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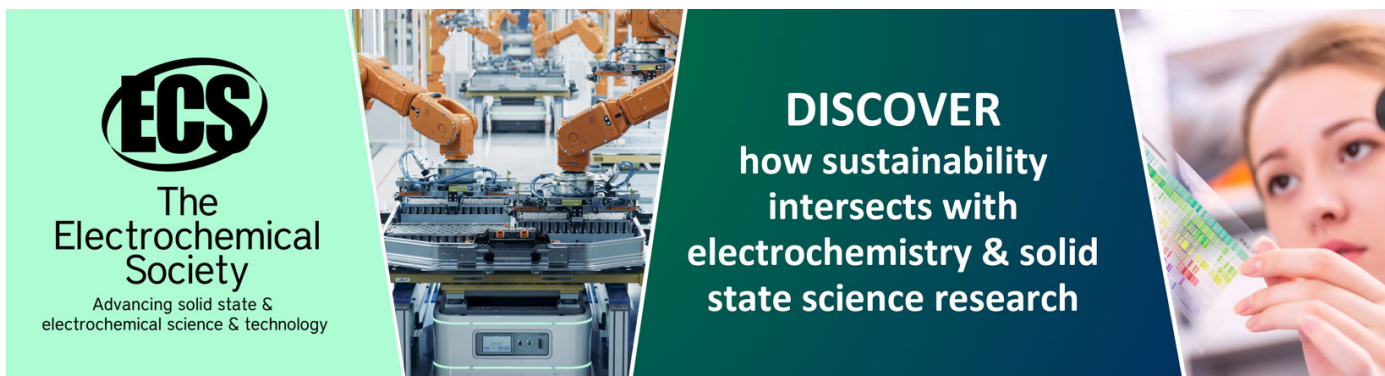
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Research on Experience Design Optimization of Mobile Reading Based on Continuous Using Behaviour

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Abstract. [Purpose / Meaning] The rich tools and media forms of mobile reading, while improving the convenience of reading, are also accompanied by the difficulty of maintaining the user's concentration, and tend to be superficial reading experiences. How to use interaction design to improve the user's reading experience and then cultivate its deep reading ability is of great significance to promote the quality of mobile reading services. [Methods / Processes] Guided by promoting users' continuous use behaviours, this paper adopts an empirical research method in the form of questionnaires and conducts relevant regression analysis on the recovered questionnaire data to explore the influencing factors and influencing path of mobile reading applications on user cognitive experience and behavioural results. [Results / Conclusions] The factors extracted by factor analysis are classified into three categories: independent variables (content, function, interaction, vision), and intermediate variables (perceived usefulness, flow experience, reading social experience, perceived value) and outcome variables (adoption and continuous using behaviour). Furthermore, via the path analysis, this paper builds the influential factor path model on mobile reading behaviour. Based on the final empirical research results, this paper proposes specific interactive optimization strategies for mobile reading application design around Internet product design.

1. Introduction

As the development of the Internet gradually matures, mobile reading terminals such as mobile phones, Pads, and e-readers are becoming more and more popular. The emergence of mobile reading just caters to the user's fast-paced living environment, solves the problem that the paper books and PC cannot meet the needs of the fragmented scene of the public readers, and changes the traditional reading mode of the public from the structure. In the process of evolution and development, mobile reading gradually integrates more social elements and interaction opportunities. In essence, mobile reading applications have evolved from pure e-readers in the early years to a complex and diverse reading ecological platform. However, the rich tools and media forms improve the convenience of reading, but at the same time, the user's concentration is difficult to maintain, reading habits tend to jump, reading experience tends to be shallow, and knowledge acquisition lacks coherence. Therefore, how to use design means to help users improve mobile reading experience and increase continuous reading behaviour is undoubtedly an effective means to improve users' deep reading ability and enhance the market competitiveness of mobile reading products.



