Building Evaluation Metrics for Shopping Applications Based on User Experience

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Abstract. As user needs have changed in recent years, previous evaluation methods are no longer applicable to today's user environment. This study aims to construct a user experience evaluation system for online shopping APPs and improve the efficiency of evaluation. Therefore, this study firstly reviews the current status of relevant research. Secondly, based on the theory of user experience and the characteristics of online shopping, the index elements of user experience evaluation are summarised and refined. Finally, the weights of the indicators at all levels of the user experience evaluation system were constructed using the AHP analysis model through the expert consultation method. Moreover, the consistency test was passed. Finally, a shopping APP user experience evaluation index was established with four primary indicators of interaction efficiency, interface comfort, platform reliability, and platform attractiveness and 16 secondary indicators as the core. The research results will theoretically contribute to the user experience evaluation system of online shopping.

Keywords: AHP hierarchical analysis · shopping app · user experience · evaluation indicators · online shopping

1 Introduction

The increasing popularity of mobile devices such as smartphones and tablets has led to a change in consumer behaviour [1], and many business models based on internet technology are proliferating, the most typical of which are the mobile online shopping platforms represented by Tmall and Jingdong. Meanwhile, with the popularisation of smartphones in recent years, online shopping has become the primary shopping method for consumers. Statistics as of June 2021 show that the size of online shopping users in China reached 810 million, an increase of 29.65 million compared to December 2020, accounting for 80.3% of Internet users as a whole [2]. In addition, the modern user's standard of living and education level has increased. The needs and choices for products have become diversified, and the experience of products can no longer be judged only by the needs of product use. A higher level of emotional demand for product experience has been put forward. The purpose of this paper is to build a user experience evaluation index system for online shopping APP based on the use characteristics of online

shopping based on the development of existing user experience theories, to improve the rationality and efficiency of user experience evaluation. The study's results will help provide development teams with theoretical references on improving user experience.

2 Literature Review

The core of evaluating user experience lies in whether there is a scientific and reasonable evaluation model. The current evaluation indexes for user experience are developed based on the PC terminal and have certain limitations when used to evaluate the user experience of online shopping APPs. Through an examination of the literature in recent years, it has been found that the main research directions for user experience in the academic field are the construction of user experience indicators for different applications. For example, Lv Chunmei et al. used the hierarchical analysis method to establish an evaluation system for social apps for the elderly at the level of their physical and mental needs [3]. Xue Xiang et al. established a user experience evaluation system for music APPs based on the theory of perceived schematic performance by analyzing the importance of relevant indicators [4]. Using the GQM paradigm, Yang Huan et al. constructed a user experience evaluation index for mobile apps based on the framework of user life cycle and user characteristics and combined with the opinions of relevant industry experts, with acceptance, fluency, pleasure, satisfaction, loyalty and churn as the target dimensions [5]. Second, the user experience of online shopping platforms was studied. Wang Yuehui et al. believe that the quality of user experience of social e-commerce should include content quality, system quality, transaction quality, and result quality [6]. Jiang Lujun et al. introduced the "peak and end law" into the design of online shopping APPs and explored the design method of optimal experience at key touch points of the online shopping service journey by improving the experience pleasure of peak and end value of user shopping experience [7].

Although relevant studies have researched the user experience of mobile applications from different aspects, there are currently fewer studies related to online shopping user experience evaluation indicators. As the specific use process and service touchpoints of online shopping APPs are different, the corresponding evaluation criteria should be different. The relevant theoretical research results cannot be well applied to evaluate the user experience of online shopping APPs, and there are certain theoretical limitations. Therefore, building a more targeted and specific user experience evaluation system is necessary based on a complete understanding of the existing theoretical results and the use characteristics of online shopping.

3 Theoretical Foundation

3.1 Definition of UX

User experience is a design term popularised by Dr Norman in the 1990s to replace the limitations of usability for product design development. "The age of materiality is over, the age of feeling is here." is a quote by Japanese product designer Renku Hirashima, referring to the fact that user experience is gradually becoming one of the essential

goals of design [8]. The current standard international definition of user experience is ISO 9241-220:2019 the perceptions and reactions of users when they use or expect to use a product. Among them are the following definitions of user experience: 1. user perceptions and reactions: including the emotional changes before and after use by the user. 2. User experience results from the product's brand image, functionality, system performance, interactive behaviour, and the internal state that arises from the user's prior experience. 3. Human-centred design can only be generated by the design aspects of interactive systems for user experience [9].

3.2   User Experience of an Online Shopping App

Online shopping mainly consists of the following steps: 1. the user logs on to the shopping platform 2. find the relevant products 3. browse the product description 4. choose the size of the product information 5. confirm the order information 6. complete the payment. Finally, the merchant will deliver the order to the specified address according to the order information. According to the ISO definition of user experience, each service touchpoint plays a critical experiential impact on the user experience. Firstly, before use, users will choose an APP that fits their mental model based on previous experience. This aspect involves the influence of recommendations from friends in the neighbourhood, pre-marketing strategies and brand awareness on the user's motivation to use the APP, which is the user's instinctive perception of the APP. Secondly, in the interaction with the interface user experience will be influenced by the interface design elements such as page layout, visual effects, icons text, page information. At the functional level, users' confidence in the platform's operation increases as a result of deepening experience, and they are more likely to use not only the essential functions of the platform but also other related functions. For example, they rate products, use the recommendation function to select and compare similar products.

3.3   User Experience Evaluation Index System Construction

Through the above review of the relevant theoretical foundation and the analysis of the user experience of online shopping apps, the primary operation experience of users using shopping apps is through interface interaction. Therefore, the user experience evaluation system of an online shopping APP should rightly involve the issues of usage efficiency and interface comfort. Secondly, influenced by the emotionality of user experience, the platform's reliability and attractiveness are also important indexes affecting user experience. This study establishes primary user experience indicators based on existing user experience theories combined with the use characteristics of shopping APPs. As shown in Fig. 1. The evaluation indexes include interaction efficiency, interface comfort, platform reliability, primary attractiveness, and corresponding secondary indicators.

3.4   Description of Selected Indicators

1. Efficiency of use: The primary measurement dimension of the indicator is the impact of the platform's various use touchpoints on the efficiency of user use. Secondary
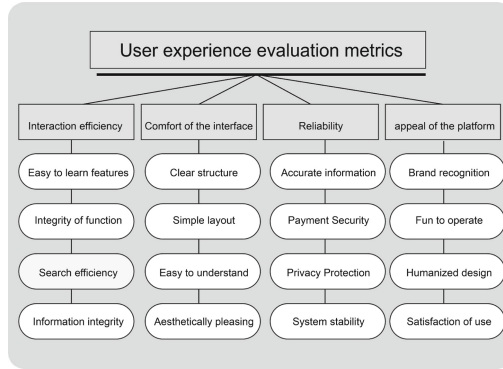
Fig. 1. Building user experience metrics for shopping applications

assessment indicators include ① Ease of learning of functions: the core of the user interface is to complete the shopping process by operating the interface functions. ② Functional perfection is reflected in whether the platform's functions can meet the user's usage needs. For example, seven days no reason to return goods, first-use first-pay service, etc. ③ Efficiency of product search: the search function of the shopping platform is the primary function of the shopping platform, and the efficiency of the search function affects the user's satisfaction with the efficiency and accuracy of the search. ④ Comprehensiveness of a product introduction: This refers to the quality of the product introduction details page's content, which guarantees users' purchasing decisions. Due to the limitations of the virtual interface size, the user's ability to quickly find product information affects the user's purchasing efficiency.

2. Interface comfort: The central dimension measured by this indicator is the impact of the interface operation on the user experience, which is the primary means of interaction for users to use the shopping platform APP. Secondary indicators include ① Clear interface information architecture: clear interface information can avoid user's visual fatigue and help users identify the interface's efficiency. ② Simplicity of interface layout: too much information displayed in the interface will cause an extra burden for users to find the function, which is not conducive to the user's search for the interface function. ③ Interface information is easy to understand: interface icons, functions, and interface language in line with user cognition will affect the user's cognitive speed of the interface. ④ Aesthetics of interface design: refers to the user's preference for interface design style, which is the user's pursuit of a personalized product experience and affects the user's visual comfort.

3. Platform reliability: This indicator mainly measures the impact of users' trust in the platform on user experience. Secondary evaluation indicators include ① Accuracy of product information: the Accuracy of product information expression will affect the user's purchasing experience, and the user's expectation does not match the experience of using the purchased product, which will affect the user's trust in the platform. ② The security of platform payment is a sensitive attribute of a user's purchase behavior; whether the payment is secure determines the user's motivation for using the platform. ③ Platform privacy protection is the user's emotional touch;

when shopping online, users focus on protecting personal privacy. ④ Stability of the system: problems with the system's stability can seriously affect the user's experience, such as long page opening time and product retrieval time, which can lead to the loss of users.

4. Platform attractiveness: The primary measure is the impact of emotional needs on the user experience. It is the user's emotional need for the platform. Secondary assessment indicators include ① Brand building awareness. It is one of the keys to improving customer viscosity. Good brand building will increase users' sense of emotional belonging to the platform and bring more potential users. ② Interestingness of the platform design. It effectively increases users' motivation to use the platform, such as relevant membership activities, offers, etc. The platform's fascinating nature will give users a more pleasant way to complete the whole process in the use process. ③ Platform human service. Is the platform and the user's emotional contact the platform to provide certain humane services, for example: in the process of critical operations, to provide the necessary multi-sensory feedback design. It will improve the user's recognition of the platform. ④ Satisfaction with the use of the platform. It is a comprehensive evaluation of the user's experience and emotional experience in the process of use; a good platform use satisfaction will improve the conversion rate of users.

4 Research Design

4.1 Research Methodology

In order to improve the scientific nature of indicator establishment, this study used hierarchical analysis to construct the weights of the correlation matrix. Firstly, according to the constructed primary indicator system, an expert consultation questionnaire was designed. Six experts were invited to compare the relative importance of the indicators and construct a judgment matrix. In order to improve the consistency of the evaluation indicators, relevant experts were trained in the use of the hierarchical analysis method. A total of 6 questionnaires were collected, and after collecting the data from the six experts, the consistency test of the weights was calculated using spssau software. The final weight indicators were counted by calculating the average value of each indicator for each expert, and the relevant weight ratios are shown in Table 1. The RI of the fourth-order judgment matrix of this hierarchical analysis was 0.890, and the CI of the judgment matrix was $0.043 < 0.1$; therefore, the matrix constructed in this study met the consistency test, and the resulting weights were consistent.

4.2 Result Analysis

As shown in Table 2. Regarding the weighting of the level 1 indicators: platform reliability > platform attractiveness > interaction efficiency > interface comfort. This result indicates that experts feel users pay more attention to platform reliability and attractiveness when shopping APPs. Good reliability is the basis for online shopping APPs, especially in online shopping APPs where payment is required for every purchase. Reliability is the key to whether users trust the platform and affects their motivation and

Table 1. Information on the weighting of evaluation indicators

Level 1 indicators	Eigenvector	Corresponding target weights	Maximum Eigenvalue	CI value	RI value
Interaction efficiency	0.655	0.164	4.128	0.043	0.890
Comfort of the interface	0.643	0.161			
Reliability	1.582	0.396			
appeal of the Platform	1.120	0.280			

Table 2. Shopping APP evaluation index weights

Level 1 indicators	Single category weighting	Level 2 indicators	Single category weighting	Combined weights	Rank
Reliability	0.396	Payment Security	0.36	0.143	1
		Privacy Protection	0.335	0.133	2
		System stability	0.219	0.087	5
		Accurate information	0.086	0.034	11
appeal of the Platform	0.28	Satisfaction	0.457	0.128	3
		Humanized design	0.335	0.094	4
		Brand recognition	0.104	0.029	12
		Fun to use	0.104	0.029	13
Interaction efficiency	0.164	Comprehensiveness of information	0.412	0.068	6
		Efficient search	0.278	0.046	8
		Functional integrity	0.177	0.029	14
		Functional ease of learning	0.133	0.022	15
Comfort of the interface	0.161	Comprehensibility of information	0.36	0.058	7
		Simple layout	0.278	0.045	9
		Design aesthetics	0.264	0.042	10
		Clear structure	0.098	0.016	16

willingness to continue using it. Secondly, experts believe the more important thing is the platform's attractiveness. With the trend of homogenization of online shopping APP products, the basic use process and functions of the products tend to be consistent, and users may focus more on whether the products are attractive. The main user group of online shopping apps is the young layer, the target users of this category can no longer be classified as novice users in the traditional sense due to the long contact time of smart devices, and they have strong adaptability and good learning ability for the use of the platform. When used repeatedly for a long time, the experience of the user layer is less tactile, and they pay more attention to the platform's attractiveness than the demand of the user level.

In terms of the weighting ratio of the overall ranking, the top indicators in the user experience category are those that meet the emotional needs of users. The top indicators in the overall weighting ratio are payment security, privacy protection, satisfaction with use and user-friendly design of the platform. Trust is the foundation of online transactions, and for online shopping platform applications where payment is the primary means of use, the security of payment is the core demand of users. Secondly, online shopping requires a large amount of personal information to be filled in, and such personal information is easily leaked through the use of the platform, merchants, couriers and other parties involved, and often when critical personal privacy information is leaked, it will cause a certain degree of annoyance to the user. In the online shopping user experience, users pay more attention to whether their privacy is effectively protected. Satisfaction with use is also an indicator that significantly impacts user experience. A good satisfaction level is the motivation for users to continue using the platform and reflects the value of the user's use. Humanised design highlights the platform's differentiated services. After more than ten years of software use, modern consumers have passed the era when moving basic usability needs can improve user experience and touch, and users prefer platforms with certain emotional content. Therefore, the platform's humanized design will help enhance the user experience. When providing APP services, the platform needs to provide the necessary humanised design to improve the emotional belonging of different user groups, which will lead to an excellent emotional interaction experience between the user and the platform.

5   Conclusions

A good user experience is one of the most important factors in measuring the commercial value of online shopping [10]. User experience has gradually become one of the criteria for evaluating whether an APP has core competitiveness. Based on the theory of user experience and the characteristics of online shopping APP, this study analyzes the user experience of online shopping. The online shopping user experience evaluation indexes were constructed with interaction efficiency, interface comfort, platform reliability and platform attractiveness as the primary indicators, and 16 secondary evaluation indicators such as functional ease of learning, functional integrity and retrieval efficiency, etc. Six experts were surveyed successively, the weight ratio of indicators at each level of the evaluation system was determined based on hierarchical analysis, and the consistency test of the weights was passed. The user experience evaluation system was finally determined,

providing a specific theoretical basis for studying the user experience of online shopping APP. In addition, with the progress of Internet technology and the upgrading of user experience needs, the user experience evaluation index system will be continuously improved, which is also worthy of attention in the subsequent research.

References

1. Ellitan L, Richard A (2022) The influence of online shopping experience, customer satisfaction and adjusted satisfaction on online repurchase intention to Tokopedia consumers in Surabaya. Budapest Int Res Crit Inst (BIRCI-J): Humanit Soc Sci 5(2)
2. China Internet Network Information Center. The 48th Statistical Report on the Development Status of the Internet in China. http://www.cac.gov.cn/2021-02/03/c_1613923422728645.htm
3. Lv C, Wang S, Tang Y et al (2019) Research on usability evaluation index of senior social app products based on hierarchical analysis method. Mech Des 36(S2):174–177. https://doi.org/10.13841/j.cnki.jxsj.2019.s2.044
4. Xue X, Zhao Y (2020) Research on user experience evaluation of mobile music app based on the theoretical framework of perceptual schematic performance. Libr Intell Knowl (06):88–100+156. https://doi.org/10.13366/j.dik.2020.06.088
5. Yang H, Bao K (2021) Research on user experience metrics and evaluation index system of mobile applications. Decoration 07:101–105. https://doi.org/10.16272/j.cnki.cn11-1392/j.2021.07.021
6. Wang Y, Liu S, Tang S et al (2021) Measurement and empirical research on the quality of online shopping experience of B2C social e-commerce platform customers. J Beijing Univ Technol (Soc Sci Ed) 23(03):71–85. https://doi.org/10.15918/j.jbitss1009-3370.2021.2772
7. Jiang L, Gong M (2018) The application of "peak-end law" in the design of online shopping service platform. Packag Eng 39(10):194–198. https://doi.org/10.19554/j.cnki.1001-3563.2018.10.036
8. Zheng Y-S, Zhu Y-W, Wang H-C (2020) Development status, research models and evaluation methods of user experience research. Packag Eng 41(06):43–49. https://doi.org/10.19554/j.cnki.1001-3563.2020.06.007
9. ISO 9241-220:2019 (en) (2019) Ergonomics of human-system interaction — Part 220: Processes for enabling, executing and assessing human-centred design within organizations. International Organization for Standardization, Geneva
10. Liu L, Wang X (2013) Analysis of online shopping mall user experience under B2C e-commerce model. Bus Times 03:57–59