Non-user Models: A Methodology for Information System Functions

Authors: Gu Liping

Date: 2016-06-09T00:00:00+00:00

Abstract

Designing system functionalities that accommodate non-user behavior can enhance system utilization rates. Systematically introducing research on non-user behavior, distinguishing types of non-users, proposing a theory of non-user behavior, and exploring methods for investigating non-user behavior through contextual analysis, personas, and living laboratories can serve as design tools for improving and enhancing digital library service systems.

Full Text

Preamble

Knowledge Organization and Knowledge Management

Non-user Model—A Methodology for Information System Performance

(Department of Library and Information Science, National Taiwan University, Taipei 10671, China)

Author: Ku Liping

Abstract: Designing system functions that align with non-user behavior can increase system utilization. This article systematically reviews relevant research on non-user behavior, distinguishes types of non-users, proposes a theory of non-user behavior, and explores methods for investigating non-user behavior through scenario analysis, personas, and living laboratories. These approaches can serve as design tools for improving and enhancing digital library service systems.

Keywords: Information behavior, User profile, User model, Potential users, User performance

Classification Number: G250.76

English Title: Model of Non-user—A Methodology for Information System Performance

English Abstract: Designing system functions to meet non-user behavior can increase system utilization. This article systematically introduces relevant studies and non-user types, then proposes the non-user theory, discusses using scenario analysis, personas, and living laboratory to understand non-user behavior. It can be a guideline to enhance and improve the digital library service system.

English Keywords: Information behavior, User profile, User model, Potential users, User performance

---

1. Introduction: Reverse Thinking in "User" Research

A non-user refers to individuals who have both the right and the conditions to use a particular information institution' s services but rarely do so [**?**]. By studying non-users, we can identify directions for service improvement and innovative development in library and information institutions.

For digital libraries, exploring non-user behavior involves information behaviors not originally considered in system requirements. For example, bibliographic retrieval systems generally do not account for social functions among users, and web search engines do not incorporate social activities into page ranking algorithms. However, from the perspective of non-user behavior research, social functions are becoming an important component of user information retrieval behavior. Such social behaviors, traditionally categorized as non-user behaviors in system design, may represent the primary user behaviors of the future. In other words, exploring non-user behavior is essentially a research approach that deeply mines user behaviors and characteristics, supports and manages user behaviors based on these features, and undertakes the migration, reconstruction, and development of information service systems.

This article first reviews the research progress on non-user behavior, focusing on its developmental role in library and information science. It then systematically categorizes four types of non-user behavior and explores methods for investigating non-user behavior through scenarios, personas, and living laboratories as experimental environments, models, and procedures to enhance digital library service systems.

---

2. The Role of Non-user Behavior: Research Progress

Research on non-user behavior has a long history abroad, particularly valued in the library and information science field for its reflective insights on library services. For instance, Retlev (1991) argued that non-users are not information experts; they generally lack experience in knowledge retrieval, fail to perceive their needs, or have needs that are not considered [**?**]. From the perspective of modern library and information technology, while certain elements existed in management systems, market promotion was not prominent. Around 2005, the cognitive differences between end-users and information experts became a key research focus for information service system upgrades.

Domestically, Li Lianfu (1984) [**?**] was among the first to observe non-user behavior and proposed that libraries should engage with reader communities. Zhang Xiaolin (1987) systematically discussed the definition, concepts, and methods of non-user research [**?**]. In the 1990s, Li pointed out that because library services rarely considered disadvantaged groups—such as elderly individuals with mobility issues and general readers with low literacy rates—these readers, who originally had the ability and right to use libraries, could not experience how libraries could help improve their spiritual and material lives. Zhang noted that "non-users" also have information needs. While libraries cannot satisfy everyone with information needs, when the proportion of "non-users" significantly exceeds the statistical average, their existence indicates many unreasonable causes. Both scholars' discussions on "non-users" represent a form of library and information activity characterized by "introspection and appreciating others," where reflection on library services themselves yields the power to improve, replace, and innovate services.

Exploring non-user behavior for information systems is mostly applied after system completion, comparing differences between users and non-users. For example, Oz et al. (1993) validated the effectiveness of expert systems by comparing the professional knowledge of non-users and novices, finding that non-users had poorer professional knowledge and decision quality [**?**]. Reekers (1994) conducted interview surveys on electronic data interchange (EDI) users and non-users in large German enterprises, identifying obstacles to data exchange and effective use [**?**]. Such research focuses on opinion surveys of non-users and users, using comparisons to re-examine the actual assistance and difficulties of systems.

Manuscript received: 2010-09-25; Revised manuscript received: 2010-11-16

---

3. Types of Non-user Behavior: Research Framework

3.1 Ignored User Behavior

By exploring ignored user behaviors, information service systems can observe potential future technology application trends extending from existing non-user

behaviors. For example, Lowson (1999) studied users and non-users of different public transportation systems (automobiles and subways) and their varying requirements for different transport systems and boarding environments [**?**]. By envisioning 21st-century transportation networks, he prepared solutions for public transport problems and Olympic Games planning.

Ignored user behaviors can also break through the dilemma of insufficient reference cases for current technology applications. Five years ago, mash-up technology made 3D maps possible on the internet, but mature applications like Google Maps did not yet exist. At that time, Paar (2006) surveyed users and non-users of CD-based 3D image maps for visualizing German maps and environments, finding that respondents universally desired ease of learning, interactivity, and ecological environment reproduction [**?**].

For digital libraries, many studies currently explore user needs, habits, characteristics, and system/service development for "virtual reference services." Although different "perspectives" exist, Connaway et al. (2010) investigated three groups—users, non-users, and librarians—finding that while people generally considered chat reference models intimidating, younger Net Generation individuals were more likely to use instant messaging services and were influenced by their personal relationships with librarians [**?**]. In digital libraries where many reference systems have been launched but improvements are unclear due to uncertain service effectiveness, examining "non-user behavior" reveals that the ignored younger generation (relative to older librarians) has both greater likelihood of acceptance and specific reasons for opposing virtual reference. Among various "perspectives" (based on literature review), the following reliably persuasive recommendations can be filtered: good communication skills are crucial attitudes for knowledge-based librarians, and users hope librarians can systematically provide specific information rapidly through various formats.

Some studies point out that in the process toward a knowledge society, technology, financial resources, and policy are not the core issues. The existence of large numbers of non-users and their perceptions, behaviors, and attitudes —unknown to policymakers—are the real problems [**?**]. Non-user behavior research has prompted a shift from "resource allocation (management policy) → information systems and products → market promotion" to "market research → system design and establishment → resource allocation (policy, personnel, costs, and resources)."

3.2 User Behaviors of Other Groups

By exploring non-user groups and other user groups, we can observe hidden flaws in existing information service systems and make timely improvements. Reekers (1994) tracked and interviewed user and non-user organizations of Electronic Data Interchange (EDI) systems in German factories, comparing the advantages and problems of EDI systems in Germany and the United States [**?**]. In manufacturing plants, extensive information needs to be stored, encrypted,

transmitted, and modified, often involving large-scale integrated applications of information technology. German manufacturing has long cooperated with American manufacturing services, selling in the U.S. and global markets. When German companies developed EDI systems, the U.S. already had experiences of "system success but usage failure." Reekers' research discussed not only differences in user behavior between Germany and the U.S. but also differences in non-users, developing strategies for successful system implementation based on others' failures.

From the perspective of modern library and information technology, this resulted from EDI itself being too oriented (often necessarily) toward permission settings and high-end users while ignoring user experience and dynamic workflows—though few understood this at the time.

Roy et al. (2006) established concepts and models of target marketing, distribution, advertising, and customer service for non-Internet users, Internet users, and online shoppers [**?**]. As people clearly recognized that "the network technology required to achieve the best marketing is the key," many had previously invested heavily in network technology rather than network marketing. Roy et al.' s research on non-user behavior saved costs from such failures.

Studying non-user groups and other user groups' information behaviors is a necessary step for information service systems to effectively expand their markets.

3.3 User Behavior as Comparison Objects

Comparing user behaviors can yield insights for system design improvements. Jones et al. compared information system users' and non-users' perspectives on CASE tools [**?**]. This model remains important for information service systems because users and non-users can be viewed as experimental and control groups. By comparing differences between the two groups, researchers can draw conclusions similar to experimental methods from observational studies—a social science research model that is easy to understand and persuasive for engineering. For example, Lerouge et al. (2004) compared business school students' user and non-user perspectives on a general education course management system as a reference for collaborative technology adoption [**?**].

In many interdisciplinary collaborations, due to differences in traditional scientific training, knowledge backgrounds, and accountability systems, although theoretically people from different disciplinary backgrounds can develop broader opinions and understanding of user behavior, they often end up with narrower conclusions than originally intended. Because people are always familiar with certain aspects but have interests and opinions about others, when many such individuals come together, their conclusions about user behavior become the intersection (rather than union) of numerous opinions. Precisely because people often cannot clearly recognize complete user behavior, we need to understand user behavior through comparison with non-user behavior.

3.4 Later Discovered or Newly Added User Behavior

Another situation, or special case, involves user behaviors that emerge later and can be considered non-user behaviors within the original user behavior framework. For example, agricultural scientification (or modernization) often applied industrial engineering methods evolved from handicrafts a century ago to traditional agricultural production, industrializing agricultural product manufacturing. After computers appeared and became widespread, this should have become a better, more convenient, and more feasible modernization method. However, U.S. farms once experienced difficulties. Alvarez et al. (2006) surveyed opinions on information system management for U.S. farms, finding that computer users and non-users had different perceptions: the former anticipated potential benefits, while the latter doubted its efficiency-improving capabilities, suggesting that different pricing and software strategies should be proposed [**?**]. Those who later became users of farm management software were non-users for a long time before adoption; they could engage in high-volume agricultural production without software and never felt inconvenienced, while systems engineering personnel always assumed they were very inconvenienced—until non-user behavior was clearly understood.

With the emergence of large media streams, product diversification, multiple marketing channels, and diverse customers, selecting appropriate channels for appropriate product advertising has become a challenge for product marketing managers grown in the mass media era. Romaniuk et al. (2009) studied the scope, methods, and effectiveness of brand advertising, distinguishing users' and non-users' awareness and memory of brand advertising and the effects of various presentation methods [**?**]. Such research appears in numerous commercial company reports, using non-user behavior research methods.

In some emerging technology fields, where technology is feasible but not yet mature while market demand exists, user behavior research cannot be implemented —only non-user behavior research can conduct such exploratory studies.

---

4. Theory of Non-user Behavior: Research Methods

Many methods exist for exploring non-user behavior, but an integrated model from understanding to mining to application has not yet matured. This article synthesizes three relatively novel methods into a methodology for exploring non-user behavior to enhance digital library systems.

The technical application, development, and exploration of digital services require establishing experimental conditions and environments, purposes and objects, and processes and methods. However, past integration of user behavior research and digital library services lacked a concrete and complete experimental process. To overcome this difficulty, this article proposes using scenario analysis, creating and using personas, and living laboratories to achieve theo-

retical framework and experimental condition establishment, theoretical model building and use, and model validation and effect testing.

(1) **Scenario Analysis** describes a library' s resource conditions, such as information resources, funding, personnel, organizational structure, cultural environment, and policies [**?**]. If Library A attempts a new service or develops a new system, scenario analysis can determine whether the same model can be applied to Library B. Previously, the answer was "no"or "uncertain" because each library' s conditions differed, making Library A' s research conclusions not necessarily applicable to Library B. Now, through scenario analysis, Library B can reference Library A' s situational conditions. If they are the same, the success can obviously be replicated; if different, the conditions allowing replication can be filtered out. Furthermore, if a project is too large, Libraries A and B can agree on certain conditions, conduct separate experiments on controversial or pending issues, compare results, select the best and eliminate the worst, and jointly complete the large project. Scenario analysis saves library costs through collaboration (e.g., library consortia, library associations, information research groups) to accomplish work that could not be completed individually.

(2) **Creating and Using Personas** is a user modeling approach based on scenario analysis through collecting user data. For example, Loke et al. (2009) developed motion-sensing technology for a multi-user, interactive, immersive art video, constructing an intuitive multi-user spatial and social interaction model [**?**]. The difference between personas and traditional user models is that personas always consider actual product and market conditions for overall planning of industrial design, technology application, marketing, and development engineering. Most importantly, creating and using personas can transform user models in digital environments into various operational models, enabling researchers to validate user behavior models generated from scenario analysis in living laboratories.

(3) **Living Laboratory** is a pre-market product trial. For relatively novel technology products requiring exploratory experiments before mass production, living laboratories primarily establish an experimental environment simulating real-world conditions to study important details affecting product experience. Living laboratories are "low-cost" experiments for "large projects." For example, Jeng (2009) proposed an integrated ubiquitous smart spaces design framework to provide research teams with a living laboratory for testing smart living [**?**]. As living laboratories for developing new mechanical products based on human perception and response, they can extract, refine, and validate the feasibility of various new services from non-user behavior research results for digital libraries.

Scenario analysis provides a way to describe constraint conditions that can be continuously modified to obtain final conclusions or approximate solutions. Creating and using personas provides an operational model applicable to building non-user behavior models. Living laboratories can validate these models' direct

applicability to digital library service user behaviors.

5. Conclusion: Non-users Generate Technological Innovation

Exploring non-user behavior can enhance understanding of user behavior and subsequently design and implement more complete information service systems. Tien (2008) noted that information service systems include three elements: people (composed of behaviors, attitudes, values, etc.), processes (collaboration, characteristics, customization, etc.), and products (software features, hardware, infrastructure, etc.) [**?**]. According to these three elements, each designer must solve challenges in system lifecycle, human-computer interface, and system integration. In this framework, people as the main system component require careful, thorough, and repeated in-depth exploration of their behavior patterns.

Digital libraries particularly need to understand how new digital library systems match network user behaviors while continuously developing new systems, functions, and services. Exploring non-user behavior contributes to user-centric design (UCD), user experience (UE), usage rates, and user-generated models (UG) research.

Many reasons create "non-users" : users unaware of the system (accessibility issues), users who stop using after trial (usability issues), systems failing to meet user needs (interaction issues), or alternative systems being available (replaceability issues). As integrated systems, systems-of-systems (SoS), and digital library systems oriented toward various users, exploring non-user behavior is an effective means to supplement insufficient understanding of user behavior. Even without complete comprehension of all user behaviors, we can still prevent problems like low system usage, undervalued librarians, or services failing to meet user needs.

If information service systems focus on operational issues and information service personnel focus on promotion methods and techniques while neglecting "user behavior" questions such as who will use it, what it is used for, and who can use it (usability), and fail to address "non-user" issues like who does not use it (accessibility), whether it has value (replaceability), or whether there are complaints (interactivity), then it becomes difficult to clearly and completely understand "non-user behavior" and the role and significance of innovative services. In other words, it will be hard to break away from existing services, institutions, and accustomed theories and methods to face the changing human and network society, achieving maximum efficiency, effectiveness, and adaptability (meeting user needs) through innovative technology.

Non-user behavior research proposes a set of innovative methods for reflective processes in library and information science. Different research orientations toward non-user behavior can assist different information service systems in ex-

panding their functions to varying degrees. However, the challenge for information systems is understanding user behaviors and characteristics and applying them to information service system design. Using scenario analysis, creating and using personas, and living laboratories as experimental environments (or conditions), models, and validation steps for experimental information service systems and end-user behavior can solve these challenges.

References:

[?] Zhang Xiaolin. Thoughts on "Non-users"[J]. *Library and Information Service*, 1987, 31(3): 18-19.

[?] Retlev U. What does the User Look for from an Online Host [J]. *Online Review*, 1991, 15(3-4): 193-206.

[?] Li Lianfu. Developing Library Services for the Disabled and Elderly—Foreign Trends and Our Tasks [J]. *Library Construction*, 1984(4): 35-38.

[?] Oz E, Fedorowicz J, Stapleton T. Improving Quality, Speed and Confidence in Decision-making: Measuring Expert Systems Benefits [J]. *Information & Management*, 1993, 24(2): 71-82.

[?] Reekers N. Electronic Data Interchange Use in German and US Organizations [J]. *International Journal of Information Management*, 1994, 14(5): 344-356.

[?] Brick L. Non-use of Business Libraries and Information Services: A Study of the Library and Information Managers' Perception, Experience and Reaction to Non-use [J]. *Aslib Proceedings*, 1999, 51(6): 195-205.

[?] Verdegem P, Verhoest P. Profiling the Non-user: Rethinking Policy Initiatives Stimulating ICT Acceptance [J]. *Telecommunications Policy*, 2009, 33(10-11): 642-652.

[?] Alvarez J, Nuthall P. Adoption of Computer Based Information Systems—The Case of Dairy Farmers in Canterbury, NZ, and Florida, Uruguay [J]. *Computers and Electronics in Agriculture*, 2006, 50(1): 48-60.

[?] Lowson M V. Personal Public Transport [J]. *Proceedings of the Institution of Civil Engineers-Transport*, 1999, 135(3): 139-151.

[?] Paar P. Landscape Visualizations: Applications and Requirements of 3D Visualization Software for Environmental Planning [J]. *Computers Environment and Urban Systems*, 2006, 30(6): 815-839.

[?] Connaway L S, Radford M L. Virtual Reference Service Quality: Critical Components for Adults and the Net-Generation [J]. *Librí*, 2010, 60(2): 165-180.

[?] Roy S, Ghose S. Internet Adoption as a Two-stage Transition—Converting Internet Non-users to Internet Users and to Online Buyers [J]. *International Journal of Market Research*, 2006, 48(3): 321-349.

[?] Jones M C, Price R L, Ferrier K. CASE Tools Revisited: A Comparison of CASE User and Non-user Perceptions [J]. *Journal of Computer Information Systems*, 1999, 40(1): 57-63.

[?] Lerouge C, Blanton J E, Kittner M. A Causal Model for Using Collaborative Technologies to Facilitate Student Team Projects [J]. *Journal of Computer Information Systems*, 2004, 45(1): 30-37.

[?] Burnett G E, Porter J M. Ubiquitous Computing Within Cars: Designing Controls for Non-visual Use [J]. *International Journal of Human-Computer Studies*, 2001, 55(4): 521-531.

[?] Romaniuk J, Wight S. The Influence of Brand Usage on Responses to Advertising Awareness Measures [J]. *International Journal of Market Research*, 2009, 51(2): 203-218.

[?] Stickley S. Preparing for the Future Scenario Planning Process [EB/OL]. [2010-10-27]. http://www.arl.org/bm~doc/scenarios-data-gathering-summary-082010.pdf.

[?] Loke L, Robertson T. Design Representations of Moving Bodies for Interactive, Motion-sensing Spaces [J]. *International Journal of Human-Computer Studies*, 2009, 67(4): 394-410.

[?] Jeng T S. Toward a Ubiquitous Smart Space Design Framework [J]. *Journal of Information Science and Engineering*, 2009, 25(3): 675-686.

[?] Tien J M. Services: A System' s Perspective [J]. *IEEE Systems Journal*, 2008, 2(1): 146-157.

(Author E-mail: kuliping@ntu.edu.tw)

News Item: OCLC and EBSCO Enhance Discovery Services Through Data Exchange

OCLC and EBSCO Publishing Group (hereinafter referred to as EBSCO) have expanded their cooperation agreement to improve the user experience of WorldCat Local and EBSCO Discovery Services through an extended data exchange protocol. This new cooperation agreement will create additional value for libraries subscribing to both OCLC and EBSCO services.

Libraries using the WorldCat Local solution and subscribing to EBSCOhost full-text databases will continue to access EBSCO' s discovery services and relevant full-text content through the WorldCat Local interface. This new cooperation agreement will improve access to these databases. WorldCat Local users will no longer require authentication to search metadata in library-subscribed EBSCO databases (though authentication remains required for full-text access).

Among OCLC members, those ordering cataloging and WorldCat services can choose to access WorldCat data through EDS when using EBSCO Discovery Services, obtaining their library' s collection information, resource-sharing partners' collection information recorded in WorldCat, and all libraries' collection information in WorldCat.

Additionally, this cooperation brings other benefits, including enabling libraries to use EBSCO Discovery Services to promote interlibrary loans among OCLC member libraries. OCLC will obtain bibliographic records from OAIster, a union catalog with 25 million records of open-access resources, accessible to all EBSCO Discovery Service users. OCLC will also obtain bibliographic records from ArchiveGrid, an online service providing access to detailed archival collection descriptions, accessible to its subscribers through EBSCO Discovery Services.

This agreement reflects OCLC' s ongoing efforts for its member libraries. As a representative of its member libraries, OCLC makes WorldCat data available wherever needed to promote broad access to library collections and services.

"This expanded cooperation agreement demonstrates OCLC' s commitment to using data to enable libraries to better access library collections and services through their chosen applications," said Jay Jordan, OCLC General Manager and CEO.

Tim Collins, President of EBSCO Publishing Group, stated: "EBSCO and OCLC have worked together to implement multiple library-beneficial measures. This data exchange agreement improves the library EBSCO Discovery Service experience. The agreement benefits not only libraries but also WorldCat and EDS."

"OCLC' s goal has always been to make network access to all library collections and services possible," noted Chip Nilges, OCLC Vice President of Business Development. "OCLC and EBSCO Publishing have cooperated on multiple measures to enhance library information access. This agreement marks a new level in the mutually beneficial cooperative relationship, creating value through strategic and creative cooperation models that leverage resources."

OCLC and EBSCO will continue working together in the coming months to fulfill specific implementation plans and timelines.

(Compiled from: http://www.oclc.org/news/releases/2010/201054.htm)

(Journal News)

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