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The Empirical Study on the Mobile Learning Based on Continued-Acceptance

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Abstract. With the rapid popularization of wireless technology and intelligent machines, mobile learning has become a new way of learning. It has become a popular topic that how to optimize the effect of mobile learning. Adopting the method of questionnaire survey and principal component analysis involving 103 mobile learners, this study investigates the influencing factors of sustainable mobile learning and eventually puts forward four factors as following: the internal and external motivation, the actual self-control, the objective condition and the humanized products and services.

Introduction

With the wide application of mobile communication technology and information technology, and the appearance and popularization of electronic products such as smart phones, tablet computers and kindles, mobile learning has become a new way of learning which plays a very important role in the living and learning of the future. Mobile learning has the characteristics of learning anytime and anywhere, which makes it possible for people to learn during the spare time in the subway, airport, office and other places. Therefore, it is a powerful support for the realization of lifelong learning. At present, the main user of mobile learning is college students, causing it an important issue that how to optimize the effect of mobile learning.

The existing study mainly focus on the short-term adoption of mobile learning from aspects of technology, resources, environment and learners. However, what factors affect the long-term continuous mobile learning of students? Which factor is more important among numerous factors? All these are the problems to be studied.

Beijing is a national culture center with a large number of educational institutions and scientific research institutions, whose level of education is fairly high. This study, taking 103 students of Capital University of Economics and Business as an example, investigates the factors influencing the sustainable mobile learning of college students and understands these factors. Finally, it is conducive to promoting the further development of mobile learning.

Theoretical Foundation and Literature Review

Definition of Mobile Learning

Opinions vary on the definition of mobile learning. The existing literature mainly has the following three kinds of interpretation:

The first one regarded the mobile learning as an extension of distance learning. Desmond Keegan (2000), an expert in distance education, proposed three stages of the distance education: distance learning, digital learning and mobile learning, respectively.

The second one thought that mobile learning is the extension of digital learning. When we carried out mobile learning, the learning content did not change, but the main means of access to information and knowledge had turned into mobile communication equipment and mobile communication network.

The third one hold the view that it is the characteristics of mobility and situation relevance that makes mobile learning different from other forms of learning. On this basis, some scholars had given

their explanation. Shengquan Yu (2007), professor of Beijing Normal University, believed that mobile learning is the process that learners obtain learning resources, interact and collaborate with others, and eventually construct their own knowledge with the utilization of mobile information network and device at any time and any place they need.

This paper thinks that mobile learning is the way of learning which is based on wireless network and permits learners to learn and interact with others at anytime and anywhere through mobile devices.

Domestic and International Research Status

The practice of mobile learning abroad can be traced back to the Wireless Andrew project of Carnegie Mellon University. The initial objective of this project is to support wireless research and create a campus community of users and a mobile computing lab. It has built a wireless infrastructure to enable high-speed wireless internet access to the campus. The foreign research mainly initiated by the E-learning providers and educational institutions of the developed countries, such as the "Uniwap Mobile Learning" project of University of Helsinki in Finland, the next generation mobile learning of Ericsson in Dublin, and "M-Learning" shared by many organizations in Europe and Israel. These foreign researches on the mobile learning mainly focus on the resource development, the technology development and the feasibility study.

Compared with foreign countries, the research on mobile learning in our country started late, in the early 21 century, promoted by the Department of Education. In recent years, domestic scholars mainly did research from the following aspects: mobile devices, mobile learning resources, mobile system development and related teaching activities. Ronghuai Huang and Xiaochen Wang (2009) summarized the previous definition of mobile learning and summed it up into three categories, then put forward the definition and characteristics of mobile learning, and explored five preconditions for mobile learning. Through the analysis of user needs, they designed scenes and activities, provided related services, then they carried out the restriction analysis and ultimately fed back to user needs. Through this cycle, user needs can be continuous improved. In their study, more than 30 international mobile learning projects or activities were verified, which proved the scientific validity of the mobile learning activity design model.

