

Characteristics and Patterns of Contextual Information Needs in Mobile Libraries: A Postprint

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Abstract

[Purpose/Significance] The contextualized information acceptance scenario in mobile libraries influences users' information needs, which stem from the gap between their comprehensive literacy and their ability to solve target problems. In the era of micro-media, self-media, and omnimedia, in-depth research on contextualized user information needs and their characteristics in mobile libraries, and uncovering the patterns of user information needs, constitutes the core and key to mobile library information services. [Method/Process] This study treats mobile libraries as a system and, from a systems theory perspective, investigates the connotation, elements, and characteristics of users' contextualized information needs. On this basis, grounded in social cognitive theory, user satisfaction theory, and self-regulation theory, it summarizes the patterns of contextualized information needs in mobile libraries, and employs log mining methods to empirically validate these patterns. [Results/Conclusion] In mobile library scenarios, for individual users, different users' information needs may exhibit different dominant patterns such as chain, branched-chain, tree, and network structures; however, for user groups, their information needs strictly follow a progressive trend of "chain-branched-chain-tree-network."

Full Text

Preamble

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Research on the Characteristics and Patterns of Scenario-Based Information Demand in Mobile Libraries

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Abstract

[Purpose/Significance] The scenario-based information acceptance context of mobile libraries influences users' information demands, which originate from the gap between users' comprehensive literacy and their ability to solve target problems. In the era of micro-media, self-media, and omnimedia, in-depth research on mobile library users' scenario-based information demands and their characteristics, as well as excavating the patterns of user information demands, constitutes the core and key of mobile library information services. **[Method/Process]** This study regards the mobile library as a system and investigates the connotation, elements, and characteristics of users' scenario-based information demands from a systems theory perspective. Based on social cognition theory, user satisfaction theory, and self-regulation theory, it summarizes the patterns of mobile library scenario-based information demands and employs log mining methods for empirical validation of these patterns. **[Result/Conclusion]** In mobile library scenarios, while individual users' information demands may exhibit different advantages such as chain, branch, tree, or network structures, user groups demonstrate a strict progressive trend in their information demands following the "Chain → Branch → Tree → Network" pattern.

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Since Beijing Institute of Technology Library launched information services via SMS platform in 2003, mobile library development in China has undergone 15 years of evolution. The construction process of mobile libraries has been one of continuously discovering and satisfying user information demands, ecologically adapting to changes in the information environment, and extending the physical boundaries while expanding the value chain of library services. In 2010, the Association of College and Research Libraries (ACRL) published the report "Futures Thinking for Academic Librarians: Higher Education in 2025," which predicted that "mobile devices are growing exponentially, and new applications will drive new services" when forecasting trends affecting academic libraries. The report emphasized that mobile libraries should fully consider user demands when providing services. In the scenario era, mobile library information acceptance contexts have become increasingly rich and powerful. As the five forces of the scenario era—big data, mobile devices, social media, sensors, and positioning systems—become deeply embedded in mobile libraries, they exert two major impacts on information acceptance: first, users' tolerance for existing mobile library information acceptance decreases due to contextual changes and enhanced scenario functions; second, changes in user information demands stimulate continuous optimization of contexts and scenario configurations, progressively improving user satisfaction with information demands.

R. L. Liu et al. argue that to facilitate search and navigation, information is generally organized hierarchically into different levels. Nevertheless, users inevitably suffer from information overload during information queries, as hierarchical organization often fails to achieve sufficient refinement according to user demand preferences. R. Savolainen believes that information demand is the fundamental factor prompting people to identify and obtain information sources, serving as a secondary trigger or driver determined by more basic factors, such as task execution information demands. Yin Yuehong contends that research on mobile library user demands is of great significance for improving service quality, as demands constitute the direct driving force for the emergence and development of mobile library services. Deng Lijun et al. point out that current library mobile services focus only on their own resources and technical levels, lacking effective control over changes in user information demands, and must adjust library service concepts accordingly to correct perceptions of users, resources, and services. Li Yujia et al. conduct in-depth analysis of user experience demands in mobile library usage, exploring the main factors influencing user demands and proposing suggestions for optimizing mobile library design to maximize user satisfaction. Guo Shunli et al. construct a mobile library user information demand model from a context-aware perspective, utilizing users' location context, basic information context, and social network context to provide personalized information services.