2. Research Methodology and Result

2.1. Research concept

At home and abroad, most of the existing research on reading application design is based on the heuristic experience evaluation method, which lacks the empirical research perspective on user's reading information behaviour and experience design. Guided by the continuous use behaviour of mobile reading users, this paper adopts the method of questionnaire research to link the user's perception experience after actual use with the elements of product design at all levels, explore the influencing factors of mobile reading applications on user experience and the path relationship between them, and provide strategic suggestions for more targeted planning of mobile reading experience design.

2.2. Questionnaire design and preliminary survey

The empirical research aims to solve the following questions: ① what are the influencing factors of mobile reading application on user experience? ② how do these factors ultimately affect the user's continuous use behaviour? The questionnaire design for this study is based on the S-O-R model proposed by Mehrabian and Russell. This model indicates that the occurrence of human behaviour is first caused by antecedent variables (Stimulus), the mediating variables (Organism) are the individual's emotional and cognitive responses, and finally the individual's attitude or behavioural response is the outcome variable (Response).[1] The method of literature analysis, brainstorming and Delphi were used to design the items of the questionnaire. Finally, 39 items of evaluation factors were sorted out from three dimensions of stimulation, organism and response, and the initial questionnaire was completed. However, the specific content of each item is omitted due to the length of the article. In order to ensure the reliability and validity of the questionnaire, the author adopts the method of pre experiment to make the quality of the questionnaire up to the standard through two modifications.

2.3. Questionnaire recovery and data analysis

The final version of the questionnaire was distributed in combination with online and offline methods, and 203 valid questionnaires were finally recovered. SPSS data analysis software is used in this study. Firstly, in order to extract typical factor variables from many original variables, exploratory factor analysis is used. On this basis, the stepwise regression analysis and correlation analysis are used to quickly screen out the influential variables, and finally the path analysis method is used to build the influence relationship model between variables [2].

2.3.1. Premise test of factor analysis. In order to ensure that the original variables have a strong correlation to meet the conditions of factor analysis. In this study, Kaiser Meyer Olkin test is used [3]. The validity analysis results are shown in Table 1, KMO value is 0.869, greater than 0.6, which meets the prerequisite requirements of factor analysis, meaning that the data can be used for factor analysis research. And the data passed Bartlett's sphericity test ($P < 0.05$), indicating that the research data is suitable for factor analysis.

Table 1. KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.869
Bartlett's Test of Sphericity	Approx. Chi-Square	3297.773
	df	666
	<i>P</i>	0.000

2.3.2. Extraction of main factors. Exploratory factor analysis was conducted on 39 variables for 203 effective samples investigated. Nine main factors were extracted for each factor load factor value, and

the eigenvalue values were greater than 1, as shown in Table 2. Combining the corresponding relationship between factors and items, and using professional knowledge, the factors are named. Nine main factors are product design elements (content, function, interaction, vision), user perception experience elements (perceived usefulness, flow experience, reading social experience, perceived value) and user behavior (continuous using behavior).

Table 2. Results of exploratory factor analysis

Principal Component	product design elements	user experience elements	user behavior
Factor Name	Content design	Perceived usefulness	Continuous use behavior
	Functional design	Flow experience	
	Interaction design	Reading social experience	
	Visual design	Perceived value	

2.3.3. Exploration of influence relationship. Based on the results of factor analysis, this study uses the S-O-R model to define product design elements as independent variables, user experience elements as intermediate variables, and user behavior as result variables. The influence relationship among the factors under each variable were explored. Because there are many corresponding relations among variables, and not all variables will have influence relations, so first, stepwise regression analysis is used to make the system automatically identify the influential variables, and at the same time, correlation analysis is used to verify.

Take content factor, function factor, interaction factor and visual factor as independent variables, and then take perceived usefulness, flow experience, reading social experience and perceived value as dependent variables for four times of stepwise regression analysis. The results are integrated as shown in Table 3:

Table 3. Step by step analysis results

Independent Variable	Dependent Variable	Regression Coefficient	F value	Influence Relationship
Content design	Perceived usefulness	0.312 (3.869**)	F (2,110) =30.467, P=0.000**	Positive significance
Visual design		0.311 (3.568**)		Positive significance
Interaction design	Flow experience	0.573 (5.302**)	F (1,111) =28.108, P=0.000**	Positive significance
Functional design	Reading social experience	0.692 (7.744**)	F (1,111) =59.973, p=0.000**	Positive significance
Functional design	Perceived value	0.656 (7.514**)	F (2,110) =54.218, p=0.000**	Positive significance
Interaction design		0.214 (2.325*)		

*P < 0.05, ** P < 0.01, t value in brackets

The regression coefficient of content is 0.312 ($t = 3.869$, $P = 0.000 < 0.01$), the regression coefficient of vision is 0.311 ($t = 3.568$, $P = 0.001 < 0.01$), which means that content and vision will have a significant positive impact on perceived usefulness; the regression coefficient of interaction is 0.573 ($t = 5.302$, $P = 0.000 < 0.01$), which means that interaction will have a significant positive impact on flow experience; the regression coefficient of function The value is 0.692 ($t = 7.744$, $P =$

0.000 < 0.01), which means that function will have a significant positive impact on reading social experience; the value of function regression coefficient is 0.656 ($t = 7.514$, $P = 0.000 < 0.01$), and the value of interaction regression coefficient is 0.214 ($t = 2.325$, $P = 0.022 < 0.05$), which means that function and interaction will have a significant positive impact on perceived value.

2.3.4. Construction of conceptual model. In order to explore the specific direction of the influence relationship among the lower factors of independent variable, intermediate variable and result variable, this study uses the path analysis method based on the correlation regression analysis, takes the standardized path coefficient as the statistical index, and combines the significance level of each path to analyze, thus generating the influence relationship model as shown in Figure 1.

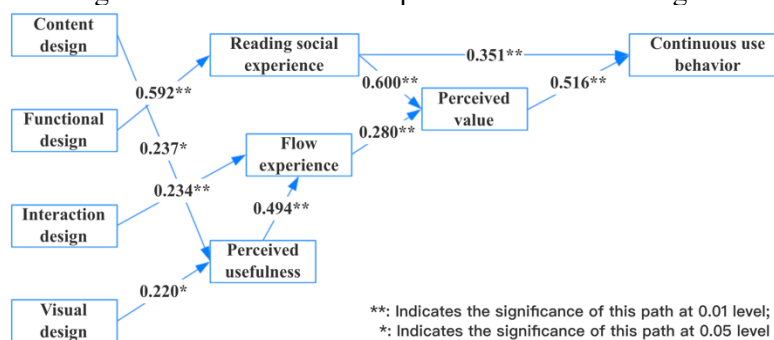


Figure 1. Influence relation model (Author self-drawn)

2.4. Summary of research results

According to the above research results, the product design elements that affect the cognitive experience of users after using mobile reading products can be classified into four aspects: content factor, function factor, interaction factor and visual factor. The cognitive experience factors of mobile reading users can be divided into four aspects: perceived usefulness, flow experience, reading social experience and perceived value. Application content provision and visual presentation directly affect the user's perception of product usefulness, interaction design directly affects the user's flow experience, in addition, the user's perception of usefulness will also promote its flow. Function design will directly bring users' experience of reading social interaction. Reading social and flow experience will further promote users' perception of reading value. Finally, the perception of reading value and reading social experience jointly promote the occurrence of users' continuous use behaviour.

3. Suggestions on Design

Based on the previous research conclusion, the maintenance of users' continuous use behaviour of mobile reading platform is mainly affected by perceived usefulness, flow experience, reading social experience and perceived value. Next, based on the influence relationship between product design elements and user cognitive experience, specific platform optimization suggestions are put forward.

3.1. Clear reading objectives and reduce cognitive load

Clear goals provide direct motivation for user behaviour. For reading a book, a task with a long completion cycle, we need to constantly subdivide the objectives, make the whole book read step by step, so as to improve the task completion rate. In the process of completing tasks, people will be accustomed to being driven by goals. Therefore, in product design, the total tasks are reasonably divided into different levels, and small goals are set for each level. Through the use of visual exaggeration, reward gap and other methods to enhance the contrast between the current goal and the ultimate goal, so as to promote the user step by step to the ultimate goal. At the same time, according to the "milestone effect", when users achieve a small goal, the sense of achievement will motivate them to get closer to the next goal, thereby reducing the frequency of readers' quitting.

In addition, simple visual experience, reducing unnecessary interference beyond the target, and promoting users to focus on the current target task will also help readers maintain the continuous use state. Therefore, in the product design, we need to optimize the different module characteristics of the reading platform, which can mainly follow the three principles of retrieval area - direct, reading area - purification and functional area - clear. For example, the mobile reading application "snail reading", which advocates immersive and simple electronic reading experience. In the design of the "desk" module, the number and level of book presentation are strictly controlled. Users can only put three books on the first level page at most, and other books need to enter the second level page for browsing. In this way, the target book can jump out of a large number of unprocessed tasks, reduce the decision-making cost of users, and guide users to read in the fastest way. Its design conforms to decision psychology. Too many visible books will bring processing load to users. Cognitive load is the total amount of cognitive resources needed to complete specific information processing. Cognitive resources include short-term memory capacity, knowledge, experience, time urgency, general ability and special ability [4]. There is a parabola relationship between cognitive load and cognitive task performance. If cognitive load is too low or too high, it will reduce task performance and directly affect user experience quality in the process of information processing. When the cognitive load of products is relatively light, users are more likely to generate relevant concepts, understand the use of products, and use products efficiently.

3.2. Real-time interactive feedback to stimulate users' subjective stickiness

Feedback is the response to the user's operation. Good feedback will give the user a strong sense of control. The interactive feedback of mobile reading products can be divided into sensory cognitive feedback, operational behaviour feedback and interactive incentive feedback [5].

With the continuous innovation of technology, people's senses such as sight, hearing, taste, touch and smell are awakened. The way for users to obtain information feedback is to integrate all-round sensory cognition such as sight, hearing and touch. At present, the sensory cognitive feedback of mobile reading products mainly focuses on visual feedback and auditory feedback. Progress bar is the most common form of visual feedback. The display of its advance form and estimated remaining time can convey the simplest feedback information. Speech feedback involves speech synthesis, speech recognition, speech evaluation, natural language understanding and other aspects. When applied to the design of reading applications, it can release users' eyes and improve the humanization of reading.

Operational behaviour feedback refers to the response to the already operational behaviour. In the design of mobile reading application, we need to pay attention to the setting of feedback duration. The duration of feedback has a significant impact on the user's continuous use behaviour, and the degree of difficulty is directly proportional to the duration of the feedback cycle. Therefore, the application can learn from the incentive mechanism of online games: every effort will be rewarded. Rewards can take the form of experience, equipment and virtual currency. This is also reflected in the incentive rules of the mobile reading application "WeChat reading": the feedback cycle is short, you can get a "book currency" reward after reading for 30 minutes; the incentive is just needed, the "book currency" can be used to buy virtual books; the reward is perceptible, the "book currency" needs to be manually exchanged by users.

Interactive incentive feedback is reflected in the incentive feedback of users' time, energy and money cost, which can directly stimulate the generation of users' reading motivation and improve the return rate of platform users. Reading activities can be carried out continuously, and need appropriate incentives to give "return", and constantly strengthen positive reading behaviour. The content-based incentive theory is often mentioned in the incentive theory, that is, people can give them what they need. Therefore, the establishment of interactive incentive feedback mechanism needs to build a diversified and all-round incentive feedback system around the needs of users' usefulness, ease of use and identification.

3.3. *Book centered topic connection and like-minded community interaction*

In the process of reading, readers often experience a kind of psychological induction phenomenon, that is, resonance. It is a strong emotional activity and psychological state induced by the book content, and it is the main internal motivation for users to keep reading. The resonance phenomenon of literary works can be summarized into the following two aspects: ① It refers to the resonance between readers and authors, which realizes the exchange of thoughts and feelings between readers and authors. ② It means that different readers have roughly the same or similar emotional experience for the same work, which realizes the ideological and emotional experience between different readers. Returning to the design goal of continuous reading behaviour maintenance, we can find that both resonances can be generated in the social interaction mode of emotional sharing around the book content. With the deepening of communication, on the basis of emotional resonance, there is an opportunity to establish a social group. With the increasing number of participants, accurate clusters aiming to achieve deep community communication and self-emotional organization emerge. The resulting community is different from the current mobile social noise environment, which not only increases product stickiness, but also creates personalized reading conditions for users.

Therefore, the community to be established by the mobile reading application emphasizes that all members share the same aspiration, need to have common values and interests, and form a group with the influence of the work. Take "WeChat Reading" as an example. Its slogan is to make reading not lonely. Readers can discuss specific problems and plots at any time. The body of the book shows other users' ideas in the form of dashes. Users can click to view and comment on the exchange. In this way, by taking books as the center and forming an emotional intersection with the same understanding and perception, each book can become a community, reducing the difficulty of directly introducing traditional social networking into mobile reading products.

3.4. *Perceptible value promotion to promote deep learning*

The most important motivation of reading behaviour is to get the information needed and get the expected value promotion. Reading, as a cognitive activity with a long payback cycle, if the user's pay and gain are not linked in time, there will be a huge distance between pay and gain in time and space, resulting in the user's failure to feel the value change brought by their own behaviour and stop paying. Albert Bandura, the founder of social learning theory, put forward "motivational self-efficacy theory": self-efficacy comes from users' perception of self-ability and self-worth improvement. He believes that the results of user perceived behaviour evaluation will directly affect individual behaviour motivation [6]. For reading activities, "self-efficacy" is the personal value promotion perceived by users. Therefore, perceived value can be considered as one of the important reasons for the continuous return of users to use products. Although it is not easy to quantify the value improvement obtained through reading, this fuzziness just gives the product the opportunity to design added value in terms of user value perception. Based on this, the mobile reading application can coordinate the user's pay and the user's perception, and achieve a dynamic pay get balance. The design goal of the platform value system is to make every little action of the user really turn into concrete and perceptible results, and to increase the user's desire for level, privilege and convenience to the user's motivation of continuous use behaviour, so as to strengthen the user's perception of reading value.

In addition, the current fragmented reading scenario requires users to receive more refined content information in a short time, which also means that users have higher requirements for information itself, and need to perceive the usefulness and value of information in the fragmented time and scenario. This requires the reading platform to fine organize the information content, and provide accurate reading content according to the multi-dimensional reading needs of users.

4. Conclusion

The increasingly digital living environment has changed the way of publishing and acquiring books. Mobile reading applications have evolved from pure text reading devices in the early years to a complex and diverse reading ecological platform. How to reasonably manage and present the huge

information resources and functional structure in the application by means of design is very important for maintaining the continuous reading behaviour of users and cultivating the deep reading ability of users in the mobile scene. This paper uses the method of questionnaire research, using the confirmation of self-perception experience in the process of readers' mobile reading, deeply mining the directional influence of user's actual experience and use behaviour and product design at all levels. Based on the empirical research results, four suggestions for platform optimization are put forward. It provides a feasible reference for the content resource organization of mobile reading applications, interactive design optimization and industry follow-up development.

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