Success Factors of Mobile-Commerce System

Hyun Gi Hong*

Department of Business Administration, Cheongju University, Korea; hghong@cju.ac.kr

Abstract

In this paper the author has made an attempt to find out success factors' weight score of mobile-commerce (m-commerce) using factor analysis and analytical hierarchy process method. A survey based on 5-point Likert scale questionnaire and exclusive interview was administrated to 235 university students in Korea. Factor analysis derived 5 major factors from 4 major perspectives of successful implementation of m-commerce system, i.e. legal support's view, IT-infrastructure's view, user education's view, and m-commerce organization. We regard these derived 5 factors as the Critical Success Factors (CSF) for the m-commerce system. The evaluation of the validity and reliability of these factors was carried out. After derivation of 5 factors, we conducted the Analytic Hierarchy Process (AHP) to measure the weights of each factor and 14 variables. The AHP analysis showed the list of these factors weighted by its significance priorities. Based on the output from this research, the stakeholders of m-commerce system can improve the effect and excel the speed of business process of m-commerce. The result from this study will be an important reference for m-commerce organization in formulating and execution of their mobile business strategies.

Keywords: Component, Critical Success Factors, Factor Analysis, Factors' Weigh, Mobile-Commerce

1. Introduction

Recently, many commercial web sites have proliferated that offer products or services for on-line shopping. Mobile commerce (m-commerce) is one of the fast growing commercial websites based on mobile technologies[5]. M-commerce is an IT-supported business innovation, and offers business opportunities through internet access without geographic constraints, as well as personalization and location-based service[12]. With usage of personal digital devices, like smart phone and tablet computer, the potential of m-commerce is enormous[15]. M-commerce system is defined as "any transaction involving the transfer of ownership or rights to use goods and services, which is initiated and/or completed by using mobiles access to computer-mediated networks with the help of mobile devices"[11]. Users in m-commerce system are using their mobile devices for the transactions of goods and services, entertaining themselves by listening to music or watching video, or seeking information[13].

Although m-commerce system has been regarded as an extension of electronic-commerce (e-commerce), which trades the goods, services, and information, the pattern of m-commerce is different from that of e-commerce in interaction styles and value chain6. Also m-commerce system has moved beyond the PC/TV's static terminal to anytime, anywhere use of mobile devices[3].

Years ago, many research works on m-commerce system focused on adoption and continuance of m-commerce system[8,13–15]. And the propensity of m-commerce consumer has been widely investigated in order to understand which factors encourage the adoption of m-commerce system. But currently, many researchers try to carry out their research works, which explained and analyzed the success factor of m-commerce system. It is important to analyze the success factors for m-commerce system, because the position and weight of m-commerce in economic system will become more important and heavier[15].

Author for correspondence

This paper begins with an overview of m-commerce and relevant definitions of factors and variables. We then present our methods, data, and analyses. This will be followed by a discussion of the results. We conclude with the implications and limitations of this research, and recommendations for future work.

The objective of this paper is to measure the weight and significance of various critical success factors affecting the success of m-commerce system. A survey based on 5-point Likert scale questionnaire was administered to 235 university students at one private university in Korea. As the second step, an exclusive interview was carried out to the experts of m-commerce system for the weight analysis of factors and their variables. Factor analysis was deployed in 4 perspectives of the successful implementation of m-commerce system, i.e. governmental legal support's view, IT-infrastructure's view, user education's view and m-commerce organization's view. From these 4 kinds of point of view, 19 measure variables were predefined. With Factor Analysis, these variables were evaluated in terms of the validity and reliability, and finally the 5 Critical Success Factors (CSF) were derived. After analysis of those factors, we conducted the Analytic Hierarchy Process (AHP) to measure the weights of each CSF. The AHP analysis makes out the list of CSF weighted by its significance priorities. This priority list implicates which CSF is regarded as important factor for the successful implementation of m-commerce system and could be considered as reference list in the operation and execution of m-commerce system. The results of this paper could be the valuable references for the policy maker and service providers of the m-commerce service in Korea.