Through reviewing the aforementioned domestic and international literature, it is evident that experts and scholars in related fields consider demand as the key to stimulating user information acceptance. By studying the basic factors that trigger demands and mastering their characteristics, personalized services can be provided to users. However, few studies have excavated the patterns of user information demands, particularly in the scenario era. In fact, we have inevitably entered the scenario era, and whether patterns exist for user information demands in mobile library scenarios and how to construct mobile libraries based on these patterns are the key issues this paper aims to address.

2. Connotation of Mobile Library Scenario-Based Information Demand

2.1 Connotation of Mobile Library Scenario-Based Information Demand

Mobile library scenario-based information demand originates from users' cognition of information acceptance contexts and, driven by their own information desires, represents a conditional, feasible, and optimal selection of information sets that can maximize satisfaction of those desires. Mobile library user information demands can be classified according to different dimensions:

- (1) **Replaceability Dimension:** From the replaceability perspective, user information demands can be divided into rigid demands and flexible demands. Rigid demands refer to information needs that are irreplaceable

in specific scenarios—only by obtaining corresponding information in particular contexts can users effectively solve practical problems, and only by satisfying such demands can users truly achieve information re-creation and value-added. Flexible demands refer to information that users expect to obtain in specific scenarios but that is replaceable—similar or related contextual information can effectively solve users' problems.

- (2) **Comprehensiveness Dimension:** From the comprehensiveness perspective, user information demands can be divided into rough demands and precise demands. Rough demands refer to situations where users facing a problem in a specific scenario only need to conduct simple information searches to satisfy their needs, such as browsing information on a topic through navigation or simple retrieval. Precise demands refer to situations where users need to obtain relevant data and facts to solve problems—these data and fact sources must be accurate, reliable, and authoritative. For precise demands, advanced search and expert search supplemented with certain limiting conditions can be used for dynamic queries.
- (3) **Manifestation Dimension:** From the manifestation perspective, user information demands can be divided into explicit demands and implicit demands. Explicit demands refer to information demand paths that users follow according to normal logical thinking when searching for and obtaining information in specific scenarios. Implicit information demands refer to paths that can satisfy users' information needs through unconventional thinking in specific scenarios. So-called explicit demands are visible and tangible, while implicit information demands are perceptible but intangible—implicit information demands can be transformed into explicit demands under certain conditions. For example, after the emergence of Google Maps, painters' implicit demands for artistic inspiration from maps became explicit demands.
- (4) **Contingency Dimension:** From the contingency perspective, user information demands can be divided into routine demands and emergent demands. Routine demands refer to users' habitual daily needs, which have strong scenario inertia and are generally fixed in certain professions, fields, and interest preferences. Emergent demands refer to needs weakly correlated with users' professional, occupational, or life needs. Routine information demands are common forms in mobile libraries, while emergent demands are occasional needs without fixed directions that may stimulate, change, and optimize routine information demands.

Although the above four dimensions reveal mobile library user scenario-based information demands, all levels of demands share common attributes: context-dependency, dynamism, stage-dependency, and contingency [Figure 1: see original paper].

As shown in Figure 1, mobile library scenario-based information demand integrates demands of different dimensions and levels. The integrated user in-

formation demands exhibit context-dependency, demand dynamism, demand stage-dependency, and demand contingency. These characteristics guide the organic integration of mobile library information demands into scenario-based demands. Through the stimulation of scenario-based information demands, mobile libraries dynamically adapt information acceptance contexts to users' scenarios, satisfying user demand expectations and promoting scenario-based context reconstruction and information service value-added. User information demands are stage-dependent, dynamic, and contingent—mobile libraries should dynamically perceive changes in user information demands, iteratively adapt scenario-based information acceptance contexts based on user demands, and provide corresponding information services. Simultaneously, mobile libraries should guide, stimulate, and regulate user information demands based on existing scenario functions and context configurations to achieve ecological evolution of scenario-based information demands.