Haiguang Fang and Hongyun Wang (2011) summarized the theory and practice of mobile learning, and constructed the framework of mobile learning which was divided into three aspects: mobile learning equipment, support environment and service environment. This framework mainly related to six factors: mobile devices, mobile networks, mobile learning platform, mobile design, learning resources and content. On this basis, they obtained four classic application modes of mobile learning system environment and finally discussed the development trend of the system environment of the mobile learning.

Using the questionnaire survey method, qualitative interviews method and experienced research method, Wei Wang and Shaochun Zhong (2009) did their research on the realization mode, the application situation, the content and form, the learning time and users' experience of mobile learning, and eventually came to the conclusion that mobile devices and software resources are factors restricting the users' mobile learning. Xiaoqing Gu (2011) designed a mobile learning acceptance model, which starting from the learning situation and took workload, perceived availability and perceived usefulness as the main factors of user satisfaction and usage intention, and finally found that the practicality of mobile learning resources is the key factor to determine the degree of user acceptance of mobile learning. Aijun Liu and Zhuqing Liu (2013) mainly adopted a way of questionnaire investigation. It made investigations on hardware equipment, learning resources, cognitive situation and behaviors about mobile learning among citizens of Nanjing, understood the characteristics of their mobile learning, then summed up the relevant constraints.

On the aspect of continued-acceptance, Oliver (1980) put forward the Expectation Confirmation Theory which thought satisfaction represents a psychological and emotional state caused by the difference between expectations and performance. In this theory, confirmation was divided into three

types: positive disconfirmation (performance is higher than expectation), confirmation (performance equal to expectation) and the negative disconfirmation (performance poorer than expectation). Among them, positive disconfirmation and confirmation can improve the user' satisfaction, so that users will continue to use the product. The Technology Acceptance Model (TAM) was proposed by Davis (1985), which believed that the usefulness and usability decided the users' attitude towards using, the attitude towards using decided the behavioral intention, and the behavioral intention determined the actual behavior of use eventually. Venkatesh and others (2003) put forward the integration of technology acceptance and use theory which included key variables that affect the intention to use: expected performance, expected effort, social impact and precondition, and variables that play a regulatory role: gender, age, experience and voluntary basis. The empirical results showed that compared with the previous technology acceptance model, the integration of technology acceptance and use theory is the most effective which could be used to explain 70% of the change of usage behavior.

Overall, the study of mobile learning shows a trend of diversification. However, research on mobile learning of college students tends to be concentrated in the short-term technology adoption, application in classroom, investigation of the present situation and feasibility study. Therefore, further research is necessary to study the mobile learning based on the continued-acceptance of the college students.

Research Design

Purpose of Investigation

The purpose of this investigation is to analyze the key influencing factors of mobile learning based on continued-acceptance of college students group represented by students in Capital University of Economics and Business students, then know the present situation of their sustainable mobile learning and put forward suggestions to promote the sustainable mobile learning.

Content of Investigation

This paper reviews the previous literature and makes a qualitative interview with a number of mobile learners. On this basis, it summarized the influencing factors of sustainable mobile learning into several aspects as following: learners' recognition and interest of mobile learning, self-control, free wireless internet, practical and convenient mobile learning resources, user-friendly interface, positive interaction feedback, credits or material motivation and learning evaluation, then worked out a questionnaire related to the factors affecting the sustainable mobile learning. As shown in Table 1, 11 items were included in the questionnaire and 4 of which are reverse scoring. Through five point calibration method, it examined the key influencing factors of college students' sustainable mobile learning.

Table 1. Factors Affecting the Sustainable Mobile Learning of College Students.