2. Method

2.1 Mobile-commerce System

M-commerce is a new business opportunity supported by mobile technology. M-commerce is regarded as similar to e-commerce system[9]. But m-commerce is different from e-commerce due to the usage of mobile computer technology, and offers new business opportunities[13]. M-commerce has much more potential compared to e-commerce due to its characteristics such as ubiquity, personalization, and flexibility, so that m-commerce can cover not only transactions of money and good, but also other entertainment activities as well, such as listening to the music, watching videos and movies, and playing mobile games. Ultimately, m-commerce provides a customized commercial service at anytime and anywhere based on mobile computing technology. To summarize, m-commerce aims to innovate commercial services rendered by utilizing mobile computing to expand time and space requirement[1].

The resources of m-commerce system are ubiquitous computing facilities, expertise and contents. The integration of m-commerce resources enables the consumer-oriented commercial service. In order to secure the success of m-commerce for customer and m-commerce service providers, all relevant infrastructures should be firmly constructed. M-commerce infrastructure include not only the mobile computing technology, but also other factors that help the successful implementation of m-commerce service, such as legal, organizational and cultural recognition. In spite of many efforts in execution of m-commerce system, the results are not so satisfied. In reality, the main reasons for such dissatisfaction to m-commerce services are external factors, such as a lack of relevant legal support, limitation of standard practice, a lack of user training, and a low societal and cultural receptivity[2]. As the numbers of users and transactions of m-commerce system increase dramatically, the m-commerce system has held a very important position in the economy. In this context, it is meaningful to analyze the success factors of m-commerce system.

2.2 Data Collection

In order to carry out this research, we formed several Critical Success Factors (CSFs) of m-commerce system in four perspectives. The questionnaires about these CSFs were surveyed in 5 point Likert scale. Questionnaire surveys were conducted to find out all factors influencing on the success of m-commerce system. On the survey, 235 replies were collected. The questionnaire was composed in 4 categories, i.e., m-commerce service organization, IT-infrastructure, policy & legal support and user education. These 4 categories comprise 19 measure variables. After Factor Analysis, these variables were classified into 5 groups. We can take these 5 groups as the CSFs for m-commerce system. Those are the profitability of m-commerce service provider, growth of service provider, reliability of m-commerce technique, legal support and user education. The Table 1 shows details of above mentioned variables and criteria. After Factor Analysis, the AHP method was conducted to survey the weight of

each CSF. As the result of this effort, we can have the list of the all variables of CSF according to their significance for the success of m-commerce system.

2.3 Operational Definition of Variables

In this section, we define several measure variables, which compose the factors regarding as the CSFs of the m-commerce system. These variables are classified in 4 perspectives as follows

2.3.1 M-Commerce Service Organization Perspective

'M-commerce service organization' is collection of m-commerce organizations and related institutions providing m-commerce service. From the perspective of m-commerce service organization, we have predefined some variables, like expansion of market share, employee satisfaction, increase of revenue and profit, customer satisfaction, expansion of m-commerce market size, and improvement of business process, as measured variables.

2.3.2 IT-infrastructure Perspective

'IT-infrastructure' is the collection of every element of information technology, like data communication, data base and function of m-commerce related mobile technology. The function of m-commerce application software, ease use of m-commerce service, expert in m-commerce system, technical support of system vendor, and safety of m-commerce system are the measured variables in IT-infrastructure category.

2.3.3 Government Policy and Law Perspective

'Government policy and law' is the legal basis of every m-commerce activity of m-commerce service organization, and also provides the solution for the difficulties and problems in performing of m-commerce service. In this category we form legal support for m-commerce, supportive legal institution, legal experts and promotion program of government as the measured variables for m-commerce system.

2.3.4 End-User Education Perspective

Generally, the main user group of m-commerce system is young and middle aged people. They as the client of m-commerce services might be familiar with the mobile technology. But there are also several cautions and additional notices, which are ad hoc services of individual service provider. The education about the m-commerce service, education about handling of m-commerce machines, End-User education about m-commerce system, and education of assisting manpower are the predefined measured variables in this category.