2.2 Adaptation of Mobile Library Scenario-Based Information Demand

Previous digital library information service research focused more on personalized information services, which emphasize user demand preferences. Existing theoretical research and practical applications indicate that mobile library scenario-based services should not only focus on “user demand-centered” approaches but also appropriately adopt “scenario-centered for users” perspectives from another angle, seeking new development opportunities for mobile libraries through complementary integration of these two levels. Mobile library scenario-based information services should include both horizontal demand satisfaction that is “user demand-centered” and vertical demand satisfaction that is “scenario-centered for users.”

Horizontal information demands do not negate vertical information demands—horizontal demands form the foundation for vertical demands, while vertical demands represent spatial expansion of horizontal demands. Vertical information demands can stimulate infinite possibilities, but these possibilities ultimately require analysis and implementation within the horizontal demand framework. The subversion of information demand possibilities by vertical demands constitutes the significance of demand flexibility and ecology. Vertical information demands may inadvertently jump to other directional needs, stimulating new demand trends, while horizontal demand satisfaction represents a continuous refinement process based on deterministic information demands.

Mobile libraries satisfy users' horizontal and vertical information demands through three types of matching:

- (1) **Positive Adaptation Demand:** Positive adaptation demand refers to situations where user demand expectations match scenario functions—needs that can be satisfied without context modification or user behavior guidance. Such demands maximize the utility of mobile library scenario-

based information acceptance contexts, avoiding both context waste and insufficiency, achieving optimal matching between context and demand.

- (2) **Insufficient Adaptation Demand:** Insufficient adaptation demand refers to situations where user demand expectations exceed scenario functions—negative adaptation demands that cannot be well satisfied. Such demands manifest as deficiencies in mobile library scenario-based information acceptance contexts, requiring context reorganization and integration through supplementation, reconstruction, and optimization.
- (3) **Excessive Adaptation Demand:** Excessive adaptation demand refers to situations where user scenario-based demand expectations are lower than scenario functions—the context can satisfy higher-level demands, representing excessive adaptation. Such demands occur when mobile library scenario-based information acceptance contexts are highly configured but user information demands have not yet reached matching levels, requiring guidance, regulation, and standardization of user information behavior to achieve effective matching between behavior and context.

In actual mobile library operations, the user demand adaptation process is illustrated in Figure 2 [Figure 2: see original paper].

In Figure 2, users' information demands in a particular domain or space are called horizontal information demands, which may exhibit positive, insufficient, or excessive adaptation with scenario configuration. However, through context modification or user behavior guidance and regulation, the adaptation ultimately tends toward positive adaptation. Vertical information demands represent the process of users expanding from one domain or space to different domains and spaces, including previous, current, and future scenario demands. The configuration of other scenarios may be positive, insufficient, or excessive adaptation, requiring continuous adjustment of the relationship between demands and scenarios using the three measures on the right side of Figure 2 to ultimately achieve positive adaptation. Figure 2 demonstrates the dynamic configuration relationship between user information demands and scenarios, essentially achieving ecological adaptation through repeated adjustments of excessive and insufficient adaptation demands. From the dual perspectives of guiding, regulating, and controlling user information behavior and organizing, reconstructing, and optimizing information acceptance contexts, dynamic spiral adaptation and stimulation of user scenario-based information demands and contexts are realized.

3. Elements and Formation of Mobile Library Scenario-Based Information Demand

3.1 Elements of Mobile Library Scenario-Based Information Demand

Cognitive theory is a learning theory that studies how changes caused by experience occur. It emphasizes organisms' understanding of current situations, yet

different users possess different comprehension abilities. Cognitive consistency theory has three variations: (1) Balance theory—Heider proposed that in a simple cognitive system, there exists a form that seeks to achieve balance, either by changing existing cognitions or adding new ones to correct imbalance; (2) Expectation confirmation theory—a fundamental theory for studying consumer satisfaction, which posits that consumers judge product or service satisfaction by comparing pre-purchase expectations with post-purchase performance, with satisfaction becoming a reference for future purchases or usage; (3) Maslow's hierarchy of needs, which categorizes human needs into five levels from low to high: physiological, safety, social, esteem, and self-actualization needs.

Drawing on these three theories and mobile library operational realities, the elements constituting mobile library user scenario-based information demands are as follows:

- (1) **Scenario-Based Demand Potential:** Scenario-based demand potential represents the specific manifestation and extension of Maslow's hierarchy of needs in mobile library scenario-based information demands. User scenario-based information demand originates from the desire to bridge the gap between solving target problems and one's own abilities, with desire stemming from motivation that stimulates information demands. This pathway drives the formation of user scenario-based information demand advantages, referred to as demand potential. Specifically, scenario-based demand potential refers to an advantage formed by the stimulation and excitation of information acceptance contexts on user information demands in specific scenarios. This potential is related not only to mobile library information acceptance contexts but also to users' own information literacy. User scenario-based demand potential is not static—it dynamically changes and ecologically evolves with contextual changes and improvements in users' comprehensive information literacy.
- (2) **Scenario-Based Demand Capability:** Scenario-based demand capability refers to the comprehensive information literacy required for matching user information demands with mobile library information acceptance contexts, including abilities in information query, acquisition, acceptance, and utilization in specific scenarios. User scenario-based information demands originate from the capability users possess for certain information needs in specific scenarios—demand capability represents users' strength in comprehensively and accurately obtaining needed information. Mobile library user scenario-based demand capability includes both potential and kinetic energy: potential energy originates from users' own demand potential, while kinetic energy stems from continuous capability enhancement during information acquisition.
- (3) **Scenario-Based Demand Force:** Scenario-based demand force refers to users' ability to stimulate their own information demands, essentially representing the effectiveness of users' action and reaction on scenario-based contexts based on their own information needs. Although demand

force creates friction in the configuration between context and scenario, it enables mutual adaptation between context and scenario, serving as a lubricant. The composition elements of mobile library user information demands are illustrated in Figure 3 [Figure 3: see original paper].

As shown in Figure 3, mobile library scenario-based user information demands are grounded in cognitive theory, expectation confirmation theory, and Maslow's hierarchy of needs, forming demand potential, demand capability, and demand force respectively. Under the effect of demand potential, user information demands first form a demand node. As demands are stimulated, another demand node forms, with progressive relationships between nodes—this progressive relationship is called information demand advantage. Under demand capability, user information demands are no longer limited to a single topic or domain but present as discrete nodes with progressive advantages between them, forming information demand advantage chains and branches. Under demand force, user information demands become diversified, further growing on branches to form information demand advantage trees and networks. To satisfy changes in user demand advantages, mobile library scenarios configure contexts in node, chain, and network forms to maximize satisfaction of user information demands, achieving ecological adaptation between user scenario-based demand elements and contexts while dynamically transforming and optimizing contexts.

3.2 Formation of Mobile Library Scenario-Based Information Demand

Mobile library user scenario-based information demands are formed through the interaction of external environments, information acceptance contexts, and users' internal cognition, which stimulate scenarios to create certain incentives that form information demand motivation, prompting the generation and development of user information demands. Based on cognitive theory, user satisfaction theory, and self-regulation theory, the author summarizes the following elements in the formation process of mobile library scenario-based information demands:

- (1) **Scenario-Based Information Users:** As the most dynamic factor in scenarios, users' experience and perception of scenarios determine scenario service performance. In different scenarios, varying degrees of scenario element richness, functional refinement, and context configuration inevitably stimulate different information demands. However, regardless of scenario or context type, information users can generally be categorized as research-oriented, creative, management-oriented, verification-oriented, knowledge-seeking, or interest-oriented.
- (2) **Scenario-Based Information Demand Channel:** The scenario-based information demand channel refers to the channel through which user demand expectations are satisfied, essentially representing the chain, branch, tree, or network context channels formed by the interaction of different dimensional contexts based on user demand expectations. Specifically,

mobile library scenario-based demand channels are formed by the organic integration of resource context, technical context, service context, social context, mobile context, and terminal context.

- (3) **Scenario-Based Information Flow:** Scenario-based information flow is the information flow pattern stimulated by user demand expectations across different dimensional contexts in users' scenarios. Its essence is the information flow pattern formed by the interaction between scenario-based elements and contextual elements based on user demand expectations. Effective scenario-based information flow can achieve good adaptation between user demands and scenarios, avoiding efficiency reduction due to information flow collisions.
- (4) **Scenario-Based Demand Utility:** Scenario-based demand utility refers to the actual functions after mobile library user information demands are formed, such as stimulating context changes, acting on environments, adapting user demands, and guiding, adjusting, and modifying user information demands.
- (5) **Scenario-Based Demand Value:** Scenario-based demand value represents the manifestation of actual utility generated by users' information flow in information channels. Specifically, it means that user information demands need to select an appropriate focus, stimulate contexts through horizontal displacement to achieve association between demands and contexts, thereby promoting demand adaptation and context optimization. Horizontal displacement methods include substitution, reversal, combination, exaggeration, removal, and reordering, while vertical deepening includes changing demands, changing goals, and changing experiences. In the aforementioned formation process, the joint action of horizontal displacement and vertical deepening promotes the formation-decomposition-reformation of user information demands, achieving dynamic spiral adaptation.

The formation framework of mobile library user scenario-based information demands is shown in Figure 4 [Figure 4: see original paper].

As illustrated in Figure 4, different user types have different information demands in different or the same scenarios. Under the support of cognitive theory, user satisfaction theory, and self-regulation theory, user information demand realization occurs through demand expectation generation, actual application experience and perception, and feedback after understanding scenario function utility. Through the transformation from horizontal to vertical information demands, mobile library context transformation and optimization are promoted. This is achieved through dynamic adjustment of the configuration relationship between contexts and scenarios based on user demand expectations, realizing ecological adaptation through a spiral cycle of "mismatch-match-mismatch" between scenarios and contexts.

4. Characteristics and Patterns of Mobile Library Scenario-Based Information Demand

4.1 Characteristics of Mobile Library Scenario-Based Information Demand

Analyzing mobile library user scenario-based information demands from different dimensions and perspectives reveals various demand characteristics. Based on existing research and practical applications, mobile library user scenario-based information demands generally exhibit the following characteristics:

- (1) **Diversity:** The diversity of user scenario-based information demands manifests in the contradictory movement of selection and adaptation to information acceptance contexts. On one hand, users select elements of information acceptance contexts to make the contexts more targeted for their demands. On the other hand, users transform and optimize information acceptance contexts, eliminating contexts unsuitable for their demands while enhancing suitable ones. Mobile library information acceptance contexts achieve natural selection based on user scenario-based demands and user-oriented needs, making user demands ecological.
- (2) **Dynamism:** Different levels and types of user scenario-based information demands possess dynamism, generally manifested in vertical changes and extensions of their professional fields and occupational characteristics, especially as users' comprehensive information literacy continuously improves, their information demands also dynamically extend.
- (3) **Stage-Dependency:** User scenario-based information demands vary across different periods, reflected in horizontal changes in professional fields and occupational characteristics, and more significantly in the evolution of professional fields and careers. Stage-dependency also manifests in significant shifts or complete changes in user interest in information demands—users have different information demands at different stages.
- (4) **Variability:** The variability of user scenario-based information demands is reflected in the changing nature of information acceptance contexts. In mobile library information acceptance contexts, there are both slow life-cycle changes and sudden mutations in information acceptance contexts. The former affects the continuous changes in user information demands, while the latter causes sudden changes, reflecting the impact of quantitative and qualitative changes in contexts on user demands.
- (5) **Evolution:** The evolution of user scenario-based information demands results from the evolution of information acceptance contexts, manifested in the evolution from paper library contexts to digital library contexts, and from digital library contexts to mobile library contexts. Slow and rapid changes in contexts cause corresponding changes in mobile library users' information demands, reflecting the continuous evolution of user information demands in practice.

- (6) **Ecology:** The ecology of user scenario-based information demands is reflected in the diversity of user types and user levels. Different levels and types of users have different information demands, including resource contexts, technical contexts, service contexts, terminal contexts, mobile contexts, and social contexts required for their information demands. Different users have subtle differences in information demands under different contexts.

The characteristics formation of mobile library user scenario-based information demands is illustrated in Figure 5 [Figure 5: see original paper].

As shown in Figure 5, the characteristics of mobile library user scenario-based information demands are continuously formed through the interaction between demands and contexts. With the arrival of the scenario era, changes in user information demands stimulate transformations in mobile library information acceptance contexts, which evolve ecologically at varying paces. Mobile library basic contexts include resource, technical, service, and terminal contexts, while auxiliary contexts include mobile and social contexts. These two dimensions of contexts associatively and couplingly guide and regulate user information demands, causing traditional contexts to undergo qualitative changes after repeated iterations, thereby better adapting to scenarios based on user demand expectations. The scenario-based configuration of mobile library information acceptance contexts is not static but dynamically changing, manifesting as the ecological and evolutionary interaction of “scenario-user-context.”

4.2 Patterns of Mobile Library Scenario-Based Information Demand

Influenced by information acceptance contexts and scenarios, mobile library user information demands exhibit evolutionary and ecological advantages. From this perspective, user information demands have certain lifecycles, experiencing four stages: gestation, growth, maturity, and decline, in a cyclical spiral. Drawing on lifecycle theory, the author proposes that mobile library scenario-based information demands exhibit the following four patterns:

- (1) **Scenario-Based Demand Node:** A scenario-based demand node refers to the dynamic changes in user demands within scenarios, with each demand called a demand node. Formed under the influence of mobile library information acceptance contexts and based on changes in users’ professional fields, occupational characteristics, and personal interests, each node builds upon the previous one, reflecting information demand advantages. In demand nodes, the previous node may remain a user demand or become permanent historical demand, with logical relationships between nodes forming detailed and overall demand advantages.
- (2) **Scenario-Based Demand Chain:** The scenario-based demand chain refers to the directed chain formed between nodes based on user scenario-based historical demand nodes and the demand advantages between nodes. As contextual elements continuously enrich and scenario functions refine,

information demand advantages manifest not only in one direction but form main chains and branches with different advantages, presenting as changes in user demand advantages. This provides theoretical basis for excavating user demand advantages and predicting future scenario demands.

- (3) **Scenario-Based Demand Tree:** The scenario-based demand tree refers to the increasingly unbalanced multi-domain state as user information demands are continuously stimulated. Based on demand advantage chains and branches, it grows into a demand advantage tree. Users' different topics, domains, and interest demands have different advantages with unbalanced growth, causing demand advantage chains to become intertwined, forming a demand advantage tree. Based on user scenario-based demand advantage chains, the interweaving of chains forms the user information demand advantage tree.
- (4) **Scenario-Based Demand Network:** The scenario-based demand network refers to the multi-domain, multi-topic, and multi-interest refinement of user information demands as contextual elements continuously enrich and scenario functions refine. User information demands grow fine branches on the original tree, with interconnections between branches, reflecting the evolution from simple to complex, from implicit to explicit, and from horizontal to vertical. The demand network also witnesses the evolution of information environments, contextual transformations, and scenario function changes.

The formation process of mobile library user information demand patterns is shown in Figure 6 [Figure 6: see original paper].

As illustrated in Figure 6, mobile library scenario-based information demand patterns include demand nodes, demand advantage chains, demand advantage branches, demand advantage trees, and demand advantage networks, with each preceding pattern forming the basis for subsequent ones. The emergence and evolution of mobile library scenario-based information demand patterns result from the interaction between mobile library scenarios and information acceptance contexts based on user demand expectations. The four patterns progress layer by layer, gradually deepening, reflecting the evolution of individual and community demand patterns. In the evolution of different demand patterns, the spiral ecological evolution of “running-in-meshing-running-in” between mobile library scenario elements and mobile context elements based on user demand expectations is realized.

5. Patterns and Analysis of Mobile Library Scenario-Based Information Demand

5.1 Hierarchical Progression Law of Mobile Library Information Demand Advantage

Mobile library users exhibit different advantages in scenario-based information demands. Most demands concentrate on scientific decision-making, research problem solving, business idea stimulation, and leisure entertainment. As users' experience continuously enriches and comprehensive information literacy gradually improves, user demand levels become increasingly diversified and content gradually extends, causing continuous progression in user information demands. The quantitative and qualitative progression of information demands indicates that quantitative changes cause qualitative changes, which then initiate new quantitative changes on the new qualitative basis, cyclically driving user scenario-based information demands to continuously progress from lower to higher stages, making entire societal information demands a vivid scene of continuous generation and succession.

The above demonstrates the hierarchical progression of both information demand advantages and levels. Here, the author summarizes this law as: user information demands exhibit gradual quantitative expansion and gradual qualitative progression. In actual mobile library construction, attention should be paid to the effective configuration of relationships between scenario elements and context elements based on the user information acceptance network, and through user perception and experience feedback, on one hand, contexts should be transformed and optimized, and on the other hand, user information demands should be guided and regulated. Through repeated iteration of scenario-context relationships, the hierarchical progression law of mobile library scenario-based information demand advantages is formed, as shown in Figure 7 [Figure 7: see original paper].

As shown in Figure 7, as users' life experience continuously enriches and comprehensive information literacy continuously improves, user information demands progress from initial demands through quantitative to qualitative changes, achieving transformation in user information demands to adapt to new information environments. Simultaneously, as user information demands change and transform, demand advantages shift from demand nodes to demand chains and then to demand networks. Furthermore, initial contexts are configured for initial demands, and as demands and demand advantages change, contexts are transformed and even optimized. Contexts include the aforementioned basic and auxiliary contexts, which ecologically adapt to user information demands, causing user information demands to evolve greenly.

5.2 Analysis of Mobile Library Information Demand Patterns

The hierarchical progression law of mobile library information demand advantages not only universally exists in any user information demand but also serves

as a powerful driving force for mobile library function improvement. First, regarding user information demands, the demand advantage progression law is inherent in different users' demand processes for different information. Users encounter various problems requiring solutions in mobile library scenarios, stimulating multiple demands. Macroscopically, these demands are common and universal, as is the progression of mobile library user information demands. However, under specific spatiotemporal conditions, due to differences in user subjects, particularly differences in information demands, the manifestation of user demand advantage progression also varies. Second, regarding mobile library function improvement and development, the user demand advantage progression law serves as an important basis for mobile library construction. Due to the existence and evolution of information acceptance contexts, mobile libraries centrally reflect users' information needs and satisfy their own multi-level needs through this satisfaction. Different user demand advantages and hierarchical progressions make mobile library services highly relative and hierarchical. Mobile library internal relationships mainly include three pairs: the basic relationship between information and mobile libraries, the provision relationship between mobile libraries and users, and the adaptation relationship between these relationships, with the adaptation relationship having global significance. The hierarchical progression law of mobile library scenario-based information demand advantages is illustrated in Figure 8 [Figure 8: see original paper].

As shown in Figure 8, the progression of mobile library user demand advantages, levels, scales, and hierarchies serves as the basis for information selection, organization, and processing. Context enrichment and optimization and scenario function strengthening stimulate user demand progression. The gap between user demand expectations and scenario support capabilities results from user perception and experience, which is fed back to mobile libraries to achieve context reconstruction, context optimization, and ecological adaptation of scenarios, thereby utilizing users' own initiative to achieve information discovery and creation through the demand advantage hierarchical progression law.

6. Empirical Validation of Mobile Library Scenario-Based Information Demand Patterns

6.1 Simulation of Mobile Library Information Demand

The above discussion demonstrates that mobile library scenario-based information demands exhibit hierarchical progression patterns that exist and can be tested. To validate these patterns, this study conducted multi-dimensional mining of mobile library user access logs from two universities in Inner Mongolia, including resource types, search methods, download volumes, browsing volumes, and tracked users' publication records to verify the scientific validity of mobile library information demand patterns. To ensure sample universality, the study mined mobile library access logs of 100 users, including CNKI, Wanfang, SCI, and mobile professional databases. The collected data were statistically ana-

lyzed and simulated using MATLAB R2010a, with results shown in Figure 9 [Figure 9: see original paper].

The simulation was conducted across resource dimensions, search methods, downloads, browsing, and user publications. The horizontal axis represents the data mining time period (November 2016 to April 2017), while the vertical axis represents dimensionless percentage values across different dimensions. Figure 9 reveals the following: (1) Resource type trend simulation shows the transition from simultaneous use of CNKI and Wanfang to exclusive CNKI use, then to combined CNKI and SCI use, evolving toward SCI use, and finally trending toward professional resource use. (2) Search strategy trend simulation shows the transition from navigation and quick search to quick search and combined search, evolving to combined search and result refinement, then to alternating combined search and expert search, further evolving to expert search and result refinement, and finally trending toward appropriate proportions of various methods. (3) Information acceptance trend simulation, primarily reflected by download and browsing volumes, shows an initial high volume transitioning to reduction, then increasing again, further reducing, and finally trending from high to low volume, with overall demand advantage manifested as “expansion-contraction-expansion.” (4) Information internalization trend simulation, reflected in user group publication changes, shows a small number of papers initially, gradually increasing publication speed, then substantially increasing, followed by sudden increases, and finally maintaining publication volume within a certain threshold.

6.2 Validation of Mobile Library Information Demand Patterns

Simulation results of collected data indicate that group user information demands exhibit certain patterns, while individual user information demands more or less contain defects, which manifest in the refinement of user information demands:

- (1) **Individual Demand Validation:** For individual user information demands, demand advantages in certain themes of certain scenarios do not strictly exhibit monotonic progression. However, overall information acceptance demonstrates strict hierarchical progression of information demand advantages. Data analysis reveals that some users’ information demands regress to previous levels before progressing forward, indicating that individual users’ cognition of information demands is not achieved in one step but involves certain twists and waves, causing non-compliance with demand advantage hierarchical progression in some scenarios. However, overall, information demand advantages exhibit strict hierarchical progression. This is related to mobile library information acceptance context configuration—improper configuration affects user demand advantages, but the complementary fusion of different contextual dimensions causes mobile library user information demands to generally tend toward clear hierarchical progression.

- (2) **Group Demand Validation:** From the entire user sample as a group, microscopic group demands exhibit certain dispersion and disorder, but macroscopic group demands demonstrate clear advantage and hierarchy. This is manifested in that although user group information demands involve different professional fields, occupational domains, and interest preferences, some individual disharmonious demands may affect group demands. However, it is normal for different users to exhibit identical information demands in the same scenario, as determined by scenario functions.
- (3) **Universality of Demand Defects:** Demand defects refer to demands that do not strictly follow hierarchical progression. Data analysis reveals that some users exhibit discontinuous cross-level and jump patterns in demand advantages. This occurs due to transformations in the information environment causing mutations in mobile library information acceptance contexts or due to users' comprehensive information literacy and life experience undergoing leapfrog improvements. After contextual mutation, users can directly utilize mutated contexts to satisfy their demand expectations, causing jump patterns in demand advantages.
- (4) **Universality of Demand Refinement:** In the era of micro-media, omnimedia, and self-media, mobile library user information demands exhibit refinement characteristics. This phenomenon can be analyzed from two aspects: First, new technologies such as semantic ontology and linked data applied in mobile libraries enable multi-language, multi-level, fine-grained dynamic refined organization of information, and changes in resource organization forms inevitably cause corresponding changes in user information demands. Second, social media applications in mobile libraries enable users to share and utilize knowledge, also exhibiting refinement characteristics such as brief comment information and original information.

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Research on the Characteristics and Rules of the Information Demand of Mobile Library

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Abstract: [Purpose/significance] The scenario information acceptance context of mobile library affects users' information demands, which originate from the potential difference between users' comprehensive literacy and their ability to solve target problems. In the era of micro-media, self-media, and all-media, it is the core and key of mobile library information service to deeply study the scenario-based information demands and their characteristics of mobile library users and excavate the rules of users' information demands. [Method/process] Regarding the mobile library as a system, this paper studies the connotation, elements, and characteristics of users' scenario-based information demands from the perspective of system theory. Then, based on social cognition theory, user satisfaction theory, and self-regulation theory, it summarizes the rules of scenario-based information demands of mobile library and conducts empirical research on users' scenario-based information demand rules through the method of log mining. [Result/conclusion] The results show that different single users' information demands may have different advantages such as chain, branch, tree, and network, but for user groups, their information demands have a strict progressive trend of "Chain-Branch-Tree-Network."

Keywords: mobile library; information acceptance context; scenario information demand; information demand rule

Note: Figure translations are in progress. See original paper for figures.

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