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Post-Print Analysis of Content Adaptation for Scenario-Based Information Acceptance in Mobile Libraries

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Abstract

[Purpose/Significance] To enhance the pleasantness of user information acceptance experience, mining users' information demand expectations, information search habits, and information acceptance preferences in different scenarios, and adapting content to users' current scenarios are practical problems that the industry currently needs to solve. [Method/Process] Employing micro-aggregation theory to conduct multi-dimensional analysis of user contexts, constructing a mobile library scenario-based information acceptance content adaptation framework through scenario identification, and building a mechanism model for mobile library scenario-based information acceptance content adaptation from the "scenario-content-context" adaptation perspective. [Results/Conclusion] Taking the Yunzhou Knowledge Service Space as an example, analyzing its information acceptance content adaptation degree and planning the content adaptation path for mobile library scenario-based information acceptance.

Full Text

Preamble

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Analysis of Scene-based Information Acceptance Content Adaptation in Mobile Libraries

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Abstract

[Purpose/Significance] To enhance user satisfaction with information acceptance experiences, mobile libraries must address the practical challenge of excavating users' expectations for information requirements, information search habits, and information acceptance preferences across different scenes, and matching content to users' contextual situations.

[Method/Process] This study employs micro-aggregation theory to conduct multi-dimensional analysis of user context and constructs a scene-based information acceptance content adaptation framework for mobile libraries through scene recognition. From the perspective of "Scene-Content-Context" adaptation, we build a mechanism model for mobile library scene-based information acceptance content adaptation.

[Result/Conclusion] Taking the Yunzhou Knowledge Service Space as a case study, we analyze its information acceptance content adaptation degree and propose a content adaptation path for mobile library scene-based information acceptance.

Keywords: mobile library; information acceptance context; scene-based service; content adaptation

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1. Introduction

Scene-based information acceptance content adaptation in mobile libraries represents a highly challenging problem that requires comprehensive consideration of multiple dimensions of user context, such as terminal screen size, network connectivity, and location [?]. The key question is how to achieve effective allocation between information acceptance contexts and scene-based elements by leveraging user context awareness and addressing the degree to which user information needs expectations, search habits, and acceptance preferences are satisfied—this represents the direction for mobile library service innovation and information space reconstruction. Content adaptation is achieved through iterative refinement based on feedback from user information acceptance experiences, guiding and regulating user information behavior to realize seamless three-dimensional adaptation between information acceptance contexts and scene-based elements [?]. The fulfillment of scene-based information acceptance expectations occurs through scenes and transitions between them. A critical industry concern is how mobile libraries can capture user contexts, perceive and adapt to mobile terminals, and deliver smooth information acceptance experiences. For instance, when a user accesses information while driving [?], the mobile library perceives the user context, identifies the scene, and transforms video information into images and text to enhance the flow experience of scene-based information acceptance content adaptation [?].

J. He et al. consider content adaptation a crucial technology for mobile devices and propose Xadaptor, a scalable content adaptation system that employs a rule-based approach to facilitate scalable, systematic content self-adaptation [?]. W.Y. Lum and F.C.M. Lau note that the diversity of mobile devices poses challenges for content adaptation, which they address through a service quality perception engine that automatically adapts content to user information needs and expectations [?]. D. Andersen et al. describe an operating system providing integrated network flow management that enables congestion control and adaptive information flow behavior, thereby achieving self-adaptation in content adaptation [?]. Zhang Zhanmei, Luo Yun, and Qu Qiang propose an internet content adaptation system oriented toward mobile social groups [?]. Tong Mingwen, Yang Zongkai, and Zhang Jingzhong introduce a service-oriented architecture into content adaptation research, designing a novel service-oriented content adaptation framework [?]. Through literature review, few studies address scene-based information acceptance content adaptation in mobile libraries.

The essence of scene-based information acceptance content adaptation in mobile libraries involves excavating user information acceptance expectations from historical scenes, identifying users' current scenes, and aggregating text, images, audio, and video on the same topic through semantic, relational, and quantitative methods for presentation on mobile terminals [?]. Specifically, mobile libraries dynamically adjust content presentation to accommodate various mobile terminals. One approach provides different presentation modes for different terminal types [?], but this method suffers from three key problems: (1) **Poor computational adaptability**. While PDAs, iPads, tablets, and mobile phones offer excellent mobility, their limited computational power and screen size result in cluttered content presentation and poor user experience without layout adjustments for specific terminals [?]. (2) **Poor adaptive adaptability**. When user contexts change, mobile libraries must modify existing webpages to support different terminals, requiring format-specific changes for any content modification—an impractical approach for large-scale content providers. To address this, S. Wang et al. propose learning user contexts and matching adaptation rules to provide appropriate services [?]. (3) **Poor personalized adaptability**. Unlike PCs, existing PC resource organization and presentation employ coarse-grained approaches with poor adaptability to terminal presentation needs. Personalized resource organization can only be achieved by treating information acceptance units as basic presentation elements [?] and aggregating all media types on the same topic through semantic, relational, and quantitative connections.

Based on these identified problems, scene-based information acceptance content adaptation in mobile libraries requires micro-aggregation methods to transform multi-column layouts into single-column formats. Li He defines micro-aggregation as the micro-level resource aggregation of library collections based on information entity relationship extraction using domain ontologies [?]. Micro-aggregation essentially fragments mobile library information acceptance contexts into contextual units based on scene-specific information acceptance ex-

pectations, then extracts and aggregates relationships among these units using contextual ontologies while preserving semantic consistency between contexts and original content, thereby improving content accessibility on mobile terminals. This study constructs a scene-based information acceptance content adaptation framework for mobile libraries to reveal adaptation patterns, designs adaptation mechanisms and models, and proposes adaptation paths to explore new perspectives for mobile library construction and information space reconstruction, ultimately enhancing user experience.

2. Mobile Library Scene-based Information Acceptance Content Adaptation Framework and Patterns

2.1 Mobile Library Scene-based Information Acceptance Content Adaptation Framework

Mobile library information acceptance terminals serve as carriers for user perception and experience. Mobile libraries must employ context-aware methods to capture terminal types and scene changes, adjusting information content presentation based on scene-specific acceptance expectations to ensure terminal adaptability [?]. One approach transcodes original content, converting media into lower-quality formats playable on mobile terminals (e.g., transforming video into static images). Another method decomposes HTML pages into blocks, assigning numerical values to each block to represent significance, then selecting the highest-scoring blocks to represent content, preventing information distortion while adjusting page layout based on regions of interest, interest values, and minimum perceptible size [?]. Practical studies propose an effective fragment generation caching method based on three features: sharing behavior, lifecycle, and personalized service. Both approaches address mobile terminal performance limitations through different means to achieve content self-adaptation.

[Figure 1: see original paper] illustrates the mobile library scene-based information acceptance content adaptation framework. As shown, the system: (1) uses mobile terminal positioning combined with Baidu Maps to identify user scenes, mining historical time, location, and behavior data to infer scene-specific information acceptance expectations; (2) employs accelerometer, orientation, and gyroscope sensors to perceive user states (e.g., moving or stationary) within the scene; and (3) determines terminal type through OS, screen size, and battery capacity analysis [?] to plan presentation methods. These three aspects leverage big data technology to mine user historical scenes, behaviors, and terminal performance, fragmenting same-topic content into fine-grained information units, then micro-aggregating them using semantic, relational, and quantitative relationships across different resource types.

2.2 Mobile Library Scene-based Information Acceptance Content Adaptation Patterns

Mobile library information content comprises multimedia objects encapsulating meaning. During fragmentation and reorganization, semantic and relational connections between objects must be preserved to ensure fidelity. When displayed across different terminals, fragmented and reorganized content should maintain consistency with original content [?]. Therefore, different information types on the same topic are presented on mobile terminals using hierarchical content structures based on user acceptance expectations. Mobile libraries should present different content types according to adaptation rules matching terminal capabilities [?]. The content structure model divides mobile library content into three layers: structural (containing content objects), pattern (including possible types for each object), and fidelity (containing possible formats for each type) [?]. The mobile library scene-based information acceptance content adaptation pattern is shown in [Figure 2: see original paper].

As [Figure 2: see original paper] demonstrates, mobile libraries can provide different topic-based information content according to user needs and expectations. Information topics can be divided into multiple sub-topics, which further contain multiple topic objects comprising different document types. For example, video objects include avi, rm, mpeg4 formats; audio objects include mp3, wmv, midi formats; image objects include jpeg (4024 \times 768), bmp (24bit), bmp (2bit) formats; and text objects include 8pt, 12pt, 4pt formats. These different document type formats adapt to various mobile terminals while ensuring fidelity.

3. Mobile Library Scene-based Information Acceptance Adaptation Mechanisms

3.1 Mobile Library Scene-based Information Acceptance Content Adaptation Mechanism

Mobile libraries can leverage multiple mobile social network platforms to obtain user information, achieving completeness and accuracy complementarity across platforms through micro-aggregation. User information includes mobile numbers, WeChat IDs, usernames, gender, region, personal signatures, birthdays, education, personal profiles, blood type, hometown, email, personal homepage, interests, hobbies, detailed addresses, photos, and logs [?]. Vertical and horizontal penetration analysis of target users on social platforms further excavates user information, supplemented by published and forwarded content to ensure accurate, complete, usable, and user-friendly information collection. The key to micro-aggregation lies in scientifically and reasonably collecting user information units, using semantic and relational connections through semantic preprocessing, attribute labeling, relationship identification, and semantic analysis to generate complete information networks [?]. Based on user information micro-aggregation, user scene-based information acceptance expectations can be mined. By adapting information acceptance contexts to scene-based elements

according to these expectations, mobile libraries enhance user perception and experience pleasure. The adaptation mechanism is illustrated in [Figure 3: see original paper].

As shown in [Figure 3: see original paper], mobile library scene-based information acceptance content adaptation micro-aggregates user information through different application platforms. Micro-aggregation results effectively excavate user information needs expectations, search habits, and acceptance preferences from historical scenes [?]. Based on this foundation and targeting users' current scenes, different information content types on the same topic are aggregated to match user information needs, ensuring content specificity, refinement, timeliness, and presentation adaptability, thereby enhancing user experience pleasure.

3.2 Mobile Library Scene-based Information Acceptance Content Adaptation Model

Mobile library scene-based information acceptance requires social media platforms (Weibo, Momo, Yujian, WeChat) to obtain personal information; location systems to dynamically acquire user scenes and scene transitions; and user behaviors like “posting microblogs,” “seeking encounters,” “using Renren,” “scrolling WeChat,” and “reading Facebook” to capture information behaviors [?]. Through big data mining of historical scene information needs, search habits, and acceptance preferences, combined with sensor data on user motion states in specific scenes, mobile libraries adapt appropriate information acceptance contexts based on user expectations [?]. Scene-based information acceptance fully utilizes five elements—location systems, sensors, mobile devices, social media, and big data—to perceive user contexts, understand acceptance expectations, and adapt information content for users' current scenes and transitions. The adaptation model is shown in [Figure 4: see original paper].

[Figure 4: see original paper] demonstrates that through the organic integration of micro-aggregation for geographic information, user behavior, and information acceptance, mobile libraries can not only obtain user information with consistency, completeness, and accuracy but also grasp user information acquisition preferences to provide personalized content adaptation services. By setting thresholds to effectively balance user privacy and personalized services, and through interaction between mobile library information acceptance contexts and scene-based elements [?], resource context adaptation based on user acceptance expectations is achieved, reaching an adaptation balance between expectations and reality within certain thresholds.

4. Mobile Library Scene-based Information Acceptance Content Adaptation Paths

4.1 Mobile Library Scene-based Information Acceptance Content Adaptation Scheme

Mobile library scene-based information acceptance content originates from diverse resources. To enhance user perception and experience, mining the same user's information behaviors across multiple social applications reveals information acceptance expectations. Based on these expectations for different scenes, same-topic information content of different types is aggregated into information resource chains (facet adaptation), information resource trees (group adaptation), and information resource networks (relational adaptation) to provide diversified one-stop services and precise personalized information services [?]. This approach refines same-topic resources into “atomic” basic information units that retain original semantic, relational, and quantitative relationships, ultimately presented on different mobile terminals. The adaptation scheme is shown in [Figure 5: see original paper].

As [Figure 5: see original paper] illustrates, mobile library information acceptance adaptation is based on user contexts, leveraging technical contexts, service contexts, and terminal contexts to adapt information content for different scenes according to user acceptance expectations [?]. Information content is dynamically adapted in chain, tree, and network forms based on changing user needs. First, different resource types are refined into basic information units that are reorganized according to user acceptance expectations and adapted to terminal contexts to enhance user experience and perception. Basic information units include text clusters (text objects), static image clusters (jpg, bmp, tiff, gif objects), video clusters (avi, wmv, mpg objects), dynamic image clusters (png and gif objects), flash clusters (swf objects), and audio clusters (mp3 and wav objects) [?].

4.2 Mobile Library Scene-based Information Acceptance Content Adaptation Paths

The formation of mobile library user value orientation is a long-term, dynamic process that can be mined from original information attributes and changes, forwarded information attributes, selection of different public accounts, and friend choices [?][?]. User information acceptance expectations are determined by user value orientation, manifested through published information, forwarded information, added or blocked content, and “liked” or “scanned” object types and their changes [?]. In practice, user value orientation provides the basis for designing scene-based content adaptation paths. Using Yunzhou Knowledge Service Space as an example, assuming a mobile library topic comprises four themes, each containing one main object and two sub-objects, the adaptation path is shown in [Figure 6: see original paper].

[Figure 6: see original paper] shows that with each information cluster containing two sub-clusters, the most primitive information acceptance content forms sub-topics composed of different information types. To better adapt to user terminals, sub-topics form tree-shaped content structures through semantic, relational, and quantitative connections, with coupling between trees creating network-based information acceptance forms. Different mobile terminals are adapted as shown in [Figure 7: see original paper] [?] to avoid horizontal and vertical scrolling, thereby enhancing adaptability and improving user experience and perception.

[Figure 7: see original paper] reveals that adaptation is achieved through: (1) **Expectation adaptation**—different scenes generate different information needs expectations, and Yunzhou Knowledge Service Space adapts corresponding content with specificity, though current mobile libraries including Yunzhou need improvement in dynamically sensing scene changes and self-adapting content; (2) **Refinement adaptation**—resources are refined into fine-grained units matching users' fragmented scene-based acceptance habits, improving pleasure (Yunzhou aggregates same-topic literature units across types with high satisfaction); (3) **Presentation adaptation**—direct PC/laptop display modes are incomplete on mobile terminals, but Yunzhou's improved vertical scrolling or touch-screen display enhances acceptance pleasure; and (4) **Dynamic adaptation**—mobile information acceptance occurs across different scenes with varying expectations, and our model achieves micro-aggregation based on scene-specific expectations, though Yunzhou still requires improvement in integrating scene elements with user needs.

Addressing the mismatch between content, mobile terminals, and user expectations, this study proposes a concept of adapting mobile library information acceptance contexts and scene-based content based on user needs, search habits, and acceptance preferences. Using micro-aggregation methods for geographic location, physical status, and information behaviors, we construct and analyze frameworks, patterns, mechanisms, and models for content adaptation, proposing adaptation paths to enhance diversified one-stop and precise personalized information services. This improves user scene-based acceptance experience and pleasure, pointing directions for mobile library scene-based construction, information space reconstruction, and service innovation, while providing new perspectives for innovative service research.

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