3. Result

Table 1 shows the result of the exploratory factor analysis with measured variables. Exploratory Factor Analysis (EFA) is a statistical technique within factor analysis whose overarching goal is to identify the underlying relationships between measured variables16. It is commonly used by researchers when developing a scale (a scale is a collection of questions used to measure a particular research topic) and serves to identify a set of latent constructs underlying a battery of measured variables. It should be used when the researcher has no prior hypothesis about factors or patterns of measured variables. EFA procedures are more accurate when each factor is represented by multiple measured variables in the analysis[16].

As shown in Table 1, we can find 5 CSFs derived from 14 variables. The Cronbach Alpha (>0.7) of each CSFs in Table 1 means that the reliability of derived factors is assured.

As the next step, Analytical Hierarchy Process (AHP) method was conducted to analyze weight and significance of each measured variables and CSF itself. The AHP is a structured technique for organizing and analyzing complex decisions. Based on mathematics and psychology, it was developed by Thomas L. Saaty in the 1970s[10]. It has particular application in group decision making in fields such as government, business, industry, healthcare, and education10. It provides a comprehensive and rational framework for structuring a decision problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions. In the AHP we administered the second questionnaire and interview to 6 experts of m-commerce system to carry out the pair-wise comparison of each CSF in terms of weight and significance. Through such pair-wise comparison, the weight of each CSF is determined and also the rank of all measured variables could be fixed. For this purpose two different surveys have been conducted. In the first survey, the questionnaire and interview for the determination of the weight of each CSF were carried out. The 6 experts determined the weight of

Table 1. Result of factor analysis

CSFs	Measured Variables	Components					Cronbach-Alpha
		Factor1	Factor2	Factor3	Factor4	Factor5	
Reliability of Technique	Expert in M-commerce System	0.972	-0.015	0.030	-0.009	-0.027	0.978
	Function of M-commerce Application Software	0.970	-0.035	0.030	-0.007	-0.039	
	Safety of M-commerce System	0.966	-0.043	0.051	0.021	-0.022	
	Ease Use of M-commerce Service	0.960	-0.004	-0.003	0.010	-0.044	
Growth of M-commerce Organization	Employee Satisfaction	-0.025	0.978	0.041	0.036	0.011	0.966
	Expansion of Market	-0.029	0.969	0.063	0.036	-0.018	
	Improvement of Business Process	-0.030	0.952	-0.023	-0.018	-0.019	
Profitability of M-commerce Organization	Customer Satisfaction	0.016	0.004	0.951	0.011	-0.013	0.926
	Increase of Revenue & Profit	0.046	0.064	0.939	0.012	0.036	
	Expansion of Market Share	0.028	-0.029	0.907	0.003	0.021	
User Education	End-User Education	0.012	-0.003	0.048	0.972	-0.029	0.944
	Education of M-commerce System	0.000	0.049	-0.026	0.972	-0.024	
Legal Support	Promotion Program of Governmental Support	-0.002	0.011	-0.006	-0.029	0.951	0.891
	Legal Support for M-commerce System	-0.098	-0.034	0.047	-0.024	0.944	

CSF itself by the pair-wise comparison of each CSF. As the result of this survey session, we can rank the CSFs as shown in Table 2. In Table 2, the determined weight of each CSF is shown which was measured by the expert. These Figures in Table 2 will be applied as the multiplier in determination of the each weight of 14 measured variables. In the second survey, the determination of weight of each measured variables within the CSF is conducted. This measurement is about how much each CSF important for the success of m-commerce system is. The final result of AHP is shown in Table 3. In Table 3 we can see

the rank of all measured variables according to their significances.