Number	Item
V1	Acceptance degree of mobile learning
V2	Cumulative time of learning
V3	Cumulative frequency of learning
V4	Learning interests
V5	Self-control ability
V6	Efficient and free wireless network
V7	Practical and convenient mobile learning resources
V8	User-friendly interface
V9	Positive interaction feedback
V10	Credits or material motivation
V11	Learning evaluation

Implementation of Investigation

This study takes students of Capital University of Economics and Business as the research object and sends out 117 questionnaires to them. In order to ensure the scientificity of the sample, this study carries out sampling according to the degree level, which makes the sample highly representative and the result more true and reliable.

Statistic and Analysis of Date

The questionnaires are issued by online questionnaire system and all data are converted into coded data automatically. Then SPSS20.0 is used to do further statistical analysis.

Result of Date Analysis

Analysis of Basic Information of Sample

Limited by various constraints, 117 questionnaires were taken back among which 103 were valid with effective rate 88%. The sample covered 71 women accounting for 60.6% and 46 men accounting for 39.32%. Among them, 47 undergraduate students were included accounting for 40.17%, 52 graduate students accounting for 44.44%, and 18 doctoral students accounting for 15.38%.

Reliability and Validity Analysis

Reliability refers to the consistency, stability and reliability of the test results, and it usually expressed as the level of internal consistency. This study used Cronbach's Alpha value to measure it and eventually got a result of 0.779, which indicated that the questionnaire has a high level of reliability. The result is shown in Table 2.

Table 2. Reliability Statistics.

Cronbach's Alpha	N of Items
.694	11

In this study, KMO and Bartletti's test of sphericity was selected to measure the validity. As shown in Table 3, KMO value is 0.729 and the significant probability of Bartlett's test of sphericity statistics is 0.000, which means the investigation has a high level of validity and suited to do principal component analysis.

Table 3. KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.729
Bartlett's Test of Sphericity	Approx. Chi-Square	239.985
	df	55
	Sig.	.000

Analysis of Investigation Result

The principal component analysis method is used in the process of factor analysis, and the factor is rotated by varimax method. Factors whose eigenvalue is greater than 1 are extracted and eventually 4 factors are extracted. Table 4 shows that communalities of all variables are more than 0.5, so all variables should be retained. Table 5 shows that cumulative variance of these 4 factors is 64.805%, which is larger than 60%, so most information in the original data is preserved.

Table 4. Communalities.

	Initial	Extraction
V1	1.000	.668
V2	1.000	.753
V3	1.000	.684
V4	1.000	.534
V5	1.000	.619
V6	1.000	.767
V7	1.000	.723
V8	1.000	.620
V9	1.000	.653
V10	1.000	.591
V11	1.000	.516

Extraction Method: Principal Component Analysis

Table 5. Total Variance Explained.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.068	27.889	27.889	3.068	27.889	27.889	2.316	21.054	21.054
2	1.898	17.251	45.140	1.898	17.251	45.140	1.741	15.829	36.883
3	1.138	10.349	55.489	1.138	10.349	55.489	1.628	14.799	51.681
4	1.025	9.316	64.805	1.025	9.316	64.805	1.444	13.124	64.805

Extraction Method: Principal Component Analysis

Table 6. Rotated Component Matrix*.

	Component			
	1	2	3	4
V1	.782	.147	-.186	.009
V2	.302	.727	.274	-.243
V3	.274	.721	.100	.281
V4	.704	.195	-.016	-.012
V5	.069	.760	-.191	-.014
V6	-.074	.106	.863	.077
V7	.244	-.118	.756	.280
V8	-.124	.061	.080	.771
V9	.164	-.042	.190	.767
V10	.736	.106	.185	-.069
V11	.624	.116	.282	.184

Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization
*Rotation Converged in 5 iterations

As shown in Table 6, all 11 items can be classified into 4 kinds of factors: factor 1 is incentive factor which includes internal motivation and external motivation, consisting of V1, V4, V10 and V11; factor 2 is real self-control factor consisting of V2, V3 and V5; factor 3 is objective condition factor consisting of V6 and V7; factor 4 is humanized product and service factor consisting of V8 and V9.

Conclusion and Recommendation

As we can see from the result of the survey, mobile learning has been widely accepted. The number of individuals who support mobile learning deeply is 23 which accounts for 19.66% and 66 persons that is 56.41% of those surveyed said they approved of mobile learning. Based on those survey data, we can say that 76.07% of those respondents are satisfied with mobile learning.

Based on the above statistical analysis, this study divides the specific factors that influence the sustainable mobile learning into four categories, namely: incentive factor, real self-control factor, objective condition factor and humanized product and service factor. Accordingly, this study gives the following suggestions.

Enhance the internal and external motivation

As the survey result shows, some college students learn mobile learning only for completing the course credit required by graduation. Although material incentives (such as credits, forum points, forum empirical value) and other incentives from the objective environment can encourage mobile learning, internal incentives take a more important role in the promotion of sustainable mobility learning. Sustainable mobile learning recognition and interest, as well as the sense of self-efficacy in the process of learning is the source of Intrinsic motivation. Thus, strengthening intrinsic motivation will promote sustainable mobile learning. First, realizing the important role played by external stimulus, observing the user's mobile learning process timely and dynamically and given the appropriate feedback. This feedback can be positive or negative. But we should pay more attention to positive incentives to enhance user’s confidence. Secondly, enhancing the practicability of mobile learning course, and combined with the learning needs of college students, like the English Test or those vocational qualification examinations. Finally, in order to meet the needs of various types of learners and help them get rid of the sense of defeat, it should set appropriate learning objectives and contents based on the abilities of learners.

Train the Real Self-control of Users

The actual self-control ability is reflected in the learning frequency of mobile learners, the total amount of time and self-control behavior against outside interference. In this paper, learning real self-control is one of the most important factors. Those unrelated factors in family, life and work can easily affect the learner’s actual self-control.

So how to improve the users’ actual self-control? First, making a clear and detailed study plan depending on the different background of mobile learners. Learning plans help users to fully arrange learning tasks, focus on the objectives, improve the efficiency of learning and learning sustainably. We can push relevant mobile learning plans and progress automatically by using a mobile terminal application, so we can remind learners completing the program on time. Second, giving the comments and feedback of mobile learners progress timely, and actively provide constructive guidance and supervision. Finally, motivating by effective measures, such as material incentives, forum points and forum empirical value.

Provide Efficient Wireless Network and Convenient Learning Resources

The research results show that efficient wireless network and convenient learning resources is one of the main factor that restricts the sustainable mobile learning of college students. Efficient wireless network is the necessary infrastructure for mobile learning, but the cost of it is not a small expenditure, especially for college students. Also, slower speed of wireless network may lead to the studying-weariness. Thus, efficient and free wireless network will promote mobile learning of college

students to some degree. On the other hand, practical and convenient learning resources mainly refer to plentiful and practical content, appropriate degree of difficulty, convenient operation of the interface and the intuitive teaching mode. The development of various wireless devices and APP has greatly improved the convenience of mobile learning. The wide use of two-dimension code also provides a platform for mobile learning. It feasible to use these new technologies to improve the convenience of access to mobile curriculum resources.

Provide Humanized Products and Services

Humanized products and services include user-friendly interface and positive interaction feedback. On one hand, user-friendly interface can fulfill the needs of mobile learners, not only the practical function needs, but also the aesthetic and psychological needs. It should be clear and easy to operate, and can realize the benign interaction feedback. Additionally, ingenious design, appropriate color, fresh picture, innovation of text and images will all bring a better experience to the user. On the other hand, positive interaction feedback between teachers and students can help learners to solve confusions, face up their own learning situation and find shortcomings, so the learners can adjust their learning goals and programs flexibly. In addition, the establishment of virtual learning community is conducive to the sharing between teachers and students, and improve the user's sense of belonging.

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