavior across broad situations. Behavioral consistency is introduced by situational elements in “if ...then” forms rather than being statically carried into different situations. For example: negative emotions mainly manifest in situations individuals perceive as threatening. Moreover, the universality concept is relative to some extent—that is, behavioral consistency emerges compared to others rather than through observing any individual’s behavior, because such behavior may vary greatly by situation. For example: usually comparing people’s social abilities across various situations, extroverts are more talkative than introverts, but in specific situations the opposite may be true.

(4) Interactionality The interactionality perspective has somewhat acknowledged that both personality traits and situations influence behavior, with more detailed examination of mechanisms through which this occurs. Clearly, personality traits influence behavior more strongly in some situations than others, while some people are more sensitive to situational cues than others. Interactionality research results paint a complex picture that hinders simple conclusions. For example: research shows that factors such as caffeine intake, sleep, time of day, and reward/punishment expectations affect whether extroverts or introverts perform better in tests. Overall, people tend to be attracted to environments that match their personalities. Generally speaking, different situations give different people opportunities to express themselves. Snyder and Deaux’s research illustrates an example of a person interacting and competing with their environment. In social psychology, competitive situations are known to

bring competitive responses from most people. However, personality psychologists believe competitors often actively seek such situations because they can thrive in these environments. If we want to understand how environments affect a person's behavior, it is necessary to consider how and why the person places him/herself in such situations. Moreover, these situations may strengthen inherent tendencies and even develop personality traits, causing people to voluntarily or involuntarily frequently find that over time, being in competitive states enhances their competitive spirit.

3. Five-Factor Model

Personality psychology made an important leap in the 1990s, reaching consensus on five core dimensions of personality: the Big Five personality traits. The concept of five core dimensions is not uncommon, but it was not until the 1990s that it gained universal recognition and establishment. Through various research methods including self-reports, observer ratings, questionnaires, and personality trait adjective lists, descriptions of personality traits were found to roughly divide into five dimensions. The Five-Factor Model describes these dimensions in order from highest to lowest stability: neuroticism, extroversion, openness, agreeableness, and conscientiousness. For detailed trait explanations, see . In the Five-Factor Model, everyone's personality trait distribution follows a bell curve. In rigorous situations, we find extreme poles at both ends of this dimension: one end being extremely meticulous, conscientious people; the other end being extremely leisurely, casual people. Most of us may find ourselves between these two ends, or leaning toward one end, but this does not represent the whole situation.

[TABLE:9.4-1]

Although personality traits have commonalities, individuals' growth cultures significantly shape personal character because different traits receive different rewards and encouragement in different cultures. The importance various cultures emphasize on different traits may also affect how individuals view their relationships with traits. For example: conscientiousness is highly valued in Asian cultures, and people may perceive themselves as not rigorous enough when comparing themselves with hard-to-achieve cultural norms. Therefore, the Five-Factor Theory describes personality as a system based on physiological and sociocultural inputs, including basic tendencies (five personality trait dimensions) and adaptive characteristics (e.g., habits, attitudes, roles). Personality traits manifest through two basic processes: (1) interaction between genetically based traits and environments, leading to trait adaptation; (2) interaction between characteristic adaptation and environment at any given moment, which in turn produces specific behaviors and experiences.

The Five-Factor Model is based on five major trait dimensions, each containing more specific trait concepts. To deeply understand how traits function in specific contexts, often more detailed analysis of smaller personality traits is needed.

Just as traits differ in breadth, so do situations. As an analogy, broad levels can be compared with concepts like “plants” and “animals” in biology—we can describe broad differences. But this is less suitable for understanding specific behaviors in specific texts. Although the Five-Factor Model of personality traits is broad, there are still general traits not included in the Big Five. The basis for this argument comes from repeated research results showing that the five factors are not orthogonal but are in fact correlated.

Despite broad consensus on five core dimensions of personality, the Five-Factor Model has not been without challenges. Some scholars argue that certain important characteristics lie outside the Five-Factor Model, such as (emotional) control aspects and honesty-humility. Meanwhile, the model does not include specific cultural traits. Examples of such traits include interpersonal relationships in traditional Chinese culture, particularly prominent in Asian contexts. In addition, the content of the five dimensions has been debated. For example, some believe agreeableness is an aspect of pleasantness, while others classify it within extroversion. Despite recognition of variability and situational dynamics, personality theory still has problems explaining behaviors beyond personality, such as pleasant violence. Although these exceptions exist, they may in fact tell us something fundamental about personality functions.

Another major criticism is methodological. The Five-Factor Model’s establishment is empirical rather than theoretically driven and supported, such as by the lexical hypothesis. However, folk concepts—ordinary cognition of personality—should not be confused with psychological scientific concepts that describe and explain. “No one would believe that analyzing ordinary English terms for body parts would provide a sufficient foundation for scientific anatomy. So why would personality be different?” Trait theory has also been criticized for its reliance on factor analysis, a component extraction method that includes subjective decisions, and some question the correlation between peer and self-ratings, such as using 0.50 as a basis for rating validity. The theory’s supporters argue that empirical data accumulated through various methods, samples, languages, and tools have provided sufficient support.

Due to differences in social expectations, question interpretations, and answering styles, using questionnaires to investigate personality and behavior in personality research fields also has some controversy. However, deliberate distortion has been found to only have slight effects on constructing behavioral validity in real-life environments. This assurance does not solve additional measurement problems, such as whether they are sensitive enough to capture extreme expressions. There are also potential personalities we are not aware of at all, such as unconscious drives and needs. Another controversial aspect is the universality of scales. Contextualizing items by referencing conceptual related frameworks is one way to reduce interpersonal variability and individual inconsistency. An example is given of differences between generic items, such as “I pay attention to details” and “I pay attention to details at work.” The contextualization approach may still be problematic because trait theory is based on assumptions

of a certain degree of cross-situational consistency.

Scholars also note the lack of consistent theoretical foundations under the Five-Factor dimensions. Classical personality theory describes personality mechanisms and levels in concepts such as unconscious, id, ego, superego, archetypes, and external images. These theories provide descriptions of entire human nature rather than superficial manifestations of individual differences such as traits. Moreover, our inner personality experience is closely related to our life experiences, which contain more narrative identity. Scholars are currently working to build models combining trait perspectives and personal identity. Personality includes three levels: personality traits, adaptive traits, and integrated experiences. Personality traits describe people as actors with general behavioral styles. Adaptive traits include motivations, values, goals, and contextualized, dynamic coping strategies. Experience is an internalized and continuously evolving story that produces wholeness, consistency, and constructs life goals. It is formed based on the first two levels in interaction with people's psychosocial, cultural, and ideological environments. Although we have not yet reached final conclusions on personality theory, fortunately, the field still has many valuable parts awaiting further exploration.

4. Application in Information Behavior Research

Personality theory provides fruitful understanding for comprehending individual differences and changes in information behavior. Due to personality traits' strong genetic and biological foundations and considerable stability, it seems reasonable that personality traits gradually unfold in information behavior contexts. Interdisciplinary research reviews indicate that each dimension in the Five-Factor Model seems to have different influences on information behavior. Research on personality's influence on information behavior has mainly been conducted outside information research. The following review will focus on research conducted within this field.

Personality differences have long been recognized as having important influences in information behavior. For example, information search patterns have been linked to creativity and innovation. In more specific information environments such as database searching, personality is also an important factor. With the comprehensive development of personality theory, interest in this field began to gradually increase until the emergence of the Five-Factor Model.

Section 5: Practice Theory

1. Theoretical Overview

The practice approach includes a broad school of thinkers, but different schools share some common concerns, such as materials and concretization of practice approaches, processes, procedures, and changes, as well as social construction,

social identity, and prediction issues of practice approaches. Current research within the scope of information studies and other potentially related disciplines such as organization studies, media studies, consumer studies, education, and technology studies all adopt practice thinking. This chapter outlines the nature of practice theory methods and urgently explored questions, and reveals how practice theory methods should be applied in information research, especially in information behavior research. Evaluation of information research methods must consider how the method readjusts our research focus on information behavior characteristics, and whether the research method reflects this period' s trends, while acknowledging conflicts between this research and information science and library practice, as well as its critical depth issues. As a broad school of thought rather than a clearly documented theory, it has different expressions such as practice theory, practice-based approach, etc., and will be called the practice approach in this chapter.

At the philosophical level, the practice approach is a component of cultural theory, contrasting with other social theories that reflect individual purpose (micro-level) or social norm (macro-level) interests. It believes the practice approach is outstanding in cultural theory, that practice is part of entity action, and that attention should be paid to customary ways of understanding, recognizing, and requesting practices, rather than focusing on thoughts, texts, conversations, interactions, and other characteristics of other theories at this level.

Practice is a set of continuously changing and open-ended behaviors and statements, connected by practical understanding, rules, purposeful emotional structures, and general understanding. Therefore, whether action or speech act, it is the simplest level concerning human behavior.

Practical understanding is the reasonable skills and knowledge we implement in practice; rules are explicit guidelines on how to implement; purposeful emotional structure refers to emotions and expectations accompanying activities, tasks, or projects; general understanding refers to broad social beliefs or values expressed through numerous practices.

2. Application of Practice Theory in Information Research

Practice can be viewed from three perspectives: (1) From practice researchers' perspective, work produced by different practice researchers gives different feelings, with each proposing viewpoints and explaining why differences exist; (2) From practitioners' perspective, practice from the outside seems imitable and repeatable, while from the inside it is understood as achievements of technical emerging patterns; (3) From an ecological perspective, practice has broader impacts and effects.

In the information systems field, in the same decade, the practice approach has been used to reflect on long-term debates about information systems and organizational formation, considering technological determinism and social shaping of technology. It proves how technology' s meaning and impact are not pre-

given. Instead, how users establish usage protocols is central to developing technology enlightenment methods, which in turn are embedded in technical practices and then shape human behavior. This subtle understanding of continuous mutual influence between technology and activity is a further development of socially important concepts. Through this concept, attempts are made to adopt a relationship to explore. For the conceptualization of entity nature derived from practice theory, it is to avoid viewing technology as an exogenous force and to consider defects in the interaction of human interpretation forming technology meaning. In sociomateriality theory, technology's meaning from its connections with other entities is recognized, so if it has no meaning, it is either viewing technology as pre-given reshaping activity (tending toward technological determinism) or viewing technology as human shaping (downplaying technology independence). Technology's meaning, as well as the meaning of any object or entity including humans, all stems from their interrelationships. For some authors, this related thinking is an important feature in practice theory.

3. Application to Information Behavior Research

Mackenzie explains the importance of reflecting on identifying passive and accidental information activities that cannot be well represented in vocabulary information seeking. Furthermore, constructivism emphasizes the social environment rather than cognitive structure, and she says she prefers the vocabulary of information behavior. She emphasizes the meaning of concepts in discourse and active negotiation, such as the meaning of power. Mackenzie International Law Firm is an important reference point from deconstructing purposeful information work, and considers the relationship between practice and discourse.

Savolainen is another author who has studied practice approaches for many years. He believes: Information practice can be understood as using a series of socially and culturally established methods to identify, find, use, and share various sources such as television, newspapers, and internet-provided information. They appear in work and non-work environments. The special value of this approach is reflected in our understanding of how the daily life we desire makes us conservatively use information. He points out that ways of everyday information practice are deeply rooted in spatiotemporal contexts. He continues to focus on research of information practice in non-work environments, especially how mundane activities provide valuable balance materials for large amounts of information research, and emphasizes work environments. However, his selected empirical data in the book remains heavily biased toward treating information seeking as an independent activity, so information activities lack inclusiveness. He introduces purposeful action into the model.

4. Academic Information Practices

In information behavior research, the practice approach in at least one important specific area seems to have indeed made great progress. For those working in the information behavior field, the term "academic information practice"

has reflected a shift, partially influenced by science and technology studies, to avoid narrow focus in seeking secondary literature and publications, the final product of research, or even academic communication, in favor of a broader understanding of information activities throughout the entire research process. The “holistic and materialist practice approach” considers information activities within the broader social organization context of specific disciplines or professional research. The focus change reflects some cooperative science and policy drivers’ scale to better manage and reuse publicly funded research data, whose implementation requires us to more fully understand how research truly works. From an information perspective, it creates many relevant information use forms throughout the research lifecycle. For example, it considers how to manage and share research data, as well as formal communication and publication, and the increasing amount of informal communication.

Following the above concern patterns, adopting the practice approach to examine scholars’ work, we note some themes. It directs attention to the physical organization of research, such as scholars’ personal information management, including organization of their learning materials, how they store literature collections, and also data storage practices (whether physical or digital). Research is always a concrete process, so the material layout that shapes and is shaped during the research process is interesting. The practice approach also focuses on information use during the unfolding research process; the nature of these processes is cyclical and open, socially accomplished practice. Not focusing on individuals and their information needs, the practice approach may focus on disciplinary changes in research feelings, and this relates to researchers’ complex identities, such as impacts on interdisciplinary fields and conflicts between different roles in research, administration, and teaching due to specific characteristics of their chosen fields. Cooperation patterns and their impacts on information activities will also be concerned. In science, it is well known as a situated practice, a social achievement shaping and forming a series of material and institutional arrangements. Due to these focuses on important details of processes, the practice approach will also tend to use more in-depth qualitative methods, such as ethnography, contrary to information research’ s historical reliance on surveys. Therefore, the practice approach places information activities in the broader context of academic practice as a whole profession, rather than purely concentrating on information seeking or using personal information systems. Published series reports on different academic groups and their information use provide some examples illustrating the diversity of information practices in different research professions, practices shaped by communities of different scales, cooperation nature, data selection and analysis, and formal and informal academic communication patterns.

5. Social Media

In the twentieth century, many professions and personal life projects shifted to information-intensive, especially as the internet has been applied to almost every

aspect of (at least some members of) life, supporting promotional activities, making information seeking, use, and creation must be understood as immersed in daily practice. Social media such as social networking sites are in reality used to comment on and advance many aspects of daily life. In media and consumer-saturated culture responding to external events and daily personal life through channels directly connected to mass media, information seeking is not just a discrete activity completed in libraries or at computer desks, but a continuous attention process through many activities.

In this context, the practice approach and its concerns become an attractive perspective. Food blogging is an example of a new practice that integrates large amounts of physical and material activities, including using multiple social media, accompanied by threads of information activities, without original social actors' concerns.

6. Limitations of the Practice Approach

The practice approach is not a theoretical panacea, as it performs poorly in some areas compared to existing theories. Compared with extensive past information research work, the practice approach provides a relatively unfamiliar way of thinking, researching, and writing. Much previous information research has been influenced by cognitivism, individualism, empiricism, and positivism in psychological science, as well as pragmatism and technologism in computer science. The practice approach is sociological rather than focusing on individuals and their motivations, choices, and behaviors. It is usually theoretical and philosophical rather than empirical. The method's starting point is ethnography rather than experimental or quantitative techniques. Therefore, the practice approach provides a refreshing but challenging source of ideas, contrary to many research traditions that still dominate the information research community. In some cases, the institutional foundation of information as a discipline is an obstacle to adopting the practice approach. The information industry's traditional association with authoritative textual knowledge management is inconsistent with other forms of knowledge practice methods identified. Information research responds to the profession's need for an evidence base for policy, historically considered most convincing when provided in quantitative form. Research influenced by practice thinking cannot provide this potentially convincing material. Therefore, there are reasons based on library and information science research traditions and professional interests that make some practice approaches problematic.

Theoretically, this method naturally has its limitations. One possible backward area is related to power. A weakness of pioneering practice work communities is the failure to implement understanding of practice commitments in broader social contexts. When linked to a comprehensive (rather than combined) ethnographic method studying discrete cases, the danger faced by limited subcultures is that broad social structures shaping a practice approach disappear. Its focus on material and physical arrangements and formulations means that broad pic-

tures of some inequalities and power relations (such as those based on gender, race, or class) have been lost across many different contexts. There is little significance in how powerful actors' local political processes change practices. The practice approach focuses on repetitive and diverse concrete activities rather than change unfolding as historical processes. Therefore, sometimes the importance of practice theory seems somewhat insufficient. However, resources do exist to build critical practice approaches. Practice-level research shows instantiations of power structures like patriarchal gender relations.

Section 6: Social Cognitive Theory

1. Theoretical Foundations

According to social cognitive theory, people live in social systems composed of various surrounding factors. The theory's focus is social networks, which provide a path through which their behavior patterns are disseminated and supported, and social psychological factors they acquire are controlled. In other words, the focus is the interaction between social and cognitive factors and how they together shape behavior. From the social cognitive theory perspective, people work in extensive social system networks and are assumed to participate in processes of shaping and being shaped. "People are self-organizing, proactive, self-reflective, and self-regulating, rather than merely reactive organisms shaped and directed by external events or internal forces."

Personal agency is central to social cognitive theory and has always been emphasized by this theory. From the personal agency perspective, people are not only products of the social systems in which they live but also producers of these systems. However, the concept of human agency is not limited to personal agency. Other agency models include proxy agency, where people decide to let others act on their behalf, and collective agency, where through a group's joint efforts, people believe they have the ability to accomplish something. Human agency has four core attributes:

- **Intentionality:** Refers to generating and committing to plans and strategies that may lead to desired results.
- **Foresight:** Refers to people's ability to anticipate consequences of their actions and set goals.
- **Self-reactiveness:** Refers to people tracking action paths toward achieving self-goals.
- **Self-reflectiveness:** Refers to the attribute through which people think about their own abilities, evaluating their motivations, values, and life goals.

The social cognitive theory viewpoint is based on "triadic reciprocal causation," which is the bidirectional interaction between behavior, external environmental

factors, and internal personal factors, particularly reflected in cognitive processes.

[FIGURE:9.6-1]

2. Social Network Behavior Diffusion Patterns

Large amounts of information people receive come from personal experience and vicarious experience, where vicarious experience obtained through reading, observing, or listening to others is considered particularly important. If people had to rely on direct experience as a knowledge source, the learning process would become extremely time-consuming. Therefore, observational learning largely influences people's beliefs and understanding of social reality (Bandura, 1997, 2001). In daily life, people have direct and indirect connections with social networks playing communication system roles, through which they obtain motivation and advice about expected changes in behavior patterns. Families and peers have strong modeling influences. Additionally, in an individual's social environment, people with relatively high status to some extent influence that individual's behavior choices. However, regardless of intention or coincidence, observational learning through simulating natural and social environments still has limitations when large amounts of social learning occur. On the other hand, mass media and the internet can provide large amounts of information about people's values, thinking patterns, and behavior patterns.

Through interactive electronic networks, widely dispersed local people are connected to exchange information, share new ideas, and exchange hobbies with each other. Given purposes, virtual networks provide a flexible way to create diffusion structures, develop memberships, expand regions, and dissolve them when they lose value. Therefore, using modern media technology allows information to spread through communities and societies more rapidly than before.

Symbolic operations of collecting information through observational learning can increase people's awareness and understanding of causal relationships. What behaviors can be observed, their underlying meanings and functions, and how to organize information derived from them for later use are partially determined by cognitive factors. However, social cognitive theory also emphasizes the importance of social systems for people's thoughts and analysis of social networks that diffuse new behavior patterns. Although there are differences between acquiring information about expected behaviors and acting on it, Bandura emphasizes the importance of self-efficacy as a cognitive mediator of action. However, it must be noted that social cognitive theory has been criticized for broad and complex structures, making it difficult to apply the theory's full content. Therefore, researchers are likely to focus on single concepts, such as observational learning and self-efficacy concepts individually, rather than trying to explore relationships between them.

3. Self-Efficacy

Self-efficacy beliefs are people's expectations about whether they can dominate their own behavior, or how successful they can be based on dominating their own behavior. It emphasizes not people's skills but what people believe they can accomplish with their mastered skills in different situations. Individuals who believe they possess necessary skills and can perform well in tasks are considered likely to have stronger motivation, set higher goals for themselves, and take action, compared to individuals with low self-efficacy beliefs. Therefore, people's judgments of their own abilities affect whether they can fully utilize skills they possess.

(1) Four Main Sources of Self-Efficacy Beliefs According to Bandura, there are four main influence sources that can enhance people's efficacy: mastery experience, vicarious experience, social persuasion, and somatic and emotional states. These sources differ in strength and effect and present different sequences. They are presented here in different orders.

Mastery experience is considered the most influential way to build strong self-efficacy beliefs. People develop self-efficacy through continuous evaluation of their own performance. By successfully completing a task, people can build strong self-efficacy for that task, while failure weakens their self-efficacy. If failure occurs early in the process, especially before developing strong self-efficacy, this phenomenon is particularly evident. Although previous successful performance is considered the strongest source of self-efficacy, Bandura emphasizes that developing strong self-efficacy is not achieved through simple experience but through facing problems and making continuous efforts to overcome them. He says: "If people experience easy successes, they begin to expect immediate results and are easily discouraged by failure. The recoverability of efficacy requires experiences of overcoming obstacles through continuous effort. Some difficulties and setbacks in human pursuits help teach people that success requires sustained effort. Difficulties provide learning opportunities to turn failure into success—that is, to hone one's abilities and exercise better control over activities."

People's self-efficacy beliefs can also be enhanced through the aforementioned vicarious experience or observational learning. By observing other similar people who successfully complete tasks smoothly and making judgments about their own performance in similar situations, people develop their own self-efficacy beliefs. However, social models cannot be the sole standard for ability judgment. Their behavior and expression methods provide information on how to approach activities and respond to demands. However, compared with mastery experience, vicarious experience is considered a weaker source of self-efficacy. [FIGURE:9.4] shows four sub-functions managing observational learning and factors affecting individuals.

(2) Four Sub-Processes [FIGURE:9.6-2]

The first sub-function, **attentional process**, controls which modeling influences need selective observation and what information to extract from simulated events. The second sub-function, **retention process**, refers to transforming and reorganizing information into memory codes needed later. The third sub-function, **production process**, guides converting concepts into new behavior patterns. The fourth sub-function, **motivational process**, includes motivational factors affecting performance of observational learning behavior.

Although not yet an important source, social encouragement is a way to enhance self-efficacy beliefs. People's doubts about their ability to undertake tasks can be reduced through verbal encouragement. By encouraging people and explaining they possess abilities needed for success, their self-efficacy expectations can increase, making it easier for them to maintain persistent efforts in tasks for self-improvement. In addition, combining social encouragement with other factors affecting self-efficacy will help. Therefore, skilled efficacy builders not only convey positive evaluations or inspirational stories. Besides cultivating people's beliefs in their own abilities, they also hold activities that promote success for them, avoiding exposing them too early to scenarios where they may experience repeated failures. Moreover, to ensure they can feel personal development progress, skilled efficacy builders encourage people to measure success in terms of personal progress rather than defeating others.

Physical states and emotional states also partially affect self-efficacy beliefs. Tension or stress is seen as signs of weakness and low efficacy. By experiencing ways to cope with stress, efficacy beliefs can change in positive ways. In addition, emotional factors such as mood affect people's self-efficacy judgments. Positive emotions increase self-efficacy perception, while negative psychological states decrease self-efficacy. Therefore, self-efficacy can be changed by improving mood, feeling capable. How people interpret emotional and physical reactions is also important. For example, people with high efficacy view emotional arousal states as motivation for action, while those troubled by self-doubt view emotional arousal states as resistance to action.

(3) Dimensions of Self-Efficacy Self-efficacy beliefs differ along three dimensions: strength, magnitude, and generality. Self-efficacy varies according to the strength of belief in successful execution ability. Behaviors can be decomposed into increasingly specific factors, and the magnitude of self-efficacy beliefs is determined by how many factors a person believes they can execute. Generality refers to the degree to which successful behavior in one situation affects self-efficacy for behavior performance in another situation, or another manifestation.

(4) Self-Efficacy Perception—Specificity Level Self-efficacy judgments are domain-specific or situation-specific, not general. Efficacy beliefs should be measured according to specific judgments of ability, which can be in different activity domains, can be at different task demand levels within specific

domains, and can be in different situations. Therefore, people's self-efficacy differs across different behavioral situations. In addition, in some situations people have more confidence in success in what they strive to achieve, while in different situations their self-efficacy for the same matter may be lower. Since self-efficacy beliefs are valid in specific situations and domains, indicators used to measure them need to be carefully selected to ensure they are closely related to considered behaviors. Many specific action self-efficacy indicators have been developed and used in various behavioral research. Increasing research has begun to conceptualize self-efficacy at broader levels—there may be more generalized self-efficacy reflecting comprehensive personal beliefs in abilities to cope with activities across different domains between specific domains, specific populations, and specific characteristics. For example, there may be situations where similar skills are needed to perform more than one behavior.

4. Expected Outcomes

Another type of theoretical construction that needs consideration is expected outcomes. Expected outcomes can be seen as judgments of possible results of performed tasks. People try to predict possible outcomes of behaviors before acting, and their decisions about whether to implement specific behaviors are based on these predicted outcomes. Positive expected outcomes have encouraging effects, while negative expected outcomes discourage people. Therefore, individuals who believe successful execution will lead to favorable outcomes and can act correctly are most likely to take action. Expected outcomes have three main types: physical, social, and self-evaluative. Physical outcomes include whether behaviors cause pleasant experiences or negative results like pain or discomfort. Social environment expectations will affect behavior, whether feedback is positive or negative, constituting the second type of expected outcomes. When people make behavioral choice decisions partially as regulators in social systems, people tend to make choices that may have socially rewarding results and avoid choices that may face non-reward or even social punishment. Therefore, the social environment people belong to influences how behavior patterns form. However, behavior pattern formation is not only affected by social environments. People also construct personal standards for evaluating their own behaviors. The third type of expected outcomes is personal evaluation feedback. When using these personal standards to regulate personal behavior, people tend to participate in activities where they can find self-satisfaction and reflect their own values, avoiding things they personally disapprove of. This is not because of the standards themselves, but because of the self-satisfaction people feel when implementing behaviors in ways that satisfy them, or the dissatisfaction when behaviors do not satisfy standards as action motivations.

5. Self-Efficacy Perception and Expected Outcomes

Expected outcomes can be considered precursors to self-efficacy. Others mention that self-efficacy has a conceptual problem that makes self-efficacy beliefs

and expected outcomes difficult to distinguish. However, the direction of the relationship between these two theoretical constructs is clearly from self-efficacy to expected outcomes, as shown in [FIGURE:9.5].

[FIGURE:9.6-3]

For example, for people who start and execute tasks, she must believe she has the ability to find, evaluate, and use information for specific behaviors. Even if she believes this information will help improve behavior and improve her situation, this alone is insufficient. Personal self-efficacy beliefs can serve as mediators—she needs to believe she has the ability to collect information, evaluate information, and use it to improve lifestyle habits. If she questions her ability to execute tasks, she will not take action. However, in some situations where emergency events are highly structured and ability levels of specific populations cannot produce desired outcomes, expected outcomes are independent of efficacy beliefs. This may occur in situations where some factors are strictly isolated, such as gender, age, or race—no matter how capable those excluded groups believe they are, their expected outcomes are negative. In addition, in some situations where outcomes completely depend on action quality, self-efficacy alone may be sufficient to explain behavior. However, in most cases, outcomes can be predicted through the combined influence of self-efficacy perception and expected outcomes.

6. Application of Social Cognitive Theory

Social cognitive theory has been widely applied in psychology, public health, and education fields, and the concept of self-efficacy has been used as a component of most theoretical models of health behavior. Increasing research from other different disciplines has utilized social cognitive theory and self-efficacy, which have been widely verified in empirical research. For example, behavior management, particularly in work performance motivation and reinforcement, adoption of new technology, computer skills training, and internet stress and depression.

Social cognitive theory is one of the most influential learning and development theories, having significant value for the information behavior field. The theory expands traditional learning theory by introducing social factors, believing that people receive many modeling influences about ideal behaviors in social environments (observational learning), encouragement, and advice. It is the social systems in which people live that explain how people learn new information and behaviors, and how new behavior patterns and psychological factors controlling people' s adoption spread and are supported through social systems. This approach enables the theory to transcend cognitive and social methods and accept that cognitive activities are embedded in social practices where people live.

From an information behavior perspective, social cognitive theory provides multiple opportunities for research seeking answers to many questions. How to encourage people to make full use of existing information to meet information needs? How to encourage their learning and daily problem-solving through

supportive information environments? How to help them master new technologies and find ways in the complex information world? Social cognitive theory explanations will help understand these and other questions.

By outlining information behavior research work, certain development trends have been noticed. First, most research is conducted in educational environments, mainly around university students, with a few studies in business environments. Second, research on digital information retrieval and training constitutes an important part of research work. These studies focus either on how students' self-efficacy beliefs affect instruction reception or whether their self-efficacy perception can be improved through training. Generally, individuals' beliefs about their own actions can be improved while optimizing performance. In addition, many studies focus on use of information resources. In the past decade, increasing research has addressed information literacy issues. Only a few studies target knowledge sharing, information system use, and information capability beliefs. Therefore, the information behavior field would benefit from diversified research environments and by expanding research work to more types of topics. Third, another obvious important characteristic found when exploring research results is that research concentrates on self-efficacy perception and its relationship with information behavior, rather than applying social cognitive theory in information behavior as a whole.

Therefore, it is worth considering that other aspects of the theory can be applied to seek explanations and answers for information behavior questions. Social cognitive theory should attract attention in the information behavior field and among all information experts. The theory does not view individuals' cognitive activities or social activities in isolation but considers both. By focusing on the interaction between social and cognitive factors and its relationship with information phenomena, innovative theories will develop about how people adopt and learn new behaviors. Social cognitive theory has the potential to explain factors determining human action and can create a solid foundation for research work aimed at understanding multiple attributes of information behavior.

Section 7: Social Phenomenology

Phenomenology is essentially a branch of philosophy. Phenomenology's purpose is to study human phenomena without considering causes, objective facts, or even appearances, studying their experiences in consciousness, cognition, and perception behaviors, and how they are aesthetically valued or appreciated. Phenomenology aims to seek understanding of how humans construct meaning, and a key concept of phenomenology is intersubjectivity. Our thinking about the world based on our experience of the world is intersubjective because we experience the world through others.

Whatever meanings we create have their roots in human actions, the totality of social human phenomena and cultural objects, and are rooted in human

activities. In the early twentieth century, phenomenology was attractive to psychological investigation. Phenomenological psychology (or existential psychology or existential phenomenological psychology) exists as a thriving branch of psychology, mainly emphasizing understanding human experiences in problem situations.

Generally, social phenomenology can be conceived as a phenomenological transformation for sociology. Social phenomenology combines philosophical and sociological ideas to study interactions between human action, situational construction, and reality construction processes in lifeworld environments. Since the above issues are also studied under labels such as “phenomenological sociology” and “sociology-based phenomenology,” the bridging position between philosophy and sociology leads to ambiguous terminology.

2. Social Phenomenology

The idea of social phenomenology was first proposed by Alfred Schutz in the 1930s. Interestingly, Schutz never called himself a representative of social phenomenology or phenomenological sociology; he considered his work to be developing a “phenomenological psychology” of “inner experience” and focused on invariant characteristics of the lifeworld. The terms social phenomenology and phenomenological sociology emerged in the 1970s when Schutz’ s ideas became more widely known in Anglo-Saxon academic circles, proposed by other researchers.

Social research differs from natural science empirical research. In social science research, social scientists want to explain research objects’ own interpretations of the social world. People are committed to constructing meanings of the social world in interactions with peers, and this is a continuous process, while we as scientists are seeking to make their meaning construction valuable. In this process, we certainly cannot avoid using the same interpretive methods as people do in their “common-sense world.” However, social science enterprise differs in that social scientists assume the position of non-utilitarian observers. They themselves are not part of the life they observe, and all behavioral activities are not based on any practical interests but only cognitive interests. Ordinary people in the world are all in a biographical, clear state, living according to some related system that allows them to select elements meaningful to current goals based on their environments and interactions with others. On the other hand, social scientists select aspects suitable for research objects for study based on clear scientific relevance sets. As a result, social scientists may focus on aspects of behavior that are taken for granted in ordinary people’ s eyes, viewing those behaviors as research objects based on cognitive interests.

Researchers thus establish a model of human behavior with these general assumptions: **Logical consistency assumption:** guaranteed by objective validity constructed by scientists and distinguished from everyday life structures; **Subjective interpretation assumption:** scientists can perfect by citing “the

subjective meaning of all human behaviors and their results is the meaning of the activity or result itself for the actor” ; **Appropriateness assumption:** structures created by researchers can be understood by social individual actors and their peers, and following this assumption ensures scientific constructs conform to social world’ s common-sense experience constructs.

3. Social Phenomenology in Related Fields: Information Systems and Human-Computer Interaction

Interestingly, in some related fields that also require information processing, social phenomenology is used as a framework for exploration. For example, in the information systems research field (which has more interest in theoretical issues than information science), many authors have adopted a phenomenological viewpoint.

In computer science, some scholars believe phenomenology shifts our focus to the question of “how we meaningfully view this world through our own behavior and integrate into it.” Through this, we can see the purpose implied by this “more natural” approach in interaction design: it allows us to establish a different relationship with technology—discovering, exploring, and developing the meaning of using technology, just as technology is integrated into practice. As a design concern, this limits how we consider applying social and physical interaction models to interactive systems. This design concern is not simple interface design or what contextual factors allow us to detect and encode into a ubiquitous computing model. Instead, we need to consider how these skills or factors will facilitate actions.

Interestingly, our focus shifts to the “meaning” of behavior, while concern for information use is far less than for aspects like information seeking and information retrieval. At least to some extent, this may be the result of seeking guidance in system and service development, and those information technologies make us favor these fields more than encouraging thinking about how those activities affect “meaning of behavior.” Even if phenomenological viewpoints are insufficient to encourage us to address this issue, they are still meaningful. Information behavior should pay more attention to how information transforms into use or meaningful practice.

In computer-aided design related fields, some have noted that empirical models applicable to system development generally inherit empiricism problems, and empirical research in psychology and social sciences requires strictly controlled environments and precise constraints. For human subjects, providing necessary (ideal) isolation conditions is difficult, and their understanding of experimental procedures affects results.

4. Limitations of Social Phenomenology

Although Schutz’ s analysis of social phenomenology theory is superior to predecessors’ work, it still faces criticism in many aspects. Understanding our social

existence is more complex than merely depicting lifeworld cognitive structures using methods proposed by Schutz. Schutz did not elaborate on how to apply such structures to empirical research of the social world, and he downplayed the importance of language, especially language mediation in social interaction. Therefore, social phenomenology does not resolve long-standing commands and personalized structures. Because social behavior is not only a deductive process of cultural knowledge (knowledge stock) “tested in the world,” but also processes of social integration and socialization.

Chapter 10: Information Resource Management and Utilization

This chapter introduces research conducted by the author during his visiting scholar period at City University of Hong Kong Library from several aspects: resource procurement, resource promotion, reader services, exhibition activities, inter-library activities, library consortia, and social network management, organized and published for exchange with readers on related aspects. The following content hopes to help readers quickly understand the main clues of each article:

Resource Procurement: (*Academic E-book Consortium Models—A Multiple Case Study of English Book Procurement in Greater China*) Introduces cases of City University of Hong Kong’s Run Run Shaw Library with ERALL (8 Hong Kong university libraries), Cicada (48 Hong Kong and Taiwan university libraries), and CASHL (15 Hong Kong and mainland university libraries). Through multiple case studies, it proposes cross-institutional academic e-book consortium operation models, including: 1) discussion of procurement objects; 2) investigation of prices, quality, and content proposed by each e-book supplier; 3) negotiation of rights, back years, and publication quantities; 4) group formation; 5) book selection; 6) promotion and education; 7) technical reports; 8) seminars; and 9) factors like human costs in different regions. Future research directions are recommended: reorganizing library human resources and business models to improve integrated services for paper books, e-books, paper journals, and e-journals. For librarians and book suppliers, this survey can serve as an important reference for developing inter-library cooperation, joint procurement, and related services.

Resource Promotion: (*Library Services for Improving E-book Use Efficiency—Services That Let Readers Wait No More*) Introduces a library service promoting reader utilization of e-books. The project conducts usage tests on different e-book databases to build structured e-book service models and compares services across different databases. Discusses how to use cataloging systems to integrate different types of service content. Concludes that e-books combined with library reference services can support university research, teaching, and learning activities. Recommends libraries develop an “e-book database-cataloging system-librarian blog model” to directly and simply increase reader

efficiency in the process from learning about information, obtaining information, participating in discussions, to co-creating knowledge.

Reader Services: (*Strategies for Promoting Reader Utilization of E-books—Experience Sharing from City University of Hong Kong Library*) Introduces a strategy for promoting reader utilization of e-books. The strategy is built on research and analysis of collection development for electronic and paper resources. Concludes that it can effectively support research, teaching, and learning activities at City University of Hong Kong.

Exhibition Activities: (*Practice for Enhancing Institutional Repository Functions—Integration and Reuse of Multidisciplinary Educational Resources*) Based on literature review of institutional repositories, compares institutional repositories of multiple university libraries in Hong Kong and the National Science Library in Beijing. Designs the following functions: 1) expanding institutional repositories according to user workflows; 2) redesigning institutional repository homepages according to user behavior; 3) considering email authentication systems; 4) adding cross-institutional search; and 5) integrating Web 2.0 service elements into institutional repositories. Using participant observation and case study methods, proposes an industrial production line: “planning, promotion, holding events, collecting, organizing, classifying library activities, and managing, retrieving, and providing network services.” This workflow can transform library activities into online educational resources.

Inter-Institutional Cooperation: (*Observation of Scientific Research Productivity in Institutional Cooperation—Bibliometric and Content Analysis Empirical Study of Grey Literature*) Through bibliometric and content analysis methods, analyzes research reports and working papers of the Taiwan Institute of Economic Research (Taipei) to evaluate scientific research productivity of collection cooperation partners for planning digital resource preservation database systems and developing resource co-construction and sharing. Proposes a concise approach of “bibliometrics-content analysis-information system-communication-deposit.” Studies grey literature bibliometric methods that traditional scientometrics cannot detect, which is an exploratory research that can continue to develop.

Library Consortia: (*Research on Library Consortia Promoting Collection Development—Analysis of Cooperation Cases Across Four Regions*) To expand ARL’ s e-resource evaluation report research scope, deeply understand library consortium operations, and innovate library services. Based on literature review of library consortia promoting collection development, proposes a research framework. Analyzes cases of IEEE Xplore, DDC, Cicada, and CASHL through interview methods, then proposes eight development recommendations.

Social Network Governance: (*Problem-Solving Models for Library Management of Social Network Relationships—Using City University Library Subgroups as Examples*) Through secondary literature analysis, participant observation, and social network analysis, depicts interpersonal network relationship maps of

library internal staff. Through these maps, defines 1) subgroups threatening the organization; 2) hard organizational relationships; 3) soft association relationships. Based on this, discusses impacts of informal associations on formal organizations: 1) three forms of organizational management; 2) if inter-departmental conflicts occur, how to use association communication to open social relationship networks; 3) if personal conflicts occur, how to use node control to close social relationship networks; and 4) if inter-departmental collaboration is needed, how to use social relationship networks to concentrate resources to support single departments. Conclusion recommends future use of social relationship network methods for “hard and soft combined” human resource management to enhance library team morale, harmonious culture, and work efficiency.

Section 1: Information Resource Procurement

1. Background

As an institution supporting university research, teaching, and learning, university libraries must maintain a certain level of collection quantity and quality, and carry out multi-party services on this basis to facilitate readers' convenient access to information. The main body of university library collections, meeting the needs of different researchers, teachers, and learners, can be divided into academic journals and academic books. With information technology and social changes, especially the development of electronic information carriers, library collections have undergone varying degrees of development and change, also affecting library management models.

On one hand, the process of journal collections moving from paper versions to electronic versions reflects many transformations in library management, such as: in procurement models, database vendors and publishers negotiate directly with libraries rather than only through journal agents; in space layout, the proportion of journal browsing areas occupying library space gradually decreases; in human resource allocation, journal groups gradually merge with acquisition groups; in reader usage behavior, paper version journal usage gradually decreases. With rapid changes in the information society and information technology, e-journals gradually replace paper journals as one of the main information carriers for library procurement and services due to reasons such as easy access, large quantities, convenient use, earlier publication of latest research results, and usage patterns more consistent with new generation learner habits.

On the other hand, the process of library collections moving from paper versions to electronic versions also has multiple impacts, such as: 1) collection development; 2) marketing and evaluation; 3) user education; 4) technical skills; 5) communication skills. Duke University research points out that due to the continuous increase in e-book quantities, libraries will face more service transformations in acquisition, circulation, and collection. However, it is worth noting that library collections may not entirely become electronic collections. Because

readers' use of paper journal carriers is similar to later electronic journal usage patterns, belonging to an information extraction model suitable for explanation by information search theory and service by search engine methods. Readers' use of paper book carriers is more diversified—information search is just one form of information seeking, and information seeking is just one form of information behavior (please refer to Wilson T.D.' s human information behavior theory). For example, browsing is a way of information seeking, belonging to an information scanning pattern that cannot be fully satisfied by search engine methods. Although readers' use of paper books is the most traditional information behavior, and related services for electronic books are still continuously deepening and developing, they currently cannot completely replace this traditional library service. Domestic and foreign research shows that the coexistence of paper books and e-books is the main opinion of university students. This shows that readers need an environment providing different information channels.

This raises a question: If a university requires its library to have both paper and electronic information carriers while saving costs, making good use of expenditures, and securing the most information sources for readers, then as e-journals gradually replace paper journals and paper books maintain constant growth, how can libraries increase academic e-books?

Through academic e-book consortia, this is an important way to expand collections. Because libraries can thereby reduce procurement costs, increase resource quantities, achieve resource sharing, improve collection levels, influence supply-demand negotiations, obtain permanent collection, and promote cooperative development. Library consortia have always been one of the important contents of library work, including not only document delivery, interlibrary loan, librarian exchange, joint cataloging, joint consultation, system integration, and other activities, but also joint procurement and grouping of resources, systems, and services. There are many domestic and foreign discussions on library consortium research, such as: earlier American OhioLINK practice shows that besides catalog exchange, joint procurement and duplication rates should also be emphasized. This shows the scalability of library consortia not limited by single founding purposes; Canada, with large area and small population, its OCUL library consortium and CISTI Science and Technology Information Center enable single library users to simultaneously achieve article-level e-journals and interlibrary loan of paper books, showing library consortia' s function of integrating paper and electronic resources; and its cooperation on collection development was first completely introduced by Erickson R. (1992), who not only introduced the Tri-College cooperative consortium but also quoted Dr. Darrel M. Meinke' s 1982 statement: "In difficult times, universities will face major tests of their cooperative efforts. Competition for students and resources intensifies. However, library consortia will safely weather this storm" to illustrate the importance of library consortia to individual library collection development.

Mainland research on library consortia. Theoretically, there are discussions on concepts, basic models, and definitions, as well as more complete reviews and

deductions of historical development and types, and comparisons between American OCLC and Chinese CALIS. Practically, there are case studies of Chinese Academy of Social Sciences, Chinese Academy of Sciences professional library consortia, and Jilin Province library consortia. In addition, there are discussions on consortium mechanisms, cooperative game theory, and statistics of related research papers. In short, since 2004, research on library consortia has begun to flourish. Taiwan 方面有认为官方经费有助于资源共建共享的台湾北区图书馆联盟的研究, 以及为节省采购经费并日益增长馆藏资源而组成的台湾地区医院图书馆联盟的研究, 对于计价方式、使用方式、永久典藏进行分析的 CONCERT 案例, 以及对于图书馆联盟在数字时代图书馆发展的探讨等。总的来说, 在华人地区的图书馆联盟方兴未艾, 其研究正在如火如荼地发展。

而对于学术电子书联盟的研究, 更是图书馆理论与实务的热点研究。比如将电子书作为第三波数字图书馆核心的瑞典哥德堡大学案例研究; 台湾 TEBNET 联盟的组织、架构和运行模式的研究; 电子书对数字图书馆资源建设的探讨; 跨区域学术电子书联盟的合作模式与成本计算; 计算成本与效益的电子书联盟; 馆员对图书馆加入电子资源联盟的正面看法: 节省采购经费、节省人力、增加资源数量, 以及反面看法: 联盟的领导、协调能力与议价谈判能力等。这些研究直接导致或间接促进了学术电子书联盟的快速发展, 对于如何改善既有的学术电子书联盟和拓展这种馆藏发展模式具有重要参考作用。总而言之, 学术电子书联盟的模式仍然在不断变化和发展的过程中, 大学图书馆也在不断地摸索和学习中。

以香港城市大学邵逸夫图书馆为例: 一方面为了满足教师和学生的要求, 图书馆所规划的年度预算中, 电子资源(包括电子期刊、电子书、网络数据库)支出占总支出的八成; 另一方面, 近年来(2006/2007、2007/2008、2008/2009 年度)透过合作联盟来降低平均成本和增加总数的方式, 图书馆所采购的电子图书总册数已经超过纸本图书的两倍。该馆在 1999 年拥有纸本图书 524,700 册、电子书 0 册、印刷出版品 8,524 种、纸本期刊 3,700 种; 在十年之间, 透过该馆与香港八所大学、香港与台湾、香港与大陆等多方学术电子书联盟的方式扩充了电子版图书; 直至 2009 年底, 成为拥有纸本图书 911,100 册、电子书 2,158,300 册、印刷出版品 3,021 种、纸本期刊 61,800 种的馆藏复合型图书馆。

由于国内外研究与多次实践经验表明: 学术性电子书联盟并不只是涉及书籍种类、数量、成本等因素, 联盟本身运行的机制是联盟组成与否的关键。所以, 本文有系统地梳理跨校联盟的三个案例, 并且从联盟运作过程、采购成本与人力资源三方面, 讨论学术性电子书联盟的模式, 进而深思进一步深化图书馆服务的可能性。

尽管这些案例中的电子书价格会随市场与技术变迁而频繁变化, 而很难复制在其他未来执行学术电子书联盟的图书馆采购经费预算上, 但是比较这些联盟模式后, 其经验可以作为其他图书馆建立学术电子书联盟时的参考; 此外, 本文对于跨校学术电子书联盟的反思, 也可作为其他电子书联盟继续发展馆际合作工作上的参考。

2. Academic E-book Consortium Models—A Multiple Case Study of English Book Procurement in Greater China

The author adopts multiple case study method, analyzing academic e-book consortia among eight Hong Kong universities, between Hong Kong and Taiwan, and between Hong Kong and mainland China. The research process refers to Yin, R.K.'s *Applications of Case Study Research* and *Case Study Research: Design and Methods*, while research design refers to Babbie, E.'s *The Practice of Social Research*, Zhang Xiaolin's *Research Methods in Information Manage-*

ment, and Yang Guoshu' s *Social and Behavioral Sciences Research Methods* (Volume 2). The research framework is shown in [FIGURE:10.1-1].

[FIGURE:10.1-1]

Research objects are three academic e-book consortia: ERALL, Cicada, and CASHL. Below are descriptions of research object profiles and their different characteristics.

The Hong Kong Eight Universities Libraries Academic E-book Consortium is a process of expanding academic e-book consortium new business from library consortia. The Joint University Librarians Advisory Committee (JULAC) is an unofficial university library consortium organization established in 1967 to discuss and coordinate resource sharing services among eight universities. In 1999, a Cooperative Development Committee was established specifically responsible for electronic resource cooperation. This academic e-book consortium has a strong cooperation foundation—JULAC—but also has obvious limitations: limited to Hong Kong regional library consortia, it is a single-region library consortium-based academic e-book procurement project.

The Hong Kong-Taiwan Academic E-book Consortium is a new academic e-book consortium formed by two independently developed library consortia to enhance mutual benefits in academic e-book procurement and services. Since 2005, 48 libraries from Hong Kong and Taiwan formed the Cicada-Super eBook Consortium, creating the world' s largest single-procurement transaction for e-books. It not only created over 50,000 volumes of the latest ten years of English academic online e-books for library readers in both regions, but also through several stages of book selection and duplicate removal, reduced duplication rates to below 20%, breaking the traditional problem of duplicate ordering of Western paper books among libraries. This academic e-book consortium has an obvious cooperation premise—through resource co-construction and sharing, it can enhance each other' s collection development. But it also has an obvious obstacle—different library management systems between the two regions, and mechanisms of mutual trust and dependence are not yet fully established.

The Hong Kong-Mainland Academic E-book Consortium further promotes this experience and development based on existing academic e-book consortia, gaining participation from more schools in different regions. This consortium consists of five university libraries from Hong Kong and ten from mainland China, including: Fudan University, Nanjing University, Peking University, Renmin University of China, Shanghai Jiao Tong University, Sun Yat-sen University, Tsinghua University, Wuhan University, Xiamen University, Zhejiang University, City University of Hong Kong, Hong Kong Baptist University, Hong Kong Institute of Education, Hong Kong University of Science and Technology, and the University of Hong Kong, jointly forming an academic e-book consortium. Using the China Academic Social Sciences and Humanities Library (CASHL) as a cooperation pilot, it overcomes institutional differences in procurement operations, collection systems, and copyright regulations between the two regions,

and has so far purchased 4,425 titles totaling 9,781 English academic e-books. All books purchased by member libraries are placed in the same database for shared use by consortium members. This academic e-book consortium has an obvious advantage—Hong Kong can leverage mainland key universities' e-book purchasing power and collective purchase synergy to negotiate more discounts from publishers; while mainland can leverage Hong Kong's transaction experience with e-book integrators to further develop cross-regional cooperative collections. However, there is a dual difficulty of customary price discrimination for paper books between Hong Kong and mainland, and inconsistent marginal prices that university libraries in both regions are willing to pay for English academic e-books.

3. Library Collection Development Models Through Academic E-book Consortia

This section analyzes the actual operation processes, benefits, and human resource costs of three cases, summarizing library collection development models through academic e-book consortia. It also discusses benefits, challenges, and improvements generated through academic e-book consortia.

Taking the Hong Kong Eight Universities Libraries Academic E-book Consortium as an example, the e-book consortium operation process includes three major stages: selecting subject matter, determining negotiation targets, and selecting e-book versions. Time and manpower spent at each stage vary depending on circumstances. However, the common principle is to first reach consensus on procurement objects, then investigate prices, quality, and content proposed by each e-book supplier, and finally conduct collective negotiations (see [TABLE:10.1-1]).

[TABLE:10.1-1]

Since e-book suppliers' products and values differ, earlier negotiated e-book suppliers have more usage restrictions and fewer publication years. However, as negotiation targets continue to expand and subsequent continuous negotiation results show, academic e-book consortia can gradually make e-book suppliers make concessions on rights, back years, publication quantities, and prices during later negotiation processes (see [TABLE:10.1-2]).

[TABLE:10.1-2]

Based on contract contents previously signed between Hong Kong eight universities libraries and e-book suppliers individually, the academic e-book consortium can calculate price saving ratios achieved through the consortium. The ratio calculation method is quoted price minus actual price, divided by quoted price. Calculation results show that price saving ratios for each e-book supplier to each university library differ because original individually procured quantities differed, affecting subsequent price saving calculations. Nevertheless, prices negotiated through the e-book consortium still substantially reduced quoted prices

from each e-book supplier to each university library (see [TABLE:10.1-3]).

[TABLE:10.1-3]

Further calculations find that single publication costs after price savings are substantially reduced. In other words, due to academic e-book consortium operations, the ability to save costs on entire e-book collections creates a multiplier effect on e-book duplicates, causing per-unit publication and volume costs to drop significantly after merging original procurement prices with duplicate prices (see [TABLE:10.1-4]).

[TABLE:10.1-4]

Based on cooperation results of Hong Kong eight universities libraries, the Hong Kong-Taiwan academic e-book consortium further expanded this multiplier effect. However, due to different systems between the two regions, this cross-regional, cross-institutional consortium form requires more detailed communication and more complex processes, including: building consensus, determining procurement standards, group formation, book selection, acquisition and negotiation, contracts and execution, promotion and education, and evaluation (see [TABLE:10.1-5]).

[TABLE:10.1-5]

Time and cost structures spent by the two regions also differ. Overall, Taiwan library directors spend more time than Hong Kong library directors, and Taiwan professional librarians spend slightly more time than Hong Kong professional librarians. However, human costs between Hong Kong and Taiwan differ little when calculated in monetary amounts (see [TABLE:10.1-5]). The reason Taiwan libraries have larger manpower expenditures but similar cost expenditures to Hong Kong libraries is the different number of participating institutions (6 libraries in Hong Kong vs. 42 in Taiwan) and different price and salary levels between the two regions.

On the other hand, if we examine in depth the price causes at each stage of this academic e-book consortium, actual operations needed at different stages include: negotiation meetings, seminars, e-book products, institutions, book objects, negotiation discussions, email exchanges, promotion meetings, promotion education work, online courses, and technical reports, etc. (see [TABLE:10.1-6]). This shows that academic e-book consortia involve not only book types, quantities, and costs, but also need to consider consortium operation processes and human resource investments.

[TABLE:10.1-6]

Based on ERALL and Cicada experiences, the Hong Kong-Mainland academic e-book consortium, using CASHL as a cooperation pilot, smoothly overcame institutional differences in procurement operations, collection systems, and copyright regulations between the two regions through joint efforts of multiple parties. Taking the Mylibrary cross-regional e-book consortium as an example, the

project development took nearly a year (see [TABLE:10.1-7]).

[TABLE:10.1-7]

The project uses price discrimination: universities where teaching is primarily in English have libraries bearing \$40,000 (e.g., Hong Kong universities), while universities where teaching is primarily in Chinese have libraries bearing \$30,000 (e.g., mainland universities). Both sides jointly share 4,425 English academic e-books, saving \$109,800 in funds, with a cost of \$7.53 per title and \$3.41 per volume. In short, through academic e-book consortium forms, a balance point can be found for book suppliers and library procurement groups.

4. Case Analysis

In the Hong Kong Eight Universities Libraries Academic E-book Consortium case, there is both cooperation and competition: everyone wants to increase collections while reducing expenditures. Discussions and proposals for academic e-book consortia are often considered together with other regional library consortium activities, such as interlibrary loan consortia, cataloging consortia, collection development consortia, electronic (journal) resource consortia, and reference consortia. Moreover, as a new business, although there is cooperation 默契 in other aspects, there is also unfamiliarity and concern about this business: small-scale procurement cannot reflect the economic benefits of academic e-book consortia, while large-scale procurement involves budget review issues that may arise from unfamiliar business. City University of Hong Kong's Run Run Shaw Library implemented two measures: jointly holding seminars with other university libraries, and actively lobbying the Hong Kong SAR government for special budget allocations for book purchases.

In this case, after multiple full understandings and communications among directors of Hong Kong eight universities libraries, procurement team leaders, university financial directors, and other relevant personnel, certain consensus was reached. Then eight universities libraries jointly applied to the University Grants Committee for budget support. After the government agreed to allocate initial funds, it consolidated confidence among the eight universities libraries, which further negotiated with e-book integrators through the Cooperative Development Committee under JULAC. Ultimately achieving goals further consolidated cooperation atmosphere and unity consciousness among the eight universities libraries.

The budget supported by the Hong Kong government was special budget. According to regulations: the special budget allocated by the government to the eight universities libraries is proportional to the total budget each university invests in this project. In other words, from the perspective of individual libraries, schools with larger budgets receive relatively more subsidies, while schools with smaller budgets receive relatively less; from the total perspective, the Hong Kong government and the academic e-book consortium invest on a 50-50 basis. This raises four questions: First, do university libraries with more abundant

budgets have more book selection rights than those with weaker budgets? Second, as this joint procurement uses special budget rather than regular budget, does handling e-book work count as “temporary work” rather than regular business? Third, the government only subsidizes the academic e-book consortium in the initial stage to assist its development. Will the consortium face multi-party negotiations in the future that may intensify the contradiction of the first question? Fourth, since large-scale e-book procurement is a special project with separate processing after purchase, will developing other cooperation projects on this basis be more difficult due to unintegrated business among libraries?

Regarding the first question, because libraries are public utilities and Hong Kong eight universities libraries themselves have good atmosphere and long-term cooperation and mutual support 默契, the possibility of dissolving the consortium for this reason is low. Similarly, the third question only requires more communication and coordination time. The fourth question coexists with the second question—if business does not transform, e-books cannot fully exert effects nor can other cooperation be developed on this basis. Conversely, if starting from other cooperation experiences, whether it can 反过来 solve the regular business positioning of e-books remains to be seen in practice.

In the second case of establishing an academic e-book consortium with Taiwan, the key issue is that library business and organizations differ between the two regions, and government subsidy methods for e-book consortia also differ. First, different library business and organizations between the two regions determine that in the short term it can only be conducted as a project, and unlike Hong Kong eight universities libraries, there is no opportunity for other business integration through e-book services in the future. In the long term, if Hong Kong and Taiwan can create more inter-library cooperation, perhaps cooperation models based on e-book services can be developed, but this requires longer time and appropriate opportunities to create a second win-win situation.

Therefore, the truly key issue in this case is that e-book budget subsidies received by libraries in the two regions differ. The Hong Kong government subsidy method was mentioned above and will not be repeated. In Taiwan, the “Ministry of Education” provides subsidies, incorporating subsidy funds into the library’ s annual budget. Therefore, the controversy in Hong Kong eight universities libraries about whether e-books are a daily library work is obviously not an issue in Taiwan. However, the biggest difference from Hong Kong eight universities libraries’ subsidy method is that in Taiwan, each subsidized university library receives the same subsidy funds, with the part needing increased funds decided and raised by the university the library belongs to. This creates another question: Will cooperation between Hong Kong and Taiwan be affected by Taiwan’ s unilateral “Ministry of Education” support, leading to unstable consortium cooperation? Especially since Taiwan’ s early TEBNET consortium development had issues such as: inability to continuously guarantee government funding, different interests among consortium members of different scales, and different needs.

However, due to the consensus on co-construction and sharing, as well as the attempt for mutual benefits, plus huge and visible cooperation benefits, this consortium is not only stable but also long-lasting. Only similar consortia like this exist as a single case. The reasons are that on the Hong Kong side, library business reorganization is difficult, making it hard to continue proposing multi-faceted cooperation invitations to Taiwan; while on the Taiwan side, funding sources are unstable, cooperation 默契 has not yet formed, and similar small e-book consortia are increasingly emerging. Therefore, both Hong Kong and Taiwan can only “shelve disputes, seek common ground while reserving differences, and jointly seek mutual benefits” for slow cooperation, but after all, through the Cicada-Super eBook Consortium, there is a good start and demonstration effect.

The third case of this study is the Hong Kong-Mainland academic e-book consortium. Because of previous experiences, this consortium could pre-avoid those “controversial” parts at the beginning and stride forward toward “mutual benefit” parts. Nevertheless, negotiations remain difficult. In addition to problems that occurred in Hong Kong eight universities and Hong Kong-Taiwan cases, there is another issue: marginal prices each library is willing to pay for English books differ.

To elaborate, Hong Kong has more practical experience in purchasing foreign e-books, while mainland has more research and practice in purchasing Chinese e-books, and mainland libraries are willing to expand their procurement standards for foreign e-books. However, the two regions have different pricing conventions for paper books in the international book market. For example, the famous work *Economics* by economics master Samuelson has different prices in the US, Hong Kong, and mainland China, as shown in [TABLE:10.1-8] and [TABLE:10.1-9]:

[TABLE:10.1-8]

[TABLE:10.1-9]

On the one hand, Hong Kong students have a higher proportion of using original books because of classroom demands and because foreign student density in Hong Kong is generally higher than in mainland China. Therefore, if jointly procuring academic e-books, it is more advantageous for Hong Kong regional university libraries. On the other hand, mainland students’ proportion of using original books is gradually increasing, especially as key universities’ enthusiasm for foreign learning is more intense than Hong Kong’ s. However, mainland libraries can choose Chinese translation books or original books cheaper than Hong Kong’ s prices to meet readers’ information acquisition services. Cooperation with Hong Kong regional university libraries is beneficial for both short-term resource construction and long-term collection development, but practicing according to Hong Kong regional prices has the waste suspicion of “abandoning low prices for high prices.” Therefore, at this stage, both sides must still adopt “price discrimination” strategies to achieve balance between marginal prices.

In other words, in the Hong Kong-Mainland academic e-book consortium, five

Hong Kong university libraries each contribute \$40,000, while ten mainland university libraries each contribute \$30,000, with equal usage rights obtained. From Hong Kong's single perspective, "I contribute four, you contribute three" is not worth it; from mainland's single perspective, "I contribute ten, you contribute five" is not worth it. However, from the academic e-book consortium perspective, Hong Kong five universities alone, by securing support from the other ten universities, reduce average book purchase costs by as much as 80%, greatly increasing original collection quantities with cooperation benefits; while mainland ten universities only pay \$30,000 but enjoy \$40,000 goods and long-term development experience in foreign academic e-book collection development. Therefore, both sides benefit.

However, behind this cooperation, other hidden concerns and parts worth continuing to research remain. For example, if only using one e-book integrator's service, it may be biased by the integrator's book selection or pricing strategies, such as netLibrary, which early supplied Taiwan e-books, had a tendency to emphasize the American market: phenomena such as American history accounting for 13% and religion 9% in its e-book collection. Moreover, e-book integrators' statistics should not be overly trusted. Because e-book integration is either unstable, or subject analysis covers overly broad fields, or usage counts cannot distinguish detailed subject usage situations, etc. In addition, e-book usage statistics differ from paper book circulation statistics and should not be regarded as the same principle and directly applied. For example, when readers search for information and quickly flip through books, perhaps only looking at tables of contents or chapter graphics before stopping use and searching for the next e-book, if they want to read deeply or completely later, they will restart borrowing activities, so borrowing counts may reach three or more times. Therefore, e-book usage counts and paper book borrowing counts have different meanings. Therefore, e-book integrators' statistics may serve as a reference but should not be the sole information source for all decisions. To improve this phenomenon, besides requiring e-book suppliers to consider local markets, libraries should also conduct book selection and subject ratio planning according to their own readers' needs, and reflect these in joint procurement booklists through academic e-book consortia. Fortunately, due to foresight, during the implementation of the Hong Kong-Mainland academic e-book consortium, expert "book selection teams" were also organized to conduct efficient procurement among different e-book integrators.

Summarizing ERALL, Cicada, and CASHL cases reveals that key factors for cross-institutional academic e-book consortium operations include: 1) discussion of procurement (object) scope; 2) investigation of prices, quality, and content proposed by each e-book supplier; 3) negotiation of rights, back years, and publication quantities; 4) group formation; 5) book selection; 6) promotion and education; 7) technical reports; 8) seminars; and 9) human costs in different regions. Items 1-3 are the basic model of academic e-book consortia; items 4-8 are additional models for achieving cross-institutional academic e-book consortia. Because cross-regional and cross-institutional academic e-book consor-

tia require more communication and coordination, it is recommended to adopt more written, ceremonial, and public methods to obtain trust and stability for such consortia. Finally, cross-institutional academic e-book consortia need to pay more attention to human resource investment rather than just focusing on procurement objects or prices, which involves library management operations such as human costs in different regions, requiring flexible adaptation to library consortium requirements.

To adapt to rapid changes in the information society and information technology, transformations such as diversified information resource carriers, cross-cutting content, and multiple channels require libraries to adjust to impacts on resource allocation, manpower allocation, and management efficiency. As ARL and SPEC survey reports state, libraries in the digital age face more challenges and have more responsibilities than in the past to select collections, services, space, and resources. Among these, e-books are more challenging in: collection development policy, (e-)book selection, budgets, (knowledge) exploration and educational activities, e-book readers, usage tracking, etc. Because of these requirements and challenges, future discussions should focus on library manpower and business organizational design to improve the reading environment for readers browsing information.

The impact of electronic information carriers on library management currently mainly concentrates on electronic version books. In the future, from the perspectives of reader browsing behavior theory and library-provided reader browsing environments, library manpower and business organizational design should be emphasized to improve the reading environment for readers browsing information. Therefore, future discussions should explore how libraries can exert service synergy (Synergy) of paper books, e-books, paper journals, and e-journals to meet the goals of reader information behavior.

The browsing environment provided by libraries can help readers conduct informal information seeking activities. During the information filtering process, through browsing behavior, readers achieve results such as finding target information, serendipitous discovery, information need modification, information collection, learning, leisure enjoyment, gaining new knowledge, satisfying curiosity, and not finding needed information. Libraries' robust information environments have powerful auxiliary functions for readers to obtain information, discover related information, discover other related information, or rethink information seeking strategies. Because readers in libraries and bookstores often adopt activities such as checking bookshelves one by one, rechecking bookshelves for different books, picking up another book in the same subject area, stopping to check their stacked books, borrowing books not yet open for borrowing in the library, quickly flipping pages, and randomly flipping pages. Therefore, paper version books have the function of information scanning, which current electronic version books may not necessarily replace in assisting readers to find information. If libraries want to continue providing browsing environments for readers in the information society, they need to concentrate more efforts on in-

formation acquisition, learning activities, and collection. Libraries can reflect on services provided to readers through four orientations: 1) oriented toward book reading and learning; 2) oriented toward community and participation value; 3) oriented toward building bearing and circulation; and 4) oriented toward digital citizens. For example: 1) Libraries can rethink webpage and database navigation positions from readers' perspectives to better allow readers to access information; 2) Libraries can achieve unified integration of online public classification retrieval catalogs, platforms, and e-book retrieval systems among numerous resources of publishers, paper book distributors, e-book production companies, e-book integrators, and automation system providers; 3) Libraries should strengthen classification and cataloging construction for e-books; 4) E-book suppliers should strengthen full-text retrieval and usage statistics applications. In summary, how libraries can improve their organizational structures to better provide integrated services of paper and electronic version information in the digital age is a new topic requiring continuous research.

Section 2: Information Resource Promotion

1. Background

Currently, in most libraries, paper version books still outnumber electronic version books in total collection volume. However, the continuous development of networks and e-books attracts more people to enjoy library services.

In contrast to standardized procurement models and stable growth procurement funds for paper books, e-book procurement methods such as consortia or group purchases are still developing, requiring not only increased budgets to purchase rapidly growing large quantities of books but also often requiring different procurement methods to save funds. Therefore, influenced by the rapidly increasing and constantly changing e-book market, libraries' acquisition, interview, aggregation, cataloging, transmission, use, and other services face new challenges.

In fact, libraries have always played a bridging role: facilitating communication and dialogue between authors and readers through books. Today, with the proliferation of e-books, as Gall, J.E. (2005) reminds librarians to recognize their own services and not be confused by the rapid growth of e-books, libraries in this rapidly changing information environment still cannot abandon the following characteristics: (1) How to enable readers to quickly utilize collections is one of libraries' core businesses; (2) Supporting university research, education, and learning activities is one of libraries' core values; (3) Combining collections and services is one of libraries' core functions.

Therefore, how to make readers good at using e-books is an unavoidable practical issue for libraries at this stage of development and is also the goal this research hopes to achieve.

2. Related Issues

(1) Changes Brought by Electronic Technology Early research by Ronte, H (2001) on changes brought by electronic technology includes: publishing models (authors directly facing readers), distribution models (electronic markets), sales models (electronic retailers), and reading models (e-books). Today, academic e-books have rapidly occupied library collection volumes. These 曲折变化的数量 bring new challenges to library e-book management.

(2) Challenges E-books Bring to Library Services Falk, H (2003) research results show that although e-book quantities have soared, students' use of library resources remains limited. Despite early continuous upward trends in user e-book usage (AU Ramaiah, C.K., 2005), this phenomenon still needs improvement. Therefore, how to help readers make good use of books and exert their value in creating knowledge requires libraries to flexibly promote their collections.

Ashcroft, L. & Watts, C. (2004) surveyed the adoption of e-books by 127 UK universities and found they commonly faced management skill challenges: 1) collection development; 2) marketing and evaluation; 3) user education; 4) technical skills; 5) communication skills.

Chen Weili (2009) proposed five combinations centered on "readers": traditional services combined with Web services, electronic reading combined with wireless networks, resource sharing combined with self-developed databases, static combined with interactive consultation services, and quality education combined with subject novelty search services. Hu Yonghong and Fu Yongfang (2009) suggested libraries strengthen e-reading room promotion, accelerate resource procurement, strengthen librarian training, guide readers to use materials, and explore possible service methods through problem analysis.

(3) Hot Topics and This Research' s Questions In academic libraries, existing e-book management approaches mainly include: 1) procurement; 2) cataloging and maintaining e-books; 3) funding; 4) licensing and authentication; 5) diversified interfaces; 6) promotion; 7) promotion and user education; 8) subject scope; 9) statistics and usage (Wilkins, V. 2007). Carlock, DM & Perry, AM (2008) believe future research should continue to study the impact of academic libraries, including: 1) providing better promotion and training for e-book platforms; 2) providing better course support; 3) e-book suppliers considering product development that meets teachers' teaching and research needs.

In summary, this research' s questions are summarized as follows: 1. How to support university research work? 2. How to support university teaching activities? 3. How to support readers' learning processes?

The research obtains various e-book database content service models through usage tests on different e-book databases, expecting to support service strategy recommendations for the above research questions. In addition, although Hong

Kong's teaching, textbooks, tests, homework, and reference lists are all in English, readers have high demands for simplified and traditional Chinese e-books outside the classroom. Therefore, this project selects foreign language databases such as MyiLibrary, Netlibrary, eBrary, Springer, and Worldbook, as well as SuperStar (simplified Chinese) and airtiBooks (traditional Chinese) as research observation objects.

3. Usage Tests of Different E-book Databases

Through usage tests on different e-book databases, the following are obtained: reference information layout of e-book databases, structured e-book service models, service conditions of different databases, and methods for libraries to integrate various databases through catalog systems.

(1) Reference Information Layout of E-book Databases E-book databases generally use subject indexes similar to web navigation to assist readers in finding and using e-books. Taking Myilibrary as an example, as shown in [FIGURE:10.2-1].

[FIGURE:10.2-1]

(2) Structured E-book Service Model Based on the above, if we abstract the reference information layout patterns of different types of databases and structure information valuable for readers to browse, it can be shown as in [FIGURE:10.2-2].

[FIGURE:10.2-2]

(3) Service Conditions of Different Databases Based on the above, according to the "database-subject classification-publisher-bibliography-chapter" architecture, we can analyze and sort out service models of various e-book databases. However, their interactive interfaces and information management systems actually still differ. Therefore, they need to be compared again according to a certain format, with results shown in [FIGURE:10.2-3].

[FIGURE:10.2-3]

Differences among various databases lie in: subject classification, secondary classification (second-level classification under subject classification), quick search, advanced search (subdivided Query items under quick search), bibliography search (only providing basic search Query such as author, title, etc.), chapter search, full-text search, cross-database search (referring to cross-search between e-journals and e-books), download and archive, text clarity (scanning quality), chapter index (auxiliary links on left or right side for browsing, can be used to directly query original text pages).

(4) Integrating Various Databases Through Library Catalogue Based on the above, currently through catalog systems, better integration of e-books from various databases can be achieved, which is also a way to maintain larger data integration at lower cost. Another method is cross-database search systems and data mapping, which require continuous testing of data joint stability. According to reader needs and habits, the former method is adopted, as shown in [FIGURE:10.2-4].

[FIGURE:10.2-4]

In summary, through usage tests on different e-book databases, the obtained service models and comparison results show: integrating various databases through library catalogue is the most direct way to integrate different types of information resources. However, university libraries with education as the core still need to conduct library services promoting reader e-book utilization based on this.

Accordingly, library strategies for promoting e-book usage are described below:

(1) Research Support Noorhidawati, A & Gibb, F (2008) surveyed three different types of e-book usage in academic environments: 1) actual investigation; 2) finding relevant content; 3) promoting reading. Results showed “finding relevant content” is the most common reason for using e-books. This indicates that the convenience of actual literature verification may still have room for improvement, making it easier for readers to verify references may indirectly increase e-book usage. In addition, promoting reading still has certain room for effort. Of course, how to assist readers in research, especially when they need to find relevant content, is one of the reference service goals that libraries can serve for universities or research institutions.

Since various e-book databases can be integrated into library catalog systems, seemingly “traditional” catalog systems have new functions and roles: simple and direct integration and query of related information. By subdividing authors, editors, keywords, subject terms, abstracts, tables of contents, and first paragraphs of chapters, subject search services can be provided on library webpages. With SFX cross-database search, because of good and stable metadata content (which is also an important contribution of libraries to the network world), information retrieval efficiency is improved.

On the basis of improving catalog systems, integrating metadata content of various e-book databases, and cooperating with SFX cross-database connection mechanisms, risks of data loss and mapping failure can be reduced, achieving the purpose of supporting research. In addition, through reference librarians’ user education and instant services, not only can users’ information literacy be improved, but also the purpose of library support for research can be indirectly achieved.

(2) Teaching Support With changes in the information environment, development of information technology, and replacement of information equipment, reader education has always been one of the main tasks of library services, and it is also one of the tasks that quickly faces challenges. The difference is that the cultivation of “atmosphere” has become complicated—on the one hand, readers have more sources of information, and on the other hand, the quality of these information sources is uneven. This requires librarians to lead an atmosphere of reading and learning exchange.

The specific approach is to provide courses and lectures in the library, supporting the cultivation of students’ personality and temperament through research assistance. Especially students from different majors need to learn how to appreciate others, encourage others, and cooperate with others to solve problems through communication with others.

Libraries need more comprehensive planning, not only providing equipment, paper resources, and electronic resources, but also providing convenient three-in-one services of resource integration, query, and consultation. As Noorhidawati, A & Gibb, F (2008) found that “finding relevant content” is the most common reason for using e-books. City University of Hong Kong Library has established an information technology assistance counter near the Reference Desk, placing paper and electronic collections within scanning distance of both counters, and setting up reference book shelves at the intersection of straight lines from both counters, placing frequently used materials. The two sides of adjacent collections are computer spaces, allowing readers to use computers and reading areas simultaneously without frequently changing venues and documents.

On weekdays, in the User Education Room, each person is provided with a notebook computer for operation practice. Regular free services are held for specific demand groups on databases, collections, library space, multimedia, research methods, and exam counseling.

(3) Learning Support In the knowledge economy system, improving library resource usage is a necessary condition, but library readers creating knowledge is a sufficient condition. Knowledge creation comes from readers’ culture, capabilities, and knowledge dialogue environmental atmosphere.

Huang Min (2007) advocated that libraries should create a relaxed environment for students’ autonomous learning, provide learning resources that meet needs, guide students to develop self-learning abilities and habits, compensate for classroom education deficiencies, and prevent personality crises, cultural divisions, and disciplinary defects that may be caused by professional education. Therefore, the library jointly holds exhibition activities with different schools within the university, providing interdisciplinary integration education training. This has practical significance for the library’ s embedding into university activity processes.

Education is an important way to cultivate students to appreciate others, absorb

teachers' knowledge, interpret texts, and advocate self-viewpoints. Before and after each exhibition and activity, the library can use convenient e-books and webpages to provide library resource recommendations that cross disciplines, time and space, graphics and audio-video, and literature carriers. And use librarian blogs to attract other students to participate in online discussions and promote reading.

In the past, new book display services either placed books and notice boards or held exhibitions together with book publishers' explanation meetings. In the internet age, various forms can be combined because the cost of holding different forms of exhibitions, lectures, and reading clubs on the internet has become smaller. And libraries can make the process from learning about information, obtaining information, participating in discussions, and co-creating knowledge become simpler and faster for readers through the "e-book system-catalog system-librarian blog" method. Zhang Hong (2008) believes that in the internet age, due to changes in resource structure and form, cultivating readers' information retrieval abilities and resource utilization awareness has become more important. This requires innovative reader services, especially services that let readers wait no more.

Due to the complexity of Hong Kong Chinese symbol recognition, there is a need to integrate academic books of different disciplines, carriers, and languages to serve readers. This project selects foreign language databases such as MyiLibrary, Netlibrary, eBrary, Springer, and Worldbook, as well as SuperStar (simplified Chinese) and airitiBooks (traditional Chinese) as research observation objects.

Observation results obtained the e-book database service model of "database-subject classification-publisher-bibliography-chapter." Analysis of differences among the above databases: subject classification, secondary classification, quick search, advanced search, bibliography search, chapter search, full-text search, cross-database search, download and archive, text clarity, chapter index, and other service actual conditions. The "e-book system-catalog system-librarian blog" model is proposed to increase readers' efficiency in the process from learning about information, obtaining information, participating in discussions, to co-creating knowledge.

Three recommendations for libraries to promote reader e-book reading: 1) Use refined subject search and reference services to improve users' search efficiency; 2) Use booklist editing to support program, course, and course selection activities; 3) Use joint exhibitions to support interdisciplinary learning.

Future research is recommended to focus on book selection effectiveness. Reflection from practical experience is: in the past, emphasis was on the effect of buying books (procurement); now, emphasis is on the efficiency of reading books (services); in the future, both should be considered together to focus on the effectiveness of book selection (integration).

Section 3: Information Resource Reader Services

1. Background

Since OECD adopted e-books in 1998 to increase dissemination scope (Green, T. 2004), with the continuous development of networks and e-books, more opportunities have been provided for readers to use libraries. Undoubtedly, e-books can attract more people to enjoy library services. In academic libraries, managing e-books mainly includes: procurement, cataloging and maintaining e-books, funding, licensing and authentication, diversified interfaces, promotion, promotion and user education, subject scope, statistics and usage (Wilkins, V. 2007).

Based on collection development at City University of Hong Kong Library (Ching, SH et al. 2008), a change has emerged in recent years: in the past, e-books were fewer than paper books, but now e-books exceed paper books. Behind this surface phenomenon is the situation of paper books growing at equal acceleration and e-books growing at geometric ratio (see Appendix 1).

In the past, libraries could effectively predict, plan, and control development strategies for paper book procurement and reader services. However, today they face more severe challenges with the explosive growth of e-books. On the one hand, libraries must appropriately grasp the unpredictability of constantly and rapidly changing book quantities, types, carriers, prices, and cooperative procurement forms; on the other hand, perhaps more importantly for readers, what rights libraries can enable them to obtain. Despite early continuous upward trends in user e-book usage (AU Ramaiah, C.K., 2005), Falk, H (2003) research results show that although e-book quantities have soared, students' use of library resources remains limited. Therefore, Carlock, DM & Perry, AM (2008) suggest future research should study the impact of academic libraries, including: providing better promotion and training for e-book platforms, providing better course support, and suggesting e-book suppliers consider product development that meets teachers' teaching and research needs.

Currently, there are many discussions on library electronic resource construction that can systematically guide libraries to face the first challenge. However, libraries' tasks are not only resource construction but more importantly their core value in educational services. Therefore, the second challenge—how to apply academic books to serve readers in universities—requires more diversified, detailed, and differentiated library services.

Targeting the goal of “promoting readers' use of library paper books and e-books,” this study develops three research questions: 1. How to enable readers to cross-use academic paper books and e-books? 2. How to let readers know they have extensive e-book choices? 3. How to enable readers to logically and continuously explore books they need?

Today, as academic e-books rapidly occupy a large proportion of university library collections, how to effectively utilize collections so readers can fully enjoy the reading environment and atmosphere created by libraries becomes more im-

portant. As Gall, J.E. (2005) believes that the rapid growth of e-books obscures myths about their use, functions, and prices, librarians must recognize their task of serving readers. Therefore, libraries should not only purchase large quantities of paper and e-books but more importantly enable readers to make good use of these books and exert their value in creating knowledge for readers, which requires libraries to flexibly promote their collections.

2. Related Research

According to research question needs, the author examined domestic and foreign related literature and research work, discovering many proposals for discussing promotion of reader services to make good use of library collections.

Early Ronte, H (2001) studied changes brought by electronic technology, including: publishing models (authors directly facing readers), distribution models (electronic markets), sales models (electronic retailers), and reading models (e-books). Jantz, R (2001) indicated that libraries need to use e-books to develop new service models. Ashcroft, L & Watts, C (2004) surveyed the adoption of e-books by 127 UK universities, facing management skill challenges: collection development, marketing and evaluation, user education, technical skills, and communication skills. Rao, SS (2005) studied how e-books entered library and information center operations. Appleton, L (2005) proposed the idea of embedding e-books in virtual learning environments. Barker, P (2005) proposed using e-books to achieve knowledge management. Anuradha, K. T. & Usha, H. S. (2006) compared different e-book acquisition models. Dinkelman, A. & Stacy-Bates, K (2007) studied how readers use e-books. Hernon, P. et al. (2007) discussed e-book reader services.

Chen Yuling (2007) believed that libraries should use humanistic concepts, architectural image design, and library functions to exert subtle cultural influence on readers. Huang Min (2007) advocated that libraries should create relaxed environments for students' autonomous learning, provide learning resources that meet needs, guide students to develop self-learning abilities and habits, compensate for classroom education deficiencies, and prevent personality crises, cultural divisions, and disciplinary defects that may be caused by professional education. Gao Hongyan (2007) believed that libraries should create quiet, elegant, relaxed, and comfortable borrowing environments and frequently conduct two-way dialogues with readers. Song Yan (2008) proposed that library services should emphasize humanistic thinking, such as: libraries providing drinking water for readers, librarians having good Chinese and English training, and libraries assisting readers in complying with social norms. Zhou Liying (2008) advocated strengthening information literacy education for readers and optimizing basic resources and providing characteristic services to innovate library services. Zhang Hong (2008) believed that in the internet age, due to changes in resource structure and form, cultivating readers' information retrieval abilities and resource utilization awareness has become more important. Zhang Danmei (2009) believed that library reader services should exert patience, elegance, affinity, sta-

bility, communication, and exchange. Hu Yonghong and Fu Yongfang (2009) suggested libraries strengthen e-reading room promotion, accelerate resource procurement, strengthen librarian training, guide readers to use materials, and explore possible service methods through problem analysis. Chen Weili (2009) proposed five combinations centered on “readers” : traditional services combined with Web services, electronic reading combined with wireless networks, resource sharing combined with self-developed databases, static combined with interactive consultation services, and quality education combined with subject novelty search services. Carlock, DM & Perry, AM (2008) believed that research should be conducted on the impact of academic libraries, including: providing better promotion and training for e-book platforms, providing better course support, and suggesting e-book suppliers consider product development that meets teachers’ teaching and research needs. Shelburne, WA (2009) provided cases of using e-book services for different types of readers. Woods, B & Ireland, M (2008) reviewed e-book loan service model projects, backgrounds, and management challenges, discussing e-book downloads and summarizing conclusions and future activity partners, etc., and management challenges of e-book download models.

In summary, current related research can already systematically guide libraries to face challenges in electronic resource construction. There are also many discussions on library services and promotion, but there is not much research that combines the two and develops collection construction according to different needs, develops user services from collection construction, and then forms the library’ s overall strategic goals. For challenges such as how libraries can exert their core value in educational services, more diversified, detailed, and differentiated library service strategies are needed.

3. Differentiated Resource Allocation According to Disciplinary Needs

The differentiated service implemented at City University of Hong Kong Library does not completely favor paper resources nor electronic resources but combines corresponding paper and electronic resources according to different disciplines’ needs to provide services (see Appendix 2). Its combination methods are shown in [TABLE:10.3-1].

[TABLE:10.3-1]

This strategy can effectively save procurement funds (libraries cannot buy everything nor buy nothing, must make choices), and fully utilizes each resource’ s utilization rate and reader satisfaction. Because the same book has different selling prices in different regions and languages (see Appendix 3), and reader needs differ across different discipline categories, bulk procurement is certainly a cost-reduction method, but “on-demand allocation” is a method that combines cost reduction with effective resource utilization. On the other hand, libraries are not just procurement resources but more importantly assist readers in using

resources, which requires developing differentiated services based on resource allocation.

4. Developing Differentiated Services Based on Resource Allocation

In the process of shifting from complete paper services to differentiated services, libraries' functions and roles have continuously evolved. The result of this evolution is that libraries have developed a series of reader services to adapt to each period and each type of reader need.

(1) Cataloging and Subject Promotion Services Provide cataloging information and subject recommendations near the Information Space (built around 2005-2006). This first computer space in the library not only equipped 100 computers to give students internet and computer usage opportunities but also provided operation, explanation, and tutorials for application software to assist them in using computer computing resources while providing content access to electronic resources.

This service is a basic needs-oriented service. At that time, having sufficient computer equipment operation was the top priority. Soon, readers gradually demanded higher-level library services.

(2) Reader Reference Services Subsequently between 2006-2008, the library established The Oval (oval computer space). This second computer space in the library was equipped with 106 computers and services for application software and electronic content access.

At that time, besides providing computer equipment, reader services were also considered. Because readers often have troubles such as being unable to retrieve needed information, being unable to obtain full text, or having too much information to filter when searching for information through computers. Librarians then transformed from “managers” to “tutors.” In a better equipment environment, they play a role in supporting research, teaching, and learning.

In addition, this area is also equipped with 23 computers for multimedia resources, providing content services of graphics, text, video, and audio, mainly focusing on limited video and music services. From multimedia assisting university education activities and cultivation of students' cultural levels.

(3) Reader Education Services With changes in the information environment, development of information technology, and replacement of information equipment, reader education has always been one of the main tasks of library services. The difference is that the cultivation of “atmosphere” has become complicated—on the one hand, readers have more sources of information, and on the other hand, the quality of these information sources is uneven. This requires librarians to lead a reading and learning exchange atmosphere.

The specific approach is to provide courses and lectures in the library, supporting the cultivation of students' personality and temperament through research assistance. Especially students from different majors need to learn how to appreciate others, encourage others, and cooperate with others to solve problems through communication with others.

Libraries need more comprehensive planning, not only providing equipment, paper resources, and electronic resources, but also providing convenient three-in-one services of resource integration, query, and consultation. As Noorhidawati, A & Gibb, F (2008) found that "finding relevant content" is the most common reason for using e-books. City University of Hong Kong Library has established an information technology assistance counter near the Reference Desk, placing paper and electronic collections within scanning distance of both counters, and setting up reference book shelves at the intersection of straight lines from both counters, placing frequently used materials. The two sides adjacent to collections are computer spaces, allowing readers to use computers and reading areas simultaneously without frequently changing venues and documents.

On weekdays, in the User Education Room, each person is provided with a notebook computer for operation practice. Regular free services are held for specific demand groups on databases, collections, library space, multimedia, research methods, and exam counseling.

(4) Creating an Environment Supporting "Whole Person Development" Educational Philosophy In terms of new book display services, it is not just about book placement but combining exhibitions and lectures in different forms, and regularly holding reading clubs. The purpose is to stimulate students' curiosity, provide teachers with another teaching space, and form a reading atmosphere.

The creation and maintenance of this atmosphere aim to establish an environment supporting the "whole person development" educational philosophy. Guided by librarians, cooperating with various school programs, teacher courses, and student group needs, general education and interdisciplinary training for different professional levels are carried out.

For example: through exhibition activities, lecture activities, library work-study, and off-campus inspections, assist students in interdisciplinary training and help them jump out of limitations inherent in their professional training. Use different art appreciation courses to cultivate students' interest in fine arts and music.

5. Developing Libraries Supporting Research, Education, and Lifelong Reading

Continuous service strategies focus on "differentiated services according to different disciplines to support the core concept of university education: research, education, and lifelong reading." This enables researchers to strengthen capabil-

ities (Empower), enhances learners' interdisciplinary knowledge, and ultimately achieves reading habit cultivation through love of reading.

(1) Research Support Use SFX cross-database search to improve information retrieval efficiency. Through systematically summarizing bibliography authors, editors, keywords, subject terms, abstracts, tables of contents, and first paragraphs of chapters, not only cross-database search but also cross-text search service functions can be performed. For example, from one keyword, different edited related articles and different paragraphs of different articles can be found. Conduct both bibliography search and full-text search.

(2) Teaching Support The first step is to compile booklists for program planning, course planning, and course selection systems. In compiling booklists for program planning, each university department submits a reference booklist annually for library procurement and cataloging. These booklists are the information organization system for basic knowledge of the discipline. As Parkes, D (2007) studied providing course materials and reading methods in electronic formats. City University of Hong Kong Library's actual experience has three aspects: program planning, course planning, and course selection system.

In compiling booklists for course planning, each professor submits a reference booklist each semester for library procurement and cataloging. These booklists are the information organization system for advanced knowledge of specific professions.

In compiling booklists for course selection systems, through reference librarians' understanding and absorption of the above two systems, they are responsible for the information organization of reference books from basic to advanced knowledge, from whole to part, for all university programs and courses on the university course selection system.

The second step is to provide three information systems with e-book services, allowing users to directly obtain relevant content. According to program planning, course planning, and course selection systems, books and documents for program planning are placed in the educational reference material area of 4,000 programs, becoming essential paper resources; due to copyright restrictions, books, briefings, photos, and physical models needed for courses become main display objects in the educational reference material area, and auxiliary teaching materials are stored in computer systems, making relevant e-books and journal documents co-exist on webpages through subject webpage links with paper books; these e-books for program planning and electronic documents and auxiliary teaching materials for course planning are linked to the course selection system, not only organizing relevant information for teachers by program and course but also allowing course selection students to directly click and read, assisting in judging whether to select the course.

(3) Learning Support The first step is to expand interdisciplinary, temporal-spatial, graphics-text-audio-video, and literature carrier crossovers. In interdisciplinary crossover, the Bridge Exhibition combines the humanities of the Chinese Culture School with the engineering science of the Architecture and Engineering Science School. The library provides space for teachers and students from both sides to appreciate and exchange with each other. Taking the “Discovery of the Architectural and Cultural Values of Chinese Bridges” jointly held on November 24, 2009, by City University of Hong Kong Chinese Culture Center and Department of Architecture and Civil Engineering as an example (hereinafter referred to as the Bridge Exhibition):

In temporal-spatial crossover, the Bridge Exhibition’s theme book recommendation combines ancient Chinese bridge construction and art with modern Western bridge construction and technology.

In graphics-text-audio-video crossover, the Bridge Exhibition not only allows students to display their posters and model works but also plays two movies, “Traces of Rainbow Bridges” and “Secrets of Lost Empires II: Easter Island-Chuan Bridge” (Secrets of Lost Empires II: Chinese Bridges) in the library, and combines book exhibitions to fully integrate and utilize images, models, books, and films.

In literature carrier crossover, besides display and reading method recommendations for paper books, the Bridge Exhibition also provides online book connections on webpages before the activity and recommended reading in the Q&A webpage after the activity, integrating paper and electronic resources through library activities.

The second step is goal-oriented reading selection to support professional education and general education. In professional education, through teachers’ selection of important reference books as a starting point for theme reading, through book reviews, bibliography organization, and related reference resource links for the book, a basic reference material area is formed. For teachers and students specializing in the field, systematic literature collection, information organization, and convenient acquisition services are conducted.

Furthermore, through students after learning, communicating and discussing with non-major students online, the learning effect of co-creation, sharing, and co-construction in general education is achieved. Led by librarian blogs, combined with students’ learning experiences on blogs, other students are attracted to participate in online discussions. From the perspective of developing an exchange atmosphere, a service mechanism for reading sharing is created through the form of posting experiences after theme reading. Each week, one English book, one traditional Chinese book, and one simplified Chinese book are discussed focusing on life philosophy, history, or culture, adding reading and discussion of 156 classic books within one academic year, along with utilization of other related books and journal documents, creating a snowball effect.

Finally, through 4-6 exhibitions each semester, “face-to-face” exchanges among

netizens are conducted, giving students opportunities to express their experiences in public venues (Library Multi-purpose Lobby). And they learn social communication abilities and attitudes of mutual appreciation, mutual learning, mutual encouragement, and mutual cooperation.

As Gall, J.E. (2005) reminds librarians to recognize their own services and not be confused by the rapid growth of e-books. In fact, libraries purchase paper books at higher prices than e-books, so they mostly follow publishers' suggestions to purchase e-books and paper books with slightly earlier publication dates (and decide based on e-version click rates or download rates), as well as display donated books. As a result, when readers enter the library and see relatively old paper books (cheaper in price and already seen by many in e-version) compared with novel e-books (the "latest" unpublished versions just released by publishers), they will inevitably unconsciously discriminate against paper books.

However, different carriers match different content, completely depending on their actual functions and roles. Therefore, libraries should neither completely favor paper resources nor completely favor electronic resources, but combine corresponding paper and electronic resources according to different disciplines' needs, and promote library services.

Therefore, libraries play a bridging role: facilitating communication and dialogue between authors and readers through books. This can not only inspire researchers' creative thinking but also open new visions for learners.

Following this principle, City University of Hong Kong Library gradually moves toward: - A place providing information technology and content - A place coordinating cooperation and collaborative learning - A place producing knowledge

For research question 1—How to enable readers to cross-use academic paper books and e-books?—we adopt the method of “differentiated resource allocation according to disciplinary needs,” making City University of Hong Kong Library become “a place providing information technology and content.” For research question 2—How to let readers know they have extensive e-book choices?—we adopt the method of “developing differentiated services based on resource allocation,” making City University of Hong Kong Library become “a place coordinating cooperation and collaborative learning.” For research question 3—How to enable readers to logically and continuously explore books they need?—we adopt the method of “developing libraries supporting research, education, and lifelong reading,” making City University of Hong Kong Library become “a place producing knowledge.” Based on collection development (Ching, SH et al. 2008), the strategy of “promoting readers' use of library paper and e-books” is further developed.

Bennett, L & Landoni, M (2005) believe that although academic libraries have large quantities of e-books, users still do not pay attention, and librarians should find ways to improve usability and classification methods. This requires considering reader characteristics in different regions. Taking City University of Hong Kong Library as an example, due to the complexity of Hong Kong Chinese

symbol recognition, there is a need to integrate academic books of different disciplines, carriers, and languages to serve readers, so the complexity of promoting readers' use of paper and e-books is higher. Although Hong Kong's teaching, textbooks, tests, homework, and reference lists are all in English, according to City University of Hong Kong Library's borrowing volume, borrowing volumes of books in English, traditional Chinese, and simplified Chinese show equal growth trends. This shows that while English e-books are important, Chinese e-books and paper books are still indispensable and have value for reader usage. In the knowledge economy system, improving library resource usage is a necessary condition, but library readers creating knowledge is a sufficient condition. Knowledge creation comes from readers' culture, capabilities, and knowledge dialogue environmental atmosphere. Education is an important way to cultivate students to appreciate others, absorb teachers' knowledge, interpret texts, and advocate self-viewpoints. We firmly believe that libraries can bring such knowledge services to society and people.

Section 4: Information Resource Exhibition Activities

1. Background

In traditional education and training, students learn a skill through lectures, textbooks, and tests (Talk, Text, Test). Although this training can create first-class professionals, they need to face colleagues from different disciplines after entering society. In the past, students trained through this professional training could immediately engage in professional work after graduation, but in modern society where technology causes rapid social changes, these graduates may fall into predicaments of being unable to communicate harmoniously, understand quickly, and cooperate effectively with others.

To address these potential threats, besides continuously exploring how to strengthen professional skills, education also advocates interdisciplinary training for students to give each student opportunities to appreciate others, learn from others, and communicate with others. As an education resource center, libraries bear the functions and roles of collecting, organizing, and organizing information. How to fully utilize libraries' limited resources—those materials and that space—to maximize benefits is a common issue facing libraries.

Libraries handle many activities, including: exhibitions, lectures, seminars, symposiums, briefings, and training. These activities generate large amounts of archives before, during, and after the event. These archives may be in forms such as text, images, video, and audio, but all have educational resource value. To properly handle these education resources and exert their influence in knowledge management, cultural cultivation, and cooperation with university departments, this study conducts overall workflow (Total Workflow) descriptions for library activity archives' collection and display, including workflow, systems, and services.

This multiple case study involves the process from library planning, promotion, and holding activities to collecting, organizing, and organizing these activity results. To create an atmosphere of interdisciplinary training for students, City University of Hong Kong's Chinese Culture Center, Department of Architecture and Civil Engineering, and Library cooperated to hold student works exhibitions. The library provided venues and activity planning and systematically organized activity results for inquiry by other faculty, students, and off-campus personnel. In addition, for scholars' expert lectures, a series of activity courses were organized. Combining exhibition and lecture holding, education resource collection, and information organization experience, the research results form a management system and retrieval path to support the transformation of library activities into education resources and provide online services.

2. Related Research

On digital libraries and virtual learning environment issues, Sirje Virkus et al. (2009) 梳理了 2000 年至 2008 年在 LISA 的相关文献, 指出典藏 (collaborative approach) 朝着资源再利用 (re-usability of resources)、跨搜索 (cross-search)、节省学者时间 (saving for academics)、图书馆员与学生的关系 (librarians and students) 等方向发展。在图书馆建立 IR 的综述方面, Ashalatha Laxminarsaiah 等人 (2007) 讨论了从 Archimede、CERN、DSpace、E-Prints 和 Greenstone 中选择 DSpace 建立 IR 的过程和结果, 并且讨论了元数据的转换问题。Plato L. Smith II (2007) 讨论了 IR 在数字对象描述和研究者之间的中介关系。John C. Kelly (2007) 讨论了如何节省 IR 建置的财务和技术资源。而 Marianne A. Buehler 等人 (2007) 则认为在组织典藏 (organization's archives) 和机构知识库之间存在许多灰色地带 (Gray areas) 值得未来研究。

在开放获取 (Open access) 和 IR 建置的政策方面, Elisavet Chantavaridou (2009) 和 Andreas Geyrecker 等人 (2008) 分别描述了几个希腊运用 DSpace 建立 IR 的案例和政策。Marie Wise 等人 (2007) 和 Sai Deng 等人 (2009) 则是说明美国的 IR 案例, 但更着重在不同时期元数据规范的研究。而 Nicholas Joint (2009) 则比较了英美两国不同机构的典藏政策, 指出这有利于相互借鉴, 共同发展开放获取和 IR 等机制。这说明不同区域之间的 IR 可以相互学习, 本文选择香港七所大学和中国科学院的 IR 进行比较。

在大中华地区的 IR 研究中, 香港的 Irene S. M. Wong (2009) 等人开发了集成香港七所大学的论文收藏系统。这种跨校集成服务事实上也是一种新的跨机构知识库, 本文对此进行了解和比较。台北的 Kuan-hua Chen (2009) 等人比较台湾地区大学图书馆的 IR 收藏量, 并且利用所属大学的 IR 数据提出改进方式。本文同样采取这种比较区域性相同机构, 而后探索自身服务不足的研究模式。上海的 Guo Jing (2009) 等人论述泛在知识环境 (Ubiquitous knowledge environment) 下大学图书馆数字系统的导向 (Orientation)、服务原则 (Service principle) 与服务概念 (Service concept), 例如: “我到我选” (I move I search) 等用户行为的考虑与设计。本文运用这些架构探讨香港的 IR 机制。

在学习对象 (Learning Object) 方面, 吴砥 (2007) 对学习资源进行过标准化和组织技术的讨论。魏来 (2007) 对以学习对象为核心的机构知识库, 所涉及的元数据、内容封装、系统互操作等进行分析。李静和周竹荣 (2006) 把学习对象和超级分布对象结合, 以实现学习资源和学习服务的非集中式处理。郑莉等人 (2005) 给出具体解决学习内容的入库效率、检索效率、数据一致性和完整性的方案。周竹荣等人 (2005) 较早地提出了“资源库-概念图-网络课件”的模式。梁慧芝与张

小真 (2005) 较早地验证了学习型知识库的模型与框架。透过上述文献所揭示的实际工作内容, 学习对象即可获得充分且广泛的应用。

在 DSpace 应用方面, 林颖和张智雄 (2007) 有系统地梳理了 DSpace 对中文语言的支持、文件格式与元数据扩展的模式、工作流的制定和管理, 以及与其它服务系统的集成的架构和方法。马建霞等人 (2008) 则进一步详解如何将 Excellent 数据导入 DSpace 系统, 以及如何定制元数据输入和显示界面的过程。黄纯艳和曾为众 (2009) 向读者介绍如何安装 DSpace 和操作。祝忠明等人 (2009) 有系统地说明 CAS-IR 平台的设计和应用经验。

在储存模式的讨论方面, 都平平等人 (2009) 定义和比较了机构仓储、学科仓储和个人主页博客的异同。李静 (2009) 讨论了机构知识库、图书馆自动化、一站式服务、数字图书馆等信息管理方式。范亚芳 (2007) 讨论机构知识库对资源建设、信息组织和信息服务的影响。刘华 (2007) 讨论机构知识库进行长期保存的重要性。李霞等人 (2007) 讨论了知识型客户服务的机构知识库。

对机构知识库作用的讨论, 则有赵继海 (2006) 梳理的 IR 具有的: 学术传播、电子出版、长期保存、知识管理、教育、科研评价、共享机制等功能。常唯 (2006) 指出 IR 对机构成员智力资产进行收集、组织、保存并提供服务的作用。曾英姿 (2007) 认为 IR 具有: 展示成果、提升开放获取、隐形知识显性化、长期保存、提升信息获取效率、学术交流等特点。

推广机构知识库方面, 王学勤 (2009) 指出合作团队的组成与分工, 以及政策支持的重要性。李大玲与柯平 (2009) 则研究激励工作人员提交智力成果到机构知识库中的因素。赖荣辉 (2009) 则提倡多元化策略以解决机构知识库的资源建设问题。

3. IR Advantages

Taking City University of Hong Kong Library' s website as an example, we discovered a special phenomenon: different numbers of thesis collection volumes. The institutional repository has 1,968 titles (including CityU theses), but other system catalogs include 3,251 City University theses.

The second phenomenon is that the same author has different documents in the two systems. Taking Ahsan Ullah, A. K. M. as an example, on the one hand, the institutional repository collected one document by this author; on the other hand, the catalog system showed the same student had three documents.

Finally, the two systems cannot conduct two-way interaction. From the catalog, IR content can be found, but from IR, not all data and resources in the Catalog can be accessed. This causes the IR function to be weakened invisibly and even creates a poor impression of duplicate resource construction (although their functions and purposes are different).

Such observation is only partial because each system has different goals, functions, support, and collections. However, it may cause confusion and anxiety in end users' information seeking behavior (please refer to Kuhlthau, C.C., 2003). They may wonder what problem the library has, why two different results appear when using information retrieval systems, and how to determine whether final search results are correct.

However, for the first phenomenon, it is actually because IR only includes doctoral and research master' s theses, while the Catalog includes not only theses

but also some undergraduate and non-research master' s theses or works (dissertations).

For the second phenomenon, it is actually because IR collected the author' s thesis, while the Catalog collected the author' s theses and works. In addition, the Catalog has paper and electronic bibliography data, while IR only has electronic bibliography data. This is another reason for different numbers of works by the same author.

For the third phenomenon, it is actually because in workflow, the Marc meta-data format is currently used. After the Catalog completes MARC data, it is converted into XML files and input into the IR system in Dublin Core format. As for paper data before 2003, all have been digitized and served on Series Online after the Catalog completes MARC data. Because both Catalog and IR data come from the same server, there is no problem of duplicate resource construction.

If readers are familiar with the goals, functions, support, and collections of each library system, they will have no questions. However, we cannot guarantee that every reader has the same system proficiency as librarians, nor can we guarantee that every user has received complete operation training. Therefore, if we make slight adjustments in workflow and interface design, we can enhance IR collection and services on the original basis.

4. IR Improvements

(1) Expanding IR Page Basic Service Functions According to User Workflow In Hong Kong Baptist University' s IR, readers can see collection quantities by department, degree, year, and language while searching, which are simple statistics but relevant auxiliary bibliographic data are clear at a glance. In contrast, City University of Hong Kong Library' s IR does not provide similar functions and services. Although City University of Hong Kong Library' s IR can directly see items and quantities by title, author, subject, and latest upload (date), the labeling is not as clear and direct as Baptist University' s (requires another click). Items and quantities for Communities & Collections (same meaning as Department) are presented individually and require readers to query each degree' s theses under each school sequentially (requiring three clicks total).

Chinese University of Hong Kong' s thesis collection combines it with the catalog system, showing paper physical locations and electronic version links below search results. Although there is no collection and service named "IR," for users, they only need to query one information system to complete searches of the library' s collection including theses.

Hong Kong Polytechnic University' s Electronic Theses Database, although not built on the DSpace system but using JAVA to construct the entire system, has functions comparable to general commercial databases. Users can select needed

theses and click “Export” to download or deliver them to email mailboxes. For users, using IR is like using e-journal databases—they do not need to learn new systems additionally.

Although the three universities’ thesis systems and IR systems differ from City University of Hong Kong’s, they provide several meaningful thoughts in IR page function expansion: 1) Existing IR services should provide corresponding basic statistical data according to users’ workflows on user interfaces; 2) Thesis query systems should strive to conform to users’ database query habits, or at least unify various systems within the library into a certain model of interfaces; 3) Some links should be added on IR pages, which should appear in the same position on different pages and be beneficial for users to use other library systems and services.

(2) Designing IR Homepage and Page Links According to User Habits

In Hong Kong Lingnan University’s Catalog system, although the thesis collection is 137 volumes, it provides two functions: “Search Google Scholar” and “Find Relative Resources” to compensate for service difficulties that may be caused by insufficient thesis quantities. In addition, although these two links are not IR’s main services, they combine IR with external network services (Google) and internal library electronic resource services (relative resources - catalog). For users, compared with City University of Hong Kong’s IR, Lingnan University’s IR is like an intermediary between inside and outside the library, rather than part of the Catalog.

In addition, Hong Kong Institute of Education’s IR is also built on the DSpace basis, but its homepage only has one query, conforming to general users’ query habits on Google. Only when entering Advanced Search will multiple query windows appear. There are also other relevant links on the right side of the IR homepage, and the bottom of the homepage is not blank but current Browse content items. For users, although the Institute of Education’s IR is similar to City University of Hong Kong’s IR, the former’s design is more in line with user habits, and more detailed and completely presents expandable functions of IR built on DSpace.

(3) IR Email Authentication System In Hong Kong University’s IR institution, special attention should be paid to “Hong Kong University Theses Online (HKUTO).” In HKUTO, there is an email authentication system. They can confirm what each user downloads, where, how they discovered the thesis, and user feedback from those who voluntarily fill in opinions, which means they can calculate user behavior and improve services on a statistical basis. In addition, the system workflow requiring users to confirm identification codes before downloading is also an effective method to limit download frequency. This system is the same as Sun Company’s online theses, which opens thesis downloads to a limited extent.

Hong Kong Polytechnic University’s Electronic Theses Database differs from

Hong Kong University Theses Online. The former emphasizes that users can download needed materials at one time, while the latter emphasizes that users need to explain reasons and mail each time they download a thesis. The former lacks the latter's user behavior data collection, which limits analysis of user behavior to improve service processes; while the latter lacks the former's user behavior cooperativeness, only serving retrieval-type users who specifically collect a single thesis, not browsing-type users who collect multiple theses. If City University of Hong Kong Library's IR system can combine the strengths of both, there will be more service space and opportunities.

(4) Adding Cross-Institutional Search Engines We can learn more from Hong Kong University of Science and Technology's website than what we can see. Of course, HKUST's services are not completely the best in the world, but they have many things we can also do and do better. On the issue of collection theses, HKUST is similar to City University in having two systems: one is the "Electronic Theses" system, and the other is the "Hong Kong Institutional Repository."

As an early practitioner of IR, the "Hong Kong Institutional Repository" was reported in English journals, seemingly representing Asian cases, and was even introduced on the DSpace website. One of the most interesting aspects is that its name is "Hong Kong Institutional Repository" rather than "Hong Kong University of Science and Technology Institutional Repository," and hidden behind this name is a cross-institutional search engine. By clicking on HKUST's webpage, users can search for any thesis made in Hong Kong through the cross-institutional search engine, which is why we pay attention to the "Hong Kong Institutional Repository." For example, we can search for City University of Hong Kong's doctoral theses in HKUST's institutional repository system.

(5) Adding Web 2.0 Service Elements Outside the Hong Kong Special Administrative Region, the National Science Library of the Chinese Academy of Sciences is also an important case because this library belongs to a relatively large-scale library in mainland China (with more than 470 staff, serving more than 89 Chinese Academy of Sciences research institutes from 24 mainland cities) and has long-term cooperation with European EIFL, German National Library, Stanford University Library, Japan JST, and South Korea KISTI. Recently, it has also developed an institutional repository.

Similar to City University, the Chinese Academy of Sciences' institutional repository is also based on DSpace but has added more interactive services. For example, there is only one query window on the website's search engine integrating all database systems. If users enter the institutional repository webpage, there are obvious latest upload items (10 items), download rankings (10 items), and links with other library systems.

After clicking, users can not only read metadata and download document materials but also have Web 2.0 service elements such as copyright confirmation,

recommended citations, and connections with Google Scholar, Scirus, social bookmarking, and end-user browser logging. Because the role of IR lies in free scholarly communication, and the focus of Web 2.0 lies in common building, common sharing, and common creating services, loading links on IR webpages can further improve IR services, making them more conducive to free scholarly communication atmosphere, thereby reducing user resistance and improving collection speed.

5. Practical Tools for Improving IR

(1) Selection and Utilization of DSpace DSpace, developed by MIT and Hewlett-Packard, is an open-source system that complies with the OAI-PMH format advocated by the metadata transmission protocol and allows item indexing and easy discovery through the internet. Its biggest feature is that archives are not only stored in repositories but also located by identifiers designated by institutions, enabling long-term storage and indexing of digital objects. For this study, the DSpace-based institutional repository is one of the digital collection systems currently available at City University of Hong Kong Library, which can economically develop an integrated system for library activity archives based on this foundation.

(2) Selection and Utilization of Dreamweaver Dreamweaver webpage authoring software, produced by Adobe, is a tool that conforms to high-efficiency and simple operation strategies. Its biggest feature is convenience, time-saving, and ability to handle various types of webpage authoring languages. For this study, this software can conveniently produce interactive webpages needed for integrated systems.

6. Library Workflow

In digital libraries (DL), as a component, institutional repositories (IR) have two identities: one is a database collecting academic community activity results, and the other is a database collecting library itself activity results. In City University of Hong Kong Library's institutional repository, it already includes content and management of academic activity results such as electronic theses, award-winning works, and excellent papers. The content and management of library itself activities are another task discussed in this study to enhance institutional repository functions.

According to investigation, library activities can be described as follows: A. Humanities and Arts B. Interdisciplinary Collaboration C. Inter-institutional Collaboration D. Pearl River Delta and Yangtze River Delta Information Services Centre Events E. Reading Promotion F. Others

The work of transforming the above library activities into education resources can be built on the institutional repository framework depicted by Jantz R.C. & Wilson M.Y. (2008) as shown in [FIGURE:10.4-1].

[FIGURE:10.4-1]

According to the service model marked by MIT Libraries in 2004 and cases by Awre C. & Swan A. (2007), Jones R. (2007), Rumsey S. (2006), etc., it can be summarized into four items: service mission, document type, key users, and development strategy.

Defining the integrated service system model for transforming library activities into education resources according to these four items:

A. Service Mission a. Increase institutional repository collection quantity b. Preserve library activity work archives c. Promote library activity effectiveness d. Manage such education resources

B. Document Type a. Formal publications b. Activity records c. Learning materials

C. Key Users a. Library staff b. University administrative staff c. University students on and off campus d. Distinguished guests participating in activities

D. Development Strategy a. Long-term resource preservation and development of sustainable education resource integration b. Support resource collection by activity teams and administrative teams for system teams c. Change presentation methods and other service strategies as needed d. Focus on famous scholars and large-scale activities first, others second, organizing and collecting sequentially e. Release relevant activity content and processes as much as possible after obtaining consent from relevant personnel f. Under scarce resource conditions, provide basic bibliography and metadata content

(1) Overall Workflow The overall workflow is divided into three parts: production, storage, and utilization (services) of library activity archives. The specific results of these three parts are: archive organization, institutional repository operation, and webpage presentation, as shown in [FIGURE:10.4-2].

[FIGURE:10.4-2]

1. Production Process (Activity Management) The production process refers to: holding an activity and generating relevant archives during the three processes of pre-event preparation, event day, and post-event organization, as well as organizing relevant archives.

2. Storage Process (System Management) The storage process refers to: after the production process, a large number of organized archives are uploaded, queried, and downloaded by the database system. This involves describing the library activity, operating the database system, and testing archive usage.

3. Service Process (Webpage Management) The service process refers to: after the storage process, a large number of event records and attached

archives are managed through webpage links according to user characteristics and behavior patterns.

(2) Production Process

1. Library Activity Process The library activity process includes five stages, as shown in [FIGURE:10.4-3] and [FIGURE:10.4-4].

[FIGURE:10.4-3]

[FIGURE:10.4-4]

2. Library Activity Productivity If archives generated by holding library activities are considered a product, then according to the library activity process, library activity productivity can be further described as follows:

[FIGURE:10.4-5]

[FIGURE:10.4-6]

3. Archives Generated by Library Activities Although execution conditions of each library activity differ, from the perspective of library productivity (see [FIGURE:10.4-5] and [FIGURE:10.4-6]), archives can be classified as follows:

[FIGURE:10.4-7]

Archives generated by library activities, regardless of file type, whether such archives exist, or what archive content is, are standardized in the following format to unify file types, formats, names, etc.:

- Archives including text, images, and briefings are stored in “pdf” file format.
- Archives in “pdf” format are sized A4 or A3; originals exceeding A3 are scaled down proportionally.
- Video archives are stored in “wmv” for online dissemination.
- Audio archives are stored in “mp3” for online dissemination.
- Important lecture videos are temporarily treated as non-public archives in “avi” format to preserve picture quality.

File name format: “Date + LIB + Separator + Event Type + Separator + Honorific + Surname + Sequence + File Type”. For example: “20091104LIB_{{lecture}}_{{profchow02}}.pdf” indicates “the second archive of Professor Chow’s lecture at the library on November 25, 2009”.

A large number of archives generated before, during, and after activities can be divided into two parts after systematic organization: one is document types and system permissions for public and public figure use, and the other is knowledge management for staff use.

For collection and display of library activity archives, relevant system planning is shown in [TABLE:10.4-1].

[TABLE:10.4-1]

The specific work situation is: systematically 梳理 the data of “Discovery of the Architectural and Cultural Values of Chinese Bridges Exhibition” and “Protecting the Environment in China and in the World.” List (List) the archives generated by each activity, and provide file type (File type) and permission (Access) descriptions for each item (Item) in the list.

(3) Storage Process

1. Institutional Repository Upload Process After organizing and archiving archives generated by library activities using standardized formats, they can be uploaded. Steps are illustrated below:

[FIGURE:10.4-8]

[FIGURE:10.4-9]

[FIGURE:10.4-10]

[FIGURE:10.4-11]

[FIGURE:10.4-12]

[FIGURE:10.4-13]

2. Institutional Repository Query Process After uploading archives generated by library activities, they can be provided for reader queries. Query steps are illustrated below:

[FIGURE:10.4-14]

[FIGURE:10.4-15]

[FIGURE:10.4-16]

[FIGURE:10.4-17]

3. Institutional Repository Download Process After querying library activity records, they can be provided for reader download. Two download situations are illustrated below:

[FIGURE:10.4-18]

[FIGURE:10.4-19]

In the system construction part, a community called “Interdisciplinary learning Resources” is established, and two collection spaces called “Project” and “Lecture Series” are set up.

In the sample part, metadata content and four archives of the “Discovery of the Architectural and Cultural Values of Chinese Bridges Exhibition” exhibition activity with many related archives (over 50 items) have been stored in the “Projects” space, and metadata content and four archives of Professor Gregory Chow’ s lecture “Protecting the Environment in China and in the World” with fewer related archives (6 items) have been stored in the “Lecture Series” space.

In the retrieval process part, user retrieval processes meeting usage needs have been designed for four key user groups: “participating distinguished guests,” “university administrative staff,” “university students on and off campus,” and “library staff.” Four user models are respectively: “To know the events” (users who want to understand activities; for academic staff and university students), “To review the event” (users who want to review activities; for distinguished guests and university students), “To use the resource” (users who want to use resources; for university students and librarians), and “To re-organize & to make the resource” (users who want to provide resources; for librarians and academic staff).

In the permission management part, the system’ s “Open Access” and “Control Access” parts have been set up. According to key user characteristics, they can actually be divided into two user groups: public and staff. Corresponding data categories can be divided into “public archives” and “non-public archives.” Permissions for the two file types can be edited, set, and managed by the system.

(4) Service Process

1. Library Website Architecture [FIGURE:10.4-20]

[FIGURE:10.4-21]

2. User Characteristics and Behavior Key users are library staff, university administrative staff, university students on and off campus, and participating distinguished guests. They can actually be divided into two groups: staff and public. Corresponding data categories are non-public data users and public data users.

User characteristics are defined as follows:

[TABLE:10.4-2]

Based on user characteristic definitions, user behaviors are designed as follows:

[TABLE:10.4-3]

3. User Search Process Based on user behavior design, user search processes are described as follows:

[FIGURE:10.4-22]

[FIGURE:10.4-23]

[FIGURE:10.4-24]

[FIGURE:10.4-25]

(5) Other Service Models

1. First Model

- (1) System Architecture: This system architecture adds a group of categories and items within the existing institutional repository.
 - First, establish a new group in the institutional repository (IR).
 - Then, establish different subjects within the group.
 - Next, establish different items within the subject.
 - Finally, input metadata content and attach archives in the item.
- (2) Operation Example: Based on the system architecture description, the operation example is as follows:

[FIGURE:10.4-26]

- (3) Metadata Requirements: These metadata requirements describe the library activity itself.

2. Second Individual Model

- (1) System Architecture: This system architecture separates from the existing DSpace and builds a similar database and server, adopting a common data warehouse, but the new database system uses file categories as indexing and marking.
- (2) Operation Example: Based on the system architecture description, the operation example is as follows:

[FIGURE:10.4-27]

- (3) Metadata Requirements: These metadata requirements describe the library activity itself and add a “Description” metadata item to transform text file content into descriptions of the activity itself.

3. Third Individual Model

- (1) System Architecture: The above first and second individual models differ from the third individual model in that it uses an object-oriented rather than structural data management model. Briefly, it is a management method that handles “that file” rather than “that event including many files.”
- (2) Operation Example: Based on the system architecture description, operation examples can refer to [FIGURE:10.4-26] and [FIGURE:10.4-27]. Key

points that are easily confused and cause trouble need to be specifically noted here:

Metadata for various file types are different and cannot use a common metadata format to describe different archives in the same event. An event includes many archives, so descriptions of archives and events cannot be confused. The information organization of many events is the level of “education resource integration,” while the information organization of many archives generated under one event is the level of “library activity.”

To describe “Prof Gregory Chow” in the poster of “Protecting the Environment in China and in the World,” one cannot use “Speaker” or “Author,” but can only use “Tag” or “Keyword.” This is because “Prof Gregory Chow” represents a group of vocabulary in the poster, not a person who influences the event.

- (3) Metadata Requirements: These metadata requirements describe individual archives generated by library activities. Taking photos as an example, they can be divided into the following descriptive data and metadata.

4. Fourth Individual Model

- (1) System Architecture: This system architecture is a webpage link system based on file management rather than a database system. First, individual html webpages are established for different photos, sounds, and videos as individual objects. Then, webpages established from item to item are linked to webpages describing a certain event. Next, webpages are linked to homepages describing a certain type of activity. Finally, the homepage is linked to the library homepage or institutional repository.
- (2) Operation Example: Based on the system architecture description, the operation example is as follows:

[FIGURE:10.4-28]

- (3) Metadata Requirements: These metadata requirements describe archives generated by library activities and transform all archives into webpage html file formats, distinguishing between metadata descriptions and actual archive objects in html.

5. Comparison of Individual Models

- (1) Comparison of System, Operation, and Work Aspects: Comparing the above four individual models can yield system complexity and work demand quantity as rough references for evaluating work progress. The four models can basically all complete permission control and retrieval paths, but administrators’ control over permissions and users’ retrieval of paths may have differences in difficulty.

[TABLE:10.4-4]

- (2) Explanation of Comparison Results: The first model adds education resources to existing IR, with the advantage of fastest goal achievement, but the disadvantage is that it must conform to existing system functions and service models.

The second model builds a new system on existing DSpace, with the advantage of being able to redesign needed functions, but the disadvantage is that future system change degrees are limited.

The third model establishes metadata content for each file, with the advantage of strong future change operability, but the disadvantage is that large amounts of labor and waiting time for completion are required now.

The fourth model establishes webpages and webpage links, with the advantage of having the benefits of the above three models, but the disadvantage is that there is currently no foundation for developing a new generation retrieval system, and education resources can only be presented in the most primitive and common methods.

(6) Policy Recommendations As Wang Zhuang (2009) stated: “...Many knowledge-based enterprises’ knowledge management strategies have become fashionable management concepts and technical decorations, and knowledge management has not helped enterprises achieve core competitiveness improvement...” Knowledge management needs to start from three levels: spirit, system, and material, to exert corporate culture’ s guiding, communication, and motivating roles.

Libraries as organic bodies growing together, while transforming library activities into education resources, also promote their own unity and cooperation. Although production, storage, and service processes appear linear on the timeline, completing the task of “Multidisciplinary E-Learning Resources” requires mutual assistance and cooperation.

[FIGURE:10.4-29]

If archives of exhibitions, lectures, seminars, symposiums, briefings, and training and other library activities can be collected, organized, and classified, resources can be reused to exert their maximum benefits.

When discussing IR, currently more emphasis is placed on how libraries use IR to expand services or build IR tasks, with less discussion on how to build IR to meet reader needs. When thinking about the issue “we’ re not talking about the ‘box’ —we need to focus on what’ s inside the box and what services can be provided to faculty and staff,” we often have deep frustrations after experiencing setbacks. Libraries in Greater China can actually learn lessons from others’ successes and failures.

This article views the above issue from the perspective of how users use theses in library IR. The conclusion is that IR should not only be different from other

library systems but also interact with these systems, and can consider adding new functions such as Web 2.0 services. On the one hand, it reduces user confusion and anxiety; on the other hand, it attracts user participation and support. After all, the purpose of establishing IR is not only digital storage but also includes components such as creating academic exchange.

This study establishes a metadata description system for library activities and patterns for searching and using archives. Specifically, it stores and manages relevant content generated by the exhibition activity “Discovery of the Architectural and Cultural Values of Chinese Bridges Exhibition” with many related archives (over 50 items) and the lecture activity “Protecting the Environment in China and in the World” with fewer related archives (6 items), expecting to enable university and external personnel to use relevant education resources.

The significance of this research lies in: transforming library activity results into materials that can be used for teaching activities, and becoming knowledge management content for library review and improvement when handling related activities. From the library’s perspective, it provides auxiliary functions for university teaching activities.

Based on this research, we recommend: before system design and implementation, first decide future services and functions to be provided, then select models and promote related work to save costs and maximize effectiveness (please refer to [FIGURE:10.4-30]).

[FIGURE:10.4-30]

For example: the working group assumes that in the future, the library will serve two groups: one is providing activity results display for university and external personnel and allowing them to download relevant archives; the other is only providing the entire activity’s pre-, during-, and post-work archives for library staff, enabling librarians to continuously increase external service quality and improve efficiency. Therefore, the working group will recommend adopting the second model.

This study observes institutional repositories of several universities and research institutions, with insufficient sample size being its limitation. Through interviews and field investigations, it focuses on discussing how to enhance City University of Hong Kong Library’s IR collection and services, but awaits actual operation results evaluation. If research conditions permit, future studies should increase system data and user surveys, and also need to continuously refer to more case studies.

Notably, many Web 2.0 application studies have recently emerged. For example, Dean James et al. (2009) described how the largest medical library in the US, HAM-TMC, used Velocity 6.0 to establish a cross-search system, pointing out that this software tool attached to webpages helps users find data faster and more conveniently. Nguyen Cuong Linh (2009) organized, investigated, and compared Web 2.0 applications in Australian university libraries, propos-

ing many practical application cases (not limited to IR). Such technologies and investigations are suitable for introduction into discussions of IR collection and services, adding observational and research dimensions to this article.

As demonstration samples, the short-term plan only collects and displays archives for two activities; the medium-term plan designates existing activity project results, collecting and utilizing archives for about 30 activities; the long-term plan is a sustainable development education resource integration system.

Establishing IR often requires obtaining institutional policy support, user group support, and continuous system testing and improvement, which is not easy. After completing tasks one by one, if we make a little more effort to enhance added value services, we can gain more applause and feedback.

Appendices

Appendix 1: Comparison of Quantity Changes in Different Collection Categories

[TABLE:10.3-2]

Appendix 2: Comparison of Paper Academic Books and Electronic Academic Books Collections

[TABLE:10.3-3]

[TABLE:10.3-4]

Appendix 3: Comparison of Market Prices for the Same Book

[TABLE:10.3-5]

[TABLE:10.3-6]

Section 5: Inter-Library Cooperation

1. Background

Under the framework of cross-strait direct links and related economic and trade cooperation agreements, economic and trade exchanges across the Taiwan Strait and among the three regions will inevitably become more frequent, necessitating the collection, analysis, and utilization of industrial information from both sides. Based on this demand, information service institutions should adapt to the trend and gradually develop mechanisms including but not limited to: (1) collection of industrial information from both regions (joint development of deposit, digitization, and knowledge management cooperation); (2) organization of industrial data from both regions (identifying materials with different levels

of credibility, professionalism, impact, and quality); and (3) establishment of industrial research bases in both regions (enabling scholars and experts from both sides to conveniently access, exchange, and share information).

Cooperative collection development represents an effective approach to developing distinctive collections, inter-library cooperation, and resource co-construction and sharing. The library and information science communities on both sides of the strait have produced numerous relevant studies, such as: Zhang Qiu (2004) comparing collection development policies in Taiwan [1]; Suo Chuanjun and Yuan Jing (2007) examining electronic collection development policies [2]; Luo Ying (2009) investigating non-purchase-based development strategies for university archives [3]; Qiu Ziheng (2004) analyzing the application of citation analysis in health science collection fund allocation [4]; Wu Mingde (2006) recommending enhanced resource sharing and mutual support capabilities among libraries [5]; and Lin Qiaomin and Chen Xuehua (2008) outlining five development dimensions for electronic resource collections [6]. These studies not only inspired the author's idea that the aforementioned demand and supply sides might intersect in cooperative collections but also laid substantial theoretical groundwork for this paper.

However, numerous practical challenges remain in current cross-regional cooperation: (1) parties with cooperative intentions and needs lack mutual understanding; (2) limited reference experience exists for cross-regional collaboration; and (3) these two factors make cooperative models difficult to establish. To address these difficulties, this paper proposes an approach: “using bibliometric methods to understand mutual supply and demand; conducting cooperation through third-region non-profit and non-governmental institutions (such as City University of Hong Kong Library); and gradually developing cross-regional cooperation models from collection construction and information services.”

In communication studies, there exists the social science research and application of “content analysis” [7], which primarily involves quantitative analysis of news terminology. In library science, “bibliometrics” [8] focuses on analyzing books and articles through author counts, word frequency statistics, citation counts, and model validation (for definitions and distinctions among bibliometrics, informetrics, and scientometrics, please refer to Tague-Sutcliffe J's relevant discussions [9]). In information exchange studies, to achieve understanding of the five elements of information communication—communicator, audience, message, noise, and environment [10]—these two methods serve as the most fundamental means of text mining.

The author originally planned to adopt scientometric methods. Scientometrics is a new discipline derived from domain visualization research based on citation analysis, employing bibliometric methods to analyze scientific literature and conduct quantitative research on scientific communication [11]. Through specialized methods, scientometrics has been widely applied in studies measuring scientific progress and scientist behavior [12]. However, current scientometrics has not yet developed content evaluation and analysis for grey literature lacking

citation databases. Adopting scientometric methods cannot satisfy the research background and objectives of this study regarding cooperative collections.

Therefore, this section conducts bibliometric and content analysis of research project reports from the Chung-Hua Institution for Economic Research (CIER), an intelligence agency providing research reports for Taiwan's economic policy development. Based on this analysis, it proposes a co-construction and sharing plan for collections between university libraries and economic policy research institutes. The process of using bibliometrics and content analysis to promote collection development can serve as a reference for other library and information work.

2. Related Research

(1) Research Object

CIER's research project outcome reports emphasize: 1. Policy research on Taiwan's economic development; 2. Advocacy for major Taiwan economic and industrial policy issues; and 3. Knowledge and analysis of Taiwan's industrial development strategies.

(2) Research Method

Bibliometrics involves descriptive statistical analysis based on metadata formats, with research scope limited to specific databases or document tables. For example, TABLE 10.5-1 CIER's research project list represents the research scope; within this list, project numbers, institutes, project titles, commissioning units, publication years, and blank fields (remarks) constitute the metadata; the content marked below the metadata, such as "Research on China Petroleum Corporation Operations, China Petroleum Corporation," represents the metadata content—the analysis unit for this bibliometric study. Content analysis, meanwhile, focuses on extracting keywords and phrases.

(3) Research Process

According to research objectives, the study first conducts bibliometric analysis (quantitative analysis) of CIER's research project list, then performs content analysis of online materials, and finally proposes cooperation recommendations. The research steps are: 1. Data collection: downloading existing CIER research project lists from the internet; 2. Data cleaning: verifying 1,232 metadata entries online and supplementing the "remarks" field; 3. Data analysis: analyzing CIER's research project list and publicly available reports; 4. Chart generation: depicting analysis results with histograms and providing explanations; and 5. Recommendation formulation: proposing policy recommendations for cooperative development based on analysis results.

This paper employs bibliometrics and content analysis, but positions the research as a case study (City University of Hong Kong Library's database system and CIER's research project reports). Additionally, the data source (http://www.cier.edu.tw/sp.asp?xdurl=publish/web/plan_{list}.asp&ctNode=99) is an institutional website supporting Open Access. Data collection occurred on

September 24, 2009, with final access on January 10, 2010, enabling subsequent researchers to replicate and verify the study.

(4) Research Results

Based on the research methods and process, FIGURE 10.5-1 and TABLE 10.5-2 were generated, described below.

1. Cumulative Literature Growth Over 30 Years Based on online data provided by CIER, several noteworthy results emerged after calculation. These results can serve as discussion points for cooperative planning.

TABLE 10.5-2 Cumulative Literature Growth Over 30 Years

The table shows that CIER produces approximately 120 research reports annually in recent years. Therefore, future cooperative plans should account for this annual workload and budget of 120 reports.

2. Monthly Publication Volume Over 30 Years FIGURE 10.5-1 Monthly Publication Volume Over 30 Years

The chart reveals that report deadlines (simultaneously the submission dates to CIER library) concentrate in June, July, and December. Future cooperative plans should consider conducting report deposits in February and August each year.

3. Subject Categories and Policy Recommendation Patterns Based on CIER's characteristics: research subjects can be categorized by regional classification according to different institutes, by thematic classification according to economic categories, by report format according to research methods, and by various other policies according to the nature of commissioning units. Details are as follows:

TABLE 10.5-3 Policy Regions and Themes: Quantity and Ranking

Regions: Taiwan (337 entries; including Taiwan 126, China 203, Taipei 5, Kinmen-Matsu 2, Kaohsiung 1), Mainland China (132 entries; including Mainland 113, China 55, Mainland China 36), Cross-Strait (73 entries), Asia-Pacific (30 entries; including Asia-Pacific 16, India 4, Vietnam 4, Singapore 2, Australia 2, Middle East 2), East Asia (24 entries; including East Asia 13, Japan 10, South Korea 1), United States (54 entries; including US 61, Central America 7), Global (30 entries), Japan (34 entries), South Korea (18 entries), EU (18 entries; including EU 17 and Europe 1), Central America (7 entries).

Themes: Trade (135 entries), Taxation (78 entries; including tax revenue 20), Agriculture (75 entries), Services (71 entries; including service industry 39), Energy (55 entries), Technology (72 entries), International Economy and Trade (43 entries), Technology (39 entries), Innovation (36 entries), Finance and Securities (36 entries; including finance 29 and securities 7), Information (29 entries), Electricity (20 entries), Electronics (14 entries), Commerce (19 entries), Green

Environmental Protection (19 entries; including environmental protection 13 and green 6), Oil (12 entries), Human Resources (7 entries), Fisheries (5 entries), Postal Service (5 entries), Land (4 entries), Civil Aviation (2 entries), Disaster (1 entry; 2009).

Report Formats: Plan (225 entries), Impact (178 entries), Analysis (144 entries), Policy (141 entries), Strategy (112 entries), Evaluation (103 entries), Survey (56 entries), Measures (46 entries), Discussion (34 entries), Project (29 entries), Countermeasures (24 entries), Seminar (15 entries), Symposium (2 entries), Estimate (2 entries). Additionally, 625 entries include the character “研” (research), including “研究” (research) in 525 entries.

Other Policies: Industry (216 entries), SMEs (84 entries), WTO (79 entries), Knowledge (15 entries; including knowledge economy 8), Taiwan Business (26 entries), Foreign Business (9 entries), Output Value (8 entries), Customs (6 entries), State-Owned Enterprise (3 entries).

Based on these results, the regional categories in CIER’ s delivered reports rank as: Taiwan, Mainland China, United States, Japan and South Korea, Asia-Pacific, EU, and Central America. Thematic categories rank as: Trade, Taxation, Agriculture, Services, Energy, Technology, International Economy and Trade, Technology, Innovation, Finance and Securities, Information, Electricity, Electronics, Commerce, and Green Environmental Protection. Report formats rank as: XX Research, XX Plan, XX Impact, XX Analysis, XX Policy, XX Strategy, XX Evaluation, XX Survey, XX Measures, Discussion on XX, XX Project, and Countermeasures for XX. Other policies include: Industry, SMEs, WTO, Taiwan Business, Foreign Business, Knowledge Economy, Output Value, Customs, and State-Owned Enterprise.

Analysis of project titles from the list yields these results. While quantity and cumulative rankings cannot fully represent CIER’ s research direction and methods, they reflect certain categories and preferences. This analysis merits consideration as a reference for library navigation to facilitate scholars’ use of such documents.

4. Institute Report Share and Research Value Based on institute codes from the list: 0-Institute Level, 1-First Institute, 2-Second Institute, 3-Third Institute, 4-Energy and Environment Research Center (once abolished, recently re-established), 5-Economic Outlook Center, 6-Financial Strategy Center, 7-Japan Center, W-Taiwan WTO Center. Calculations from 1,214 entries show:

TABLE 10.5-4: Institute Report Share

The analysis reveals report quantity proportions ranking as: Third Institute, Second Institute, First Institute, and Taiwan WTO Center. The Third Institute focuses on Taiwan’ s macroeconomics, monetary finance, fiscal policy, economic development, industrial economics, human resources, natural resources, and social welfare. The Second Institute conducts regional studies of areas out-

side Taiwan and Mainland China. The First Institute specializes in Mainland China's economic research, academic activities, and economic information services.

Established in 1981, the three original institutes contrast with CIER's Taiwan WTO Center, which began in September 2003 under the Ministry of Economic Affairs' commission to operate the "International Economic and Trade Affairs Research and Training Center" (WTO Center). Its report volume has grown substantially in recent years, reflecting Taiwan's current concerns regarding foreign economic and trade policy directions. While this ranking cannot represent the priority order of Taiwan's economic policies, it reflects certain policy preferences and serves as a valuable reference for library navigation.

5. Project Leaders and Research Directions Cooperation on research project reports requires researchers' consent, necessitating data on principal investigators and individual analysis of their influence. Analysis of project leaders follows:

TABLE 10.5-5 Project Leaders

[Table content showing leaders, institutes, and research directions]

In summary, authors with over 20 report productions are: Wang Jianquan, Liu Dalian, Wu Huilin, Wang Suwan, Chen Xinhong, Gu Yinghua, Xiao Daiji, Yang Yahui, Wen Liqi, Liu Mengjun, Du Qiaoxia, Wang Jingming, Wang Lirong, Lian Wenrong, Shi Huici, Chen Zhangzhen, Ouyang Chengxin, and Wen Beizhang—18 scholars with diverse research directions.

Integrating the previous two sections reveals that establishing cooperative cases helps obtain quality CIER literature: (1) Taiwan's regional economic development; (2) Taiwan's industrial policy formulation; (3) Cross-strait economic and trade policy directions; (4) Taiwan's research on Japan, US, and South Korea; and (5) Taiwan's evaluation and strategies for participating in international economic and trade organizations.

Based on action objectives of industrial information collection, data organization, and research base establishment, three steps with nine details are formulated:

Step 1: Cross-regional publication delivery. Includes: (1) organizing literature records of historical research reports (author, publication date, theme, keywords, project number, abstract, classification timeline); (2) marking literature usage restrictions and recommendations; and (3) transferring literature in phases.

Step 2: Digitization and archiving of publications. Includes: (1) editing literature data and usage permission data (author, publication date, theme, keywords, project number, abstract; usage permission data includes classification, confidentiality period, allowed access numbers); (2) scanning, archiving, protec-

tion, preservation, supervision, and inspection; and (3) digital file delivery and information system planning.

Step 3: Cross-regional information system management. Includes: (1) spot-checking digital archive integrity (missing pages, unclear scans, filename errors, incomplete filenames, unified terminology for new entries, entry accuracy); (2) developing retrieval and browsing systems; and (3) simultaneous activation and proper maintenance.

Future research should focus on: (1) completing digitization of print research reports; (2) establishing literature and retrieval systems; and (3) developing database update and usage protocols, enabling both parties to achieve joint publication off-site deposit, digitized publications, and database establishment and management.

As previously discussed, information exchange studies is an interdisciplinary field between library science and journalism/communication, primarily exploring information's role in communication processes and using quantitative information analysis to interpret the essence of the five communication elements. In this study, the cooperating parties refer to the communication subject (CIER) and object (City University of Hong Kong), communication content (research reports), context (consensus on cooperative collections), and noise (obstacles to cooperative collections). The subject and object, separated by distance, require moving from superficial understanding to uncovering potential phenomena, then further negotiating cooperation and developing mutual trust and friendship.

To eliminate noise in the communication context from the object's perspective and achieve effective interaction with communication content, understanding the subject and content from the object's viewpoint (the "Other" in philosophy) is necessary. CIER is a renowned Taiwanese think tank gathering many scholars and experts with significant reputation. However, few have conducted in-depth studies of it, and its mysterious nature has even led to misunderstandings as a spy agency. In reality, it is a research institution 汇聚众多资深学者 (often university professors and entrepreneurs). Its members are not hidden in Taiwanese society but frequently attend various seminars and can be directly engaged in academic, policy, and public service settings.

Therefore, cooperative collection development not only helps develop university library collections but also assists the institute in disseminating its research results externally. During this process, initial cooperation unfamiliarity and misunderstandings created unnecessary communication noise. Through bibliometrics and content analysis, we eliminated this noise from the object's perspective and extracted clear communication content (the "message") during our understanding of the subject.

Information exchange studies borrows methods from library science and journalism/communication; in this paper, we use information exchange methods to solve practical library problems. Our analysis results validate external evaluations of CIER's high-quality research. Thus, employing bibliometrics and

content analysis proves effective for observing scientific research productivity, particularly for grey literature (reports, white papers, etc.) that traditional scientometrics cannot detect. However, this method has many shortcomings warranting future improvement.

Section 6: Library Consortium

To expand the research scope of ARL e-resource assessment reports, deepen understanding of library consortium operations, and innovate library services, this chapter proposes a research framework based on literature review of consortium-promoted collection development. Through interviews analyzing IEEE Xplore, DDC, Cicada, and CASHL cases, eight development recommendations are presented.

1. Background

The Association of Research Libraries (2010) has surveyed domestic library e-resource development since 1999, recently releasing a 2009 research report [1]. Besides comparing overall development across periods, it discusses e-resource collection/selection policies, decision-making processes, consortium selection, e-resource librarian position descriptions, and promotion, providing valuable references for library e-resource selection, procurement, and promotion. As library consortia constitute an important part of e-resource development, their models serve as analytical objects for innovative development.

Developing collections through library consortia represents not only an accepted concept among university libraries across the four regions of Greater China (Mainland, Hong Kong, Macau, Taiwan) but also a practical reality in many library resource construction efforts. Numerous papers discuss “library consortium collection development in the four regions of Greater China,” such as: studies on Mainland’s CALIS architecture and services [2]; research on CASHL’s resource co-construction and sharing model [3]; analysis of Hong Kong JULAC consortium organizational development [4]; studies on Taiwan’s Northern Region Library Consortium [5]; research on Taiwan’s CONCERT e-resource consortium [6]; and Taiwan’s TEBNET e-book consortium [7]. However, discussions on “enhancing collection development through cross-regional library consortia” remain scarce.

Cross-regional library consortium challenges include: (1) Institutional aspects—besides border control, customs, and geographic distance, differences exist in collection systems, student/faculty numbers, teaching languages, library fund scales, tendering processes, service missions, and copyright law. (2) Operational aspects—book procurement, copyright granting, cost calculation, duplicate checking, bibliographic data import, data storage and backup, usage statistics, service promotion, member recruitment, and cooperation each have distinct conventions and principles. (3) Restrictions on educational funding purposes

and eligible recipients across regions. Consequently, cross-regional library consortia rarely appear worldwide.

While cooperative collection development through library consortia represents both industry consensus and valued library work, limited literature discusses cross-regional consortium cooperation. However, recent years have seen emerging cases of cross-regional consortia for collection development in Greater China. City University of Hong Kong Library participates in Hong Kong-Taiwan, Hong Kong-Mainland, and Hong Kong-Macau consortia for collection development. This paper analyzes practical cases to explore cross-regional consortium types and propose recommendations for future collection development across the four regions.

2. Research Design

Using deep interviews, the study surveys librarians actually involved in work, comparing and summarizing four cases: IEEE Xplore, DDC, Cicada, and CASHL. The research aims to explore relevant causes, obstacles, and development strategies for cross-regional library cooperation.

Screening, organizing, and expanding domestic and international literature on “e-resource procurement” forms the research framework. This paper adopts the definition of “library consortium” as: a library 联合体 organized for resource sharing and mutual benefit, constrained by mutually recognized agreements and contracts [8]. Analysis objects include:

1. **Resource Use Models** [9]: (1) Joint purchase, shared user numbers; (2) Individual purchase of electronic copies, shared copies; (3) Individual purchase, joint database formation, shared use; (4) Joint purchase, individual ownership, individual use.
2. **Consortium Organization Models** [10-11]: (1) National (promoted by central government authorities), (2) Local (promoted by local governments), (3) Geographic (promoted by geographically adjacent library associations), (4) Sectoral (promoted by publishers, agents, or libraries).
3. **Consortium Cooperation Models** [12]: (1) Fund pooling pricing, (2) Membership system, (3) Co-construction and sharing, (4) Joint library operation.
4. **Consortium Procurement Models** [13]: (1) Buying Club, (2) Central Funding, (3) Coordinated Purchasing, (4) Mixed purchasing.
5. **Consortium Cooperation Objectives** [14]: (1) Optimize collections, (2) Reduce costs, (3) Categorized procurement, (4) Purchase after use.
6. **Consortium Procurement Plans** [15]: (1) Demand determines copy numbers, (2) Update speed determines access fees, (3) Title Select, (4) Title direct, (5) User usage-based fees, (6) Library collection development-based.
7. **Consortium Pricing Models** (Member contributions and joining conditions) [16]: (1) Content fee, (2) Print carrier fee, (3) Electronic access

fee, (4) Print and electronic joint purchase fee, (5) Content and electronic access joint purchase fee, (6) Mixed purchase fee.

8. **Consortium Procurement Benefits** [17-18]: (1) Price discounts, (2) Agent fee savings, (3) Negotiation time and labor savings, (4) Supplier improvement requests, (5) Promotion of other cooperation projects (promotion, training, consultation, service, exchange), (6) Accelerated introduction of foreign academic resources, (7) Supplier competition mechanism formation, (8) Reduced library gaps, (9) Increased resource scale, (10) Long-term e-resource preservation.

Based on these eight research objects, four modules are designed as the research framework: (1) Cooperative collection objects, (2) Regional cooperation scope and participating library numbers, (3) Consortium operation observations, and (4) Consortium participation benefits, used to analyze the following four cases.

3. Case Analysis

Cross-regional consortium forms can be divided into two types: “Group Purchase”(joint purchase, individual ownership, individual use) and “Shared Access”(joint purchase, joint ownership, joint use). Cases are analyzed below.

(1) Hong Kong and Macau University Libraries Co-constructing Electronic Databases: IEEE Xplore Case 1. Cooperative Collection Object

IEEE Xplore is an e-resource database primarily comprising journals published by the Institute of Electrical and Electronics Engineers since 1988, plus magazines, conference proceedings, standards, books, courseware, and technical reports. The consortium purchases perpetual access at cost, paying content fees plus electronic access or print fees according to individual library needs.

2. Regional Cooperation Scope and Participating Libraries

An agent-initiated buying club comprising 5 Hong Kong and 1 Macau university libraries (6 total). Initially merging CALAS with Hong Kong-Macau university libraries into a 56-library group, later separating the 6 Hong Kong-Macau libraries as an independent group.

3. Consortium Operation Observation

Adopts group purchase model where individual members conduct one-on-one procurement with suppliers but receive discounts through regional group purchasing. Annual purchases for the following year occur October-December. If subscription terminates, previously ordered content can be purchased as needed via differential compensation on a per-article or per-journal basis through CD-ROMs. The consortium lacks explicit organizational bylaws, consisting only of individual library-publisher contracts, but achieves discounts through agent organization with long-term continuity.

4. Participation Benefits

Price difference of 22% discount before and after participation. Post-

membership increases engineering science academic English e-journal collections. Agent coordination reduces consortium operation human resources and costs borne by libraries.

(2) DDC Digital Dissertation Consortium (Hong Kong-Taiwan University Libraries Co-constructing Foreign Dissertation Collections: UMI Case) 1. Cooperative Collection Object

The DDC consortium advocates e-resource co-construction and sharing, focusing on purchasing doctoral dissertations from outside Taiwan, primarily US and Canadian dissertations plus others [19]. The consortium purchases perpetual access rights. Since copyrights are purchased outright, resource quantities accumulate over time. In other words, even if individual libraries discontinue participation, they retain access to previously purchased and shared dissertations.

2. Regional Cooperation Scope and Participating Libraries

Taiwan university library-initiated consortium primarily for Taiwan region libraries, with 4 Hong Kong university libraries joining, currently totaling 108 college/university libraries.

3. Consortium Operation Observation

Network servers are hosted at Academia Sinica's Computing Center. The consortium has bylaws governing membership rules, rights, and obligations [20]. Seven member libraries serve as working committees across Taiwan's Northern (51 libraries), Central (15 libraries), and Southern (36 libraries) regions [21]: Northern region includes National Taiwan University, Tamkang University, National Chiao Tung University, and Academia Sinica Computing Center; Central region includes Providence University; Southern region includes National Sun Yat-sen University.

Bylaws stipulate: pre-2006 members must purchase 155 dissertations; post-2006 new members must purchase 170+ dissertations. All members must sign purchase agreements to join [22].

The DDC consortium's main feature is resource co-construction and sharing. A member library submits its required US-Canada doctoral dissertation orders to the consortium. After accumulating sufficient orders, unified purchase from ProQuest occurs, with sharing among all members. Members can routinely access digitized dissertations purchased by other consortium members.

Two ordering methods exist: (1) If individual member orders reach 10 dissertations and consortium orders reach 50, the agent places a unified order with the e-resource supplier. (2) If individual orders don't reach 10 but consortium orders reach 70, unified purchase occurs. After successful purchase, other members typically gain online access within four weeks, while purchasing members receive CD-ROMs before or after [23]. Invoices are issued by the e-resource supplier. Each dissertation costs US\$59 (regardless of length or age).

Taiwan members constitute 96% of total members and account for nearly 95% of total dissertation purchases, indicating Taiwan library dominance. Additionally, Taiwan's highest-lowest purchase gap is 3,342 dissertations versus Hong Kong's 1,731, showing greater disparity among Taiwan members (see TABLE 10.6-1).

4. Participation Benefits

Since joining in 2004, City University of Hong Kong Library has purchased 1,317 dissertations by April 14, 2010 [24], providing electronic versions to 110 other member libraries. The consortium provides CityU Library access to 118,572 US-Canada doctoral dissertation electronic versions purchased collectively since 2001 [25].

5. Current Consortium Observation

The aforementioned data (TABLE 10.6-2) already shows Taiwan library dominance. However, further analysis reveals Taiwan's average purchase per library is 1,088 dissertations, lower than Hong Kong's 1,350. Although National Taiwan University's 3,510 maximum purchases exceed Hong Kong University's 2,383 by 1,127, Hong Kong's other members' annual average of 235 purchases nearly triples Taiwan's other university members' 84, raising the consortium's annual average by two percentage points due to Hong Kong participation.

These observations show Taiwan's major dissertation purchasing relies on a few member libraries, with over half purchasing below average, while Hong Kong members show balanced development. Comparing maximum purchases across Taiwan North, Central, South, and Hong Kong regions reveals: National Taiwan University, Hong Kong University, National Kaohsiung University, and National Chi Nan University. Maximum annual purchase comparisons show: National Taiwan University, Hong Kong University, National Kaohsiung University, and Asia University. This indicates Taiwan's major purchasing institutions concentrate in Northern Taiwan.

CityU Library participates with exactly 1% of purchases, sharing 99% of digitized dissertations from 107 other members. Comparing Hong Kong's 4 members shows purchase quantities: Hong Kong University (2,383), CityU (1,317), Hong Kong Polytechnic University (1,050), and Chinese University of Hong Kong (652). Annual purchase comparisons show: Hong Kong University (264), Hong Kong Polytechnic University (262), CityU (220), and Chinese University of Hong Kong (163). CityU ranks second and third, less prominent than Hong Kong University but positioned in Hong Kong's middle tier to raise the consortium's annual average by two percentage points, gaining reputation while securing practical benefits through "1% purchase contribution for 99% access rights."

(3) Cicada E-book Consortium (Hong Kong-Taiwan University Libraries Co-constructing Academic E-books: Netlibrary Case) 1. Co-operative Collection Object

Various English academic e-books with perpetual access rights purchased by

the consortium. Members jointly own and use these e-books, sharing user numbers. User restrictions when accessing Netlibrary minimally impact individual libraries (low probability of all libraries simultaneously accessing the same e-book), though full copyright is not obtained.

2. Regional Cooperation Scope and Participating Libraries

48 libraries comprising 6 Hong Kong and 42 Taiwan libraries.

3. Consortium Operation Observation

Operates through consensus building, procurement standard determination, group formation, title selection, acquisition and negotiation, contracting and execution, promotion and education, and evaluation phases. After several selection and duplicate removal phases, duplication rates are reduced below 20%.

4. Participation Benefits

Average per-library e-book price decreased from US\$1.03 to US\$0.05, a 20.6-fold difference.

(4) CASHL Document Delivery System (Hong Kong-Mainland University Libraries Co-constructing Academic E-books: MyiLibrary Case) 1. Cooperative Collection Object

Primarily English academic e-books in humanities and social sciences. The consortium jointly purchases e-book copies and shares them, reducing duplication through selection processes. Resource mirrors are located in databases at Peking University Library, the CASHL consortium center in Mainland China.

2. Regional Cooperation Scope and Participating Libraries

5 Hong Kong and 10 Mainland university libraries forming a consortium.

3. Consortium Operation Observation

Initiated by CityU Library and China Academic Humanities and Social Sciences Library (CASHL), inviting 5 Hong Kong and 10 Mainland libraries to form a consortium through contracts. All member-purchased books reside in a unified database for shared group access.

CASHL is a regular organization; 5 Hong Kong libraries formed alliances with 10 Mainland libraries through contracts under CASHL's organizational framework.

4. Participation Benefits

Jointly purchased 4,425 titles totaling 9,781 English academic e-books, saving 80% compared to individual procurement. Consortium participation increases humanities and social sciences e-book collections, reduces gaps in academic English e-book access among libraries, and expands resource scale.

This paper focuses on Greater China library cooperation models, conducting research to: (1) summarize cooperation obstacles to avoid difficulties; (2) extract relevant cooperation factors to reduce cross-regional consortium exploration periods; and (3) provide recommendations for 良性发展 of current cross-regional

cooperative collection development. Case comparison results appear in TABLE 10.6-3.

TABLE 10.6-3 Cross-Regional Library Cooperative Collection Case Comparison

Based on literature review, “cooperative collection development” research objects include 8 categories with 42 sub-categories: resource use, consortium organization, cooperation models, consortium procurement, cooperation objectives, procurement plans, pricing models, and procurement benefits. This paper adds 2 objects with 8 sub-categories: procurement objects and contract forms.

1. **Consortium Procurement Objects:** E-journals and databases, dissertation electronic versions, e-books, and specific subject-type e-books.
2. **Consortium Contract Forms:** Long-term contract system, organizational bylaw system, single contract system, and mixed bylaw-contract system.

Based on these ten research objects, analysis of four cases suggests cross-regional library cooperative collection development should first determine “cooperation field target objects” and “participation benefits,” then appropriately adopt recommended consortium methods, alliance forms, and pricing models to provide practical effects for participating libraries, promoting longer-term, broader, and more diverse cooperation.

Findings and Recommendations:

1. **Cross-regional library consortia must first clarify procurement objects:** (1) Select e-journals, network databases, dissertations, e-books; (2) Subject category content; (3) Contracts for content fees, network access fees, print fees, or copyrights. Since cross-regional libraries face different institutional, operational, and funding restrictions, discussing objects rather than institutional issues, operational methods, or funding arrangements better achieves “seeking common ground while preserving differences and mutual benefit.” Consensus on procurement objects facilitates solutions to other cooperation obstacles.
2. **Cross-regional library consortia must clarify participation benefits:** All consortia have participation benefits, but cross-regional consortia particularly emphasize them because different libraries across regions have lower similarity, constraints, communication opportunities, and staff mobility, making benefits crucial for mutual trust and dependence.
3. **Cross-regional library consortium formation methods vary:** Libraries can (1) actively initiate consortia, (2) passively wait for recruitment, (3) seek suitable consortia to join, or (4) establish new regional consortia before merging with other regional consortia.
4. **Cross-regional library consortia need not be library-initiated:** Case 1 was agent-initiated. In 2004/05, libraries received 10% discounts from publishers; in 2005/06, aggregators achieved 32% discounts, saving

libraries consortium operation costs. However, agents' capacity is limited for larger benefits, more professional content, and finer subject classification selection, necessitating library-initiated cross-regional consortia.

5. **Cross-regional library alliance forms vary:** Including bylaws, contracts, or mixed systems. Bylaw systems suit intra-regional consortia but lack flexibility; contract systems suit cross-regional consortia but lack sustainability; mixed systems require loose bylaws with rigorous contracts.
6. **Cross-regional library pricing models vary:** Case 1 uses "Group Purchase" where libraries sign individual contracts with publishers for collective discounts. Cases 2-4 use "Shared Access" with different pricing: (1) Uniform price, varying quantities (Case 2): Hong Kong libraries join Taiwan consortium with uniform per-dissertation pricing, receiving CDs while sharing via Academia Sinica's database, but annual purchase quantities differ by membership status. (2) Uniform price and quantity (Case 3): Hong Kong-Taiwan joint consortium with joint selection, funding, and purchasing achieves historically lowest e-book perpetual use prices. (3) Varying price, uniform quantity (Case 4): Hong Kong libraries contract with Mainland CASHL consortium, with Hong Kong members contributing US\$40,000 and Mainland members US\$30,000 for joint selection, duplicate removal, and procurement of humanities/social sciences English academic e-books, mirrored at Peking University Library.
7. **Cross-regional library consortia show individual library effects:** CityU Library's participation in Hong Kong-Macau IEEE Xplore, Hong Kong-Taiwan DDC and Cicada, and Hong Kong-Mainland CASHL provides readers with substantial e-journals, foreign dissertations, and e-books while building trust and cooperation with other universities.
8. **Cross-regional library consortia represent a valuable future research trend:** Finding common needs and suitable models among complex options for different cross-regional consortia requires theoretical and practical expansion. Three levels warrant attention: (1) Different supplier costs (e.g., book selection/editing/publishing vs. dissertation authorization/editing/reviewing) affect theoretical applicability of pricing models; (2) Different library needs for cross-regional consortia (e.g., Hong Kong and Macau's limited collective procurement scale requires broader consortia for cost reduction, collection enhancement, and service innovation); (3) Different resource access methods (database construction/maintenance, mirror server management, network 专线 access, Chinese platform development) involve varying long-term preservation risks, costs, sustainability assessments, and library systems.

In conclusion, cross-regional library cooperative collection development should first determine "cooperation field target objects" and "participation benefits," then adopt appropriate consortium methods, alliance forms, and pricing models to provide practical effects, promoting longer-term, broader, and more diverse

cooperation.

Future Recommendations: (1) Increase case studies to extract consortium patterns; (2) Conduct more practical cooperation to explore effective, acceptable models; (3) Expand from cross-regional cooperative collection development to services like joint promotion, training, consultation, cataloging, research, and exchange.

These issues occur not only in cross-regional academic e-book consortia but also in intra-regional cross-institutional cooperation, making this discussion potentially valuable for intra-regional consortium development. This paper focuses on Greater China library cooperation methods to: (1) summarize obstacles; (2) extract cooperation factors; and (3) provide recommendations for 良性发展, indirectly facilitating more cooperation.

Although cooperative collection development represents an inevitable trend, various difficulties and problems remain during development. We believe more case discussions and exchanges will help the library community collectively address challenges and promote future cooperative development.

Section 7: Social Network Management

This section uses secondary literature analysis, participant observation, and social network analysis to map library staff interpersonal networks, identifying: (1) subgroups threatening the organization, (2) rigid organizational relationships, and (3) soft community relationships. Based on this, it discusses informal communities' impact on formal organizations: (1) three organizational management forms; (2) using community communication to open social networks during inter-departmental conflict; (3) using node control to close social networks during personal conflict; and (4) using social networks to concentrate resources supporting single departments when departmental collaboration is needed. The conclusion recommends future human resource management using social network methods for "hard and soft" approaches to enhance team morale, harmonious culture, and work efficiency.

1. Background

With streamlined (or increasingly strict) staffing and funding, diversified users and services, dramatically increased quality requirements, and surging service volumes, effectively utilizing fixed staff to expand multi-faceted services has become a new library management challenge. In work environments with limited resources and unlimited demands, increased individual workload and weakened organizational cohesion create potential conflict crises requiring urgent identification and resolution.

Libraries in Hong Kong, Macau, and Taiwan have more complex characteristics. Like Mainland cities, they face changing information environments and increased work pressure. Additionally, historical factors like multilingualism

(English for official documents, Mandarin for discussions, Min/Yue dialects for private communication) and multi-identity staff (locals, non-locals, foreigners) create management complexity within established systems.

Moreover, library and information science departments are scarce in Hong Kong, Macau, and Taiwan, with only one doctoral program. Consequently, whether graduates trained in Mainland China can identify crises and opportunities in “mundane” library work and apply scientific methods to solve practical problems becomes a highly anticipated competency.

In fact, library and information science’s “Knowledge Tool Box” contains many developed but underutilized tools for solving practical library problems, social network analysis being one. Social Network Analysis (SNA) is a sociological research approach analyzing structures from node and relationship perspectives. Recently, physics, biology, and anthropology have absorbed and refined SNA’s unique observational perspective, which has gradually expanded its influence across more fields [1]. Social networks have transcended sociological concepts, definable and expandable through multiple peripheral disciplines [2]. Relationship-centered social network research has significantly contributed to contemporary sociology’s theoretical and technical turns [3].

Network user behavior research has yielded many SNA 成果: Ye Xiangdong et al. (2008) described and measured virtual community member relationships, community structure characteristics, and opinion leader status formation [4]. Qiu Junping et al. (2008) used network analysis, citation analysis, and Pajek/Ucinet software to analyze blog social networks [5]. Dang Hongli et al. (2009) quantitatively analyzed library and information science blogs [6]. Qin Xuejian et al. (2009) conducted SNA on image blog class communities on the “Bababian” platform [7].

Organizational behavior research includes: Kuang Jinlin et al. (2009) discussing social capital, network relationship patterns, internal structure, and structural holes’ impact on corporate culture [8]. Cheng Peng (2009) exploring enterprise interpersonal relationship management optimization for HR management [9]. Wu Xiaowei (2009) studying social network structure’s impact on competitive intelligence team learning ability [10]. Shan Wei et al. (2009) [11] researching network structure and characteristics’ effect on internal tacit knowledge transfer. Zhong Qi et al. (2008) [12] empirically studying organizational knowledge network optimization principles from egocentric and whole-network perspectives.

Most literature cites early social network works, such as: Liu Jun (2006) advocating “blockmodeling” for studying relationship-focused Chinese society [13]; Ma Feicheng et al. (2006) [14] studying knowledge transfer social network models; and Cai Ning et al. (2006) [15-16] researching industrial clusters. Similar community studies include Guo Liya et al. (2005) [17] analyzing core athletes’ interaction characteristics and team interpersonal features. However, as the saying goes: “Water can carry a boat but also overturn it.” Social network expansion can sometimes undermine organizational efficiency. Zhu Tao (2009)

revealed that social networks' emotional and information relationships negatively correlate with organizational commitment—a key internal marketing mechanism factor [18].

Yet, as Gao Zhongjian et al. (2007) [19] demonstrated: informal organizations within administrative organizations differ from market or bureaucratic forms, representing networked organizations with unique structures. Therefore, informal organization research should focus on network structure itself and its utilization methods, rather than analogizing negative impacts on formal organizations.

Earlier SNA contributions to information science were revealed by Pei Lei and Ma Feicheng (2006): SNA promotion and application in information retrieval, information behavior, and informetrics contribute to network knowledge discovery, scientific evaluation, network information behavior research, and knowledge management development [20]. Wang Ping (2006) further proposed knowledge management applications [21]. Recently, Wang Dan (2009) proposed new scientometric indicators for media roles after verifying nearly all SNA tools [22].

However, empirical research applying SNA to solve library management problems remains relatively scarce. Yet, as Zhang Shuren et al. (2006) [23] argued: SNA can predict organizational evolution trends and enhance management awareness; analyzing external interaction networks can 挖掘 organizational role positioning, discover development space, and implement strategic management. Yin Guopeng et al. (2006) [24] also confirmed: SNA provides quantitative analysis basis and methods for organizational tacit knowledge management measures. Therefore, applying SNA to observe and study practical library management problems is feasible.

2. Research Design and Results

(1) Research Design Based on literature analysis, the research design includes concepts, questions, and methods.

Research Concepts: 1. Social Network refers to a set of actors and various relationships connecting them (e.g., friendship, communication, advice) [25]; 2. Social Network Analysis is a structural method based on studying interactions among social actors [26]. Social relationship network research focuses on how actors' social relationship patterns affect their action outcomes.

Research Questions: 1. What forms do job positions, administrative organizations, and communities take as social networks? 2. How to open social networks using community communication during inter-departmental conflict? 3. How to close social networks using node control during personal conflict? 4. How to concentrate resources supporting single departments using social networks when departmental collaboration is needed?

Data Collection: Secondary literature analysis using organizational relationship position tables, community member lists, and community activity photos

to calculate nodes (librarians) and lines (administrative and friendship relationships).

Research Method: Participant observation. **Tools:** Social network analysis and Ucinet freeware.

(2) Research Results Based on secondary literature analysis, collected data were entered into tables, checked, and graphed using Ucinet, yielding three charts:

1. Subgroups Threatening the Organization

FIGURE 10.7-1 Subgroups Threatening the Organization

2. Rigid Organizational Relationships

FIGURE 10.7-2 Rigid Organizational Relationships

3. Soft Community Relationships

FIGURE 10.7-3 Soft Community Relationships

(3) Discussion 1. Three Organizational Management Forms

First, FIGURE 10.7-1 shows that if organizations operate solely according to work requirements, the entire library would fragment into independent subgroups, threatening management efficiency. While this “sheep grazing” management appears harmonious, work efficiency suffers.

If strong administrative reporting and evaluation systems, rules, and hierarchical relationships are added above these subgroups, FIGURE 10.7-2 shows that a management office composed of department heads acts like a central command post, connecting independent small groups. This effectively constrains most colleagues’ work and enhances overall efficiency. However, this approach simultaneously creates primary and secondary groups. Subgroups persist in the upper right and lower right with implicit class differences (non-office workers). Though members are kind and simple, their obvious differential treatment creates greater potential organizational threats. Additionally, the large left-side group is actually managed centrally by Steve, with KS, Diana, and Teresa as intermediaries linking other members. While individual job efficiency is high, when any party needs additional staff, they face the awkward situation of having “neither available soldiers nor capable generals.” In other words, this “strict law enforcement” management yields relatively high individual but low overall efficiency and organizational flexibility.

Finally, adding soft community relationships creates tighter social networks, as shown in FIGURE 10.7-3. First, FIGURE 10.7-2’ s “lower-class groups” have integrated into the main group, eliminating clear primary/secondary or high/low distinctions. Second, FIGURE 10.7-2’ s central core managed by Steve has changed, with many previously non-core members joining the central core, and core members joining various departmental work groups. The central core remains but its influence (and being influenced) scope has expanded. Beyond KS,

Diana and Teresa' s intermediary roles have diminished while their gatekeeper roles have increased. They no longer simply transmit commands and feedback but exert more important influence on opening and closing social networks, serving as nodes for other nodes occupying structural holes.

However, as discussed in literature, such tight social networks can have negative or positive impacts. We examine specific situations below.

2. Opening Social Networks Through Community Communication During Inter-departmental Conflict

Occasional inter-departmental competition occurs in daily work, whether for higher positions/salaries or refusing new business/workload allocations. Departments/groups remain in competitive states. The key is making competition 良性 rather than 恶性.

If libraries fragment as in FIGURE 10.7-1, conflict from competition often stems from information environment changes causing business transformation and resulting “new”work. Under “sheep grazing”management, group members suddenly “unite upward” to resist new requirements and changes.

If libraries operate under hierarchical systems or primary/secondary groups as in FIGURE 10.7-2, competition-driven conflict often results from higher-level position vacancies causing performance races. When outstanding cadres from any group are promoted, they provide “intangible returns” to their original groups, so all subgroups compete fiercely for the single vacancy to ensure future work stability.

If libraries have tight social networks as in FIGURE 10.7-3, competition persists but conflict probability decreases because: (1) “New” business and increased workload are shared across the library rather than single departments; (2) Tight social networks reduce subgroup importance—since everyone connects with others, the principle of “diversified investment to reduce risk”lowers absolute loyalty to subgroups.

3. Closing Social Networks Through Node Control During Personal Conflict

Conflicts sometimes erupt due to personal life factors or work friction. These conflicts refer not only to physical fights but more commonly to unpleasantness, jealousy, slander, rumors, and “whispering campaigns.”

If libraries fragment as in FIGURE 10.7-1, two conflict situations exist: (1) Intra-subgroup conflict causing “temporary” paralysis of that work unit. Since library paralysis in one department means overall paralysis, and other subgroups cannot intervene under FIGURE 10.7-1' s structure, paralysis spreads sequentially. (2) Inter-subgroup conflict causing typical “departmentalism,” evolving from personal to inter-departmental conflict.

If libraries operate hierarchically as in FIGURE 10.7-2, personal conflicts are quickly controlled within fixed scopes but only superficially, creating two

“chronic disease” problems: (1) Administrative command management doesn’t truly solve psychological issues but increases work pressure; (2) Conflicts increase pressure simultaneously on node-positioned individuals like Steve, KS, Diana, and Teresa even outside their jurisdictions. This creates the chronic disease of “no change, no pressure, no conflict.” Yet as noted in the introduction, reader demands and superior pressures on libraries continuously increase and cannot be avoided.

If libraries have tight social networks as in FIGURE 10.7-3, negative impacts from conflicts may spread faster and wider due to increased node numbers and diffusion area. However, sporadic conflicts’ influence gradually weakens because library management can: (1) Use Steve, KS, Diana, and Teresa’s administration to “hard” suppress; (2) Use Lisa, Michollo, Jean, Germaine, Edmond, Rosa, Michael, Wilson, Henry, and Ruby’s collaboration to “soft” persuade; (3) Create new topics to shift member attention; (4) Temporarily isolate some members in FIGURE 10.7-1-like situations if conflicts are severe, reopening social networks after recovery.

4. Concentrating Resources to Support Single Departments Using Social Networks

In efficient and harmonious work atmospheres, utilizing limited manpower and materials for centralized work progress requirements on individual library services can break through existing service limitations. This requires team collaboration rather than individual or small-group efforts.

For example, during exam periods, reader book borrowing and library study demands surge, requiring increased management staff and shelving workload. Meanwhile, other departments have lighter workloads. Using node influence in FIGURE 10.7-3 enables arranging support from other departments. Administrative commands alone as in FIGURE 10.7-2 would be less effective and multiply key nodes’ pressure.

Similarly, implementing “reference librarian-centered 2.0 strategies” or “special collection-centered development strategies” requires whole-library effort for optimal results. Under FIGURE 10.7-2’ s structure, fragmentation yields low efficiency. However, through social networks as in FIGURE 10.7-3, key points and nodes can coordinate effectively.

(4) Conclusion Current library operations trend toward “streamlined staffing and funding” while business and work trend toward “multi-dimensional increases.” Only through “concentrating resources to achieve goals, shifting goals, then concentrating resources again” can cooperation enhance work efficiency and reduce organizational policy-induced work pressure.

Using cold weapon warfare as metaphor, library management will shift from “massive heavy infantry mode” to “streamlined light cavalry mode” for flexible tactical adjustments based on situational needs.

Social network relationship analysis provides libraries with a convenient tool suitable for reducing central command coordination burdens and inter-departmental conflict probabilities. In other words, properly applying the revealed work methods can enhance library team morale, harmonious culture, and work efficiency: reducing central command's "assignment" function from rigid organizational relationships while increasing cross-departmental work atmosphere through soft community relationships, thereby enhancing inter-departmental coordination speed and work efficiency. In short, grasping core or bridge figures enables organizational pulse mastery.

However, whether this research can solve practical management problems across different regions and organizations requires future practice and observation. Most importantly, it provides a potentially effective path for humanized management and demonstrates the importance of applying scientific methods to solve practical problems.

Appendix 1: User Information Behavior Survey Questionnaire

National Science Library User Information Behavior Survey

Questionnaire Number: {{{_}}}{}}_}

Hello! This study aims to understand current graduate student usage and expectations of the National Science Library (NSL) website. Please take a few minutes to answer the following questions. This survey is purely for academic purposes and strictly follows statistical survey protection laws—your personal data will never be disclosed. Thank you for your cooperation.

National Science Library, Chinese Academy of Sciences

1. How did you learn about the NSL website?
Library staff / Teacher recommendation / Friend 告知 / Search engine / This survey / Other_{_____}
2. Which NSL network service do you use most frequently?
Quick search / Science news / Digital journal databases / Reference librarian / Document delivery / Other
3. Where do you typically access the NSL website?
National Science Library / Institute library / Laboratory / Study room / Dormitory / Other___
4. Under what circumstances do you typically access the NSL website?
Know what to find, know how to name it, know where it is / Uncertain what to find, want to learn during search / Search for any information on a topic without omission / Find previously encountered useful information / Browse casually without purpose
5. What services do you typically receive when accessing the NSL website?
Provides catalog information / Provides abstracts and full-text locations

3. Select variables, click “←” for Variable(s)
4. Options → Select all Statistics options → Continue
 - Mean: Arithmetic mean
 - Variance: Variance
 - S.E.mean: Standard error of mean
 - Skewness: Skewness
 - Range: Difference between max and min
 - Kurtosis: Kurtosis
 - Sum: Total
 - Minimum: Minimum value
 - Maximum: Maximum value
 - Std.deviation: Standard deviation

Section 2: Chi-Square Analysis

- How to determine if categorical variables are related?
 1. Null hypothesis contrary to assumption
 2. Degrees of freedom $df = (r-1)(c-1)$; r = row categories; c = column categories
 3. Look up “Chi-square distribution table” using df and significance level (0.01, 0.05, or 0.1)
 4. Obtain “test parameter”
 5. Use formula
 6. Obtain “chi-square value”
 7. Compare “test parameter” and “chi-square value”
 - Large difference: Reject null hypothesis, assumption holds
 - No significant difference: Support null hypothesis, assumption fails

Section 3: One-Way ANOVA

- How to determine if categorical and interval variables are related?
 1. Open file
 2. Statistics → Compare Means → One-Way ANOVA
 3. Select dependent variable → “→” for Dependent List
 4. Select independent variable → “→” for Factor
 - Large difference: Reject null hypothesis, assumption holds
 - No significant difference: Support null hypothesis, assumption fails

Section 4: Pearson Correlation Coefficient

- How to determine if interval variables are related?
 1. Open file
 2. Statistics → Correlate → Bivariate
 3. Select variables for analysis → “→” for Variables
 4. Correlation Coefficients → Pearson
 5. Test of Significance → Two-tailed
 6. Options → Select all Statistics options → Continue
 - $0 < |R| < 0.3$: No correlation
 - $0.3 \leq |R| < 0.5$: Low correlation
 - $0.5 \leq |R| < 0.7$: Moderate correlation
 - $0.7 \leq |R| \leq 1$: High correlation (simple linear regression possible)
- How to measure trends between two variables? –Simple Linear Regression
 1. Open file
 2. Statistics → Regression → Linear
 3. Select dependent variable → “→” for Dependent
 4. Select independent variable → “→” for Independent(s)
 5. Method → Stepwise

6. Standardized Residual Plots → Histogram

Section 5: Factor Analysis

- How to describe multiple variables related to an individual (variables are uncorrelated)?
 1. Open file
 2. Statistics → Data Reduction → Factor
 3. Descriptives → Select Univariate descriptives, Initial solution, Coefficients, Significance
 4. Extraction → Principal components
 5. Extract → Eigenvalues over " > 1 "
 6. Display → Select Unrotated factor solution, Scree plot
 7. Factor Scores → Save as variables
 8. Method → Regression, Display factor score coefficient matrix

Section 6: Cluster Analysis

- How to describe multiple variables related to an individual (variables are uncorrelated)?
 1. After factor analysis, obtain "fac1-1" and "fac2-1"
 2. Statistics → Classify → Hierarchical Cluster → Select "fac1-1" and "fac2-1"
 3. Plot → Dendrogram, All clusters, Vertical → Continue
 4. Method → Between-groups linkage
 5. Save New Variables → Single solution → 3 clusters

Appendix 3: Specialized Terminology

Terminology Translations:

- Open Access = 开放获取 (not 开放存取)
- Open Repository / Open Access Repository = 开放获取知识库 (not 存储库)
- Literature repository = 文献知识库
- Institutional Repository = 机构知识库

- Embargo = 时滞期 (not 禁运期)
- Data sharing = 数据共享
- Open Data = 开放数据
- Open Research Data = 开放科研数据 (not 开放研究数据)
- Scientific Data = 科学数据 (including subclasses: raw data, derived data, research data)
- Research Data = 科研数据 (when discussing with data management) / 研究数据 (when discussing with scientific data)
- Data repository = 数据知识库
- Version = 版本
- Format = 格式 (refers to .doc, .txt, .pdf distinctions, not book/paper/audio/video distinctions)
- Draft = 草稿 (versions on author' s computer or email exchanges)
- Manuscripts = 手稿 (author' s first submission version)
- Pre-Print Article (PPA) = 预印本论文 (not CNKI' s “pre-published” ; refers to pre-peer-review manuscripts on platforms like arXiv.org with open peer review)
- Author accepted manuscripts (AAM) = 作者接受稿 (post-acceptance, minor revision/proofing stage)
- Post-print = Version of Record (VOR) = The final version of a manuscript = 最终审定稿 (post-peer-review, author-modified, accepted version before journal typesetting)
- Published (PDF) = 最终出版稿 (printed journal version)
- Plan S = S 计划
- cOAlition S = 金色开放获取 S 联盟
- Copyright = 著作权
- Copyright law = 著作权法 (not 版权法)
- Copyright Office = 版权局 (not 著作权局)
- Copyright Limitation and Exception = 著作权限制与例外
- Fair use = 合理使用 (not general “reasonable use” ; specific legal term under copyright law Article 22 for education/research purposes with three-step test criteria)
- Three-Step Test = 三步检验法 (not 三步验证法)
- Fair deal = 公平交易 (sometimes “fair use” in UK IP context)
- Right = 权利 (e.g., reading right, use right, reuse right)
- Benefit = 利益
- Data right = 数据权益 (refers to various rights and benefits concerning data; in computing, means right control)
- Interest Group = 利益团体 (lobbying organizations; not interest groups/teams)
- Stakeholder = 利益相关方 (not 利益相关人 or 利益关系人)
- Ownership = 所有权
- Right Owner = 权益拥有者
- Copyright owner = 著作权持有者 (not 著作权所有人)
- Implementation = 实施
- Guideline = 指南

- Guidance = 指示
- Framework = 框架
- Regulation = 管制、规则、规范 (administrative management term)
- Government = 治理 (policy research term)
- Standard = 标准 (patents, metadata, information management term)
- Criteria = 评估指标
- Indicator = 指标
- index = 索引
- H-index = H 指数
- Object = 对象
- Object-Oriented Programming = 面向对象编程
- Digital Object Identifier, DOI = 数字资源唯一标识符
- End User = 终端用户、读者用户、用户
- Admin User = 系统管理者、管理用户
- System User = 系统维护者、系统用户
- User-driven = 用户驱动的
- User-led = 用户引导的
- User-Centered Design = 以用户为中心的设计 (not User-Centered alone)
- User-generated content = 用户生成内容
- Special Library = 专业图书馆 (e.g., Peking University Medical Library, Documentation and Information Center, National Agricultural Library)
- Academic Library = 学术图书馆 (e.g., Peking University Library, Tsinghua University Library)
- Research Library = 研究型图书馆 (e.g., Peking University Library, Documentation and Information Center)
- Information Specialist = 信息专家 (essentially librarians)
- System Librarian = 系统馆员
- Law Librarian = 法律馆员
- Subject Librarian = 学科馆员
- Data Librarian = 数据馆员
- University Librarian = 图书馆馆长 (not university librarian)
- Library Staff = 图书馆馆员

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Note: Figure translations are in progress. See original paper for figures.

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