Table 2 gives us, at first, the information about level of significance of each CSF. The "Reliability of Technique" is the most important factor for the m-commerce system in the CSF level. The "Profitability of M-commerce Organization" comes into second place. This means that the reliability of m-commerce technology is very essential for the successful operation of m-commerce system. Next CSF is "Growth of M-commerce Organization". The "Legal Support" is also important, because it is necessary

Table 2. Result of analytic hierarchy process (CSFs level)

Critical Success Factors	Weight of each Expert						Average	Rank
	Ex1*	Ex2*	Ex3*	Ex4*	Ex5*	Ex6*		
Reliability of Technique	0.35	0.30	0.40	0.25	0.38	0.20	0.313	1
Growth of M-commerce Organization	0.15	0.15	0.15	0.20	0.23	0.14	0.170	3
Profitability of M-commerce Organization	0.30	0.25	0.25	0.30	0.22	0.40	0.287	2
User Education	0.05	0.10	0.15	0.15	0.07	0.06	0.097	5
Legal Support	0.15	0.20	0.05	0.10	0.10	0.20	0.133	4
* Ex1 ~ Ex6: Experts of m-commerce system answered in 1st questionnaire of 2nd survey session for AHP.								

Table 3. Final result of AHP (measured variable level)

CSFs	Measured variables	Weight of each Expert						Average*1	Rank*2	Weight*3	Rank*4
		Ex1*5	Ex2	Ex3	Ex4	Ex5	Ex6				
Reliability of Technique	Expert in M-commerce System	0.22	0.25	0.15	0.20	0.22	0.26	0.22	3	0.069	8
	Function of M-commerce Application Software	0.30	0.40	0.40	0.35	0.28	0.32	0.34	1	0.106	2
	Safety of M-commerce System	0.25	0.20	0.10	0.25	0.18	0.27	0.21	4	0.066	10
	Ease Use of M-commerce Service	0.23	0.15	0.35	0.20	0.32	0.15	0.23	2	0.072	6

		*1							*2	*3	*4
Growth of M-commerce Organization	Employee Satisfaction	0.30	0.38	0.48	0.40	0.35	0.40	0.39	2	0.066	9
	Expansion of Market	0.45	0.40	0.32	0.35	0.48	0.35	0.41	1	0.070	7
	Improvement of Business Process	0.25	0.22	0.30	0.25	0.17	0.25	0.20	3	0.034	14
Profitability of M-commerce Organization	Customer Satisfaction	0.12	0.27	0.32	0.39	0.16	0.39	0.28	2	0.080	3
	Increase of Revenue & Profit	0.50	0.45	0.55	0.33	0.49	0.40	0.45	1	0.129	1
	Expansion of Market Share	0.38	0.28	0.13	0.28	0.35	0.21	0.27	3	0.077	4
User Education	End-User Education	0.36	0.45	0.35	0.30	0.56	0.41	0.41	2	0.040	13
	Education of M-commerce System	0.64	0.55	0.65	0.70	0.44	0.59	0.59	1	0.057	11
Legal Support	Promotion Program of Governmental Support	0.35	0.40	0.38	0.55	0.38	0.54	0.43	2	0.057	12
	Legal Support for M-commerce System	0.65	0.60	0.62	0.45	0.62	0.46	0.57	1	0.076	5

*1 : Average weight of all Expert's

*2 : Rank of measured value within CSF

*3 : weight of measured variables weighted by the CSF's multiplier,

*4 : weight-rank of all measured variables

*5 : Expert answered in 2nd questionnaire of 2nd survey session.

for the protection of customer rights in case of the interest conflict between customer and m-commerce service provider. The legal and policy support from the government provide the overall foundation for the implementation of m-commerce system. The "User Education" comes in 5th place. The "5th place" does not mean that this issue is not important for the successful implementation of m-commerce system. As shown in Table 2, the level of significance of each CSF is presented by average of the weight. These digits will be applied as multiplier for deter-

mination of weight of measured variables in Table 3.

The data in Table 3 can be interpreted just like that of Table 2. We can see the rank of all measured variables of each CSF. In Table 3 the "revenue and profit" of m-commerce service organization is the first priority of all measured variables. This means that the possibility to make profit through m-commerce business activity is most important factor for the successful implementation of m-commerce system overall. The other significance rank of measured variables can be interpreted as Table 3.

4. Discussion

As discussed before, m-commerce service is the combination of ubiquitous computing technology and commercial services. The m-commerce service makes it possible to provide commercial and entertainment services in any place and at any time[14]. Therefore, m-commerce service can expand the time and space limits in delivering of commercial service[7]. It is very apparent that m-commerce system makes our life more convenient and comfortable. Many governments make efforts to establish the technical and legal infrastructure for the successful implementation of m-commerce system[2]. In this context it is meaningful to study which factors have the effect on the successful operation of m-commerce system and also to analyze the priority of these factors according to their significance.

This study investigated the weight and significance priority of success factors of m-commerce system. In this paper, the combination of the Exploratory Factor Analysis (EFA) and Analytical Hierarchy Process (AHP) method was conducted based on the questionnaire and interviews to the m-commerce system related experts. As the result of this research, we have derived the ranked list presenting the significance of factors and measured variables.

This study is tempered with limitations. First, there was a lack of sample data for measured variables. This means that the preparation of a perfect and more sophisticated questionnaire and careful selection of interviewee is essential for the betterment of the quality of research. The questionnaire and interview was conducted only in one university in Korea, so future studies could use the model developed in this research and test it in other countries. Moreover, it would be better, if this kind of survey is applied to other institutions related with m-commerce business. Second, this kind of quantitative research alone is not enough to measure the real priority of factors.

Therefore, it may be necessary to combine the qualitative research with this study. Third, it is possible that other significant variables have not been included in this model. Variables such as self-satisfaction, the income status of m-commerce customers, and the perceived cost for adoption of m-commerce can be included in future research model.

This research can also bring meaningful strength and implication to both academics and practices. The academics can review the whole research procedure of this study and make effort to improve the research methodology for the better result. In the practice, the result of this study could be meaningful references for the implementation and successful operation of m-commerce system.

5. References

1. Chong AYL, Chan FTS, Ooi K. Predicting consumer's decision to adapt mobile commerce: cross country empirical examination between China and MALAYSIA. Decis Support Syst. 2011; 53(1):34–43.
2. Ran CJ. Exploratory study of success factors for U-Heath system and analysis of it's weight. The Journal of Digital Policy & Management. 2012; (6):93–8.
3. Clark I. Emerging value propositions for m-commerce. J Bus Strat. 2009; 25(2):41–57.
4. Dai H, Palvia P. Factors affecting mobile commerce adoption: a cross-cultural study in China and the United States. The Data Base for Advances in Information Systems. 2008; 40(4):43–61.
5. Feng H, Hoegler T, Stucky W. Exploring the critical success factors for mobile commerce. Proceedings of the International Conference on Mobile Business. ICMB '06; Los Alamitos, CA: IEEE Computer Society Press; 2006. p. 40–6.
6. Featherman MS, Miyazaki AD, Sprott DE. Reducing online privacy risk to facilitate e-service adoption: the influence of perceived ease of use and corporate credibility. J Serv Market. 2010; 24(3):219–29.
7. June L. Are personal innovativeness and social influence critical to continue with mobile commerce? Internet Res. 2014; 24(2):134–59.
8. Maity M. Critical factors of consumer decision making on m-commerce: a qualitative study in the United States. International Journal of Mobile Marketing. 2010; 5(2):87–101.
9. Ngai EWT, Gunasekaren A. A review of mobile commerce research and applications. Decis Support Syst. 2007; 43(1):3–15.

10. Saaty TL. The analytic hierarchy process. McGrow Hill; 1980.
11. Tiwari R, Buse S. The mobile commerce prospects: a strategic analysis of opportunities in the banking sector. Hamburg: Hamburg University Press; 2007.
12. Trivedi P, Sagar KK. Emerging trends of ubiquitous Computing. Int J Adv Comput Sci Appl. 2010; 1(3):72–4.
13. Wei TT, Marthadan G, Chong AYL, Ooi KB, Arumugam S. What drives Malaysian m-commerce adoption? An empiri- cal analysis. Ind Manag Data Syst. 2009; 109(3):370–88.
14. Zhou T. An empirical examination of users' post-adoption behavior of mobile service. Behav Inform Tech. 2011; 30(2):241–50.
15. Zhou T. Examining the critical success factor of mobile website adoption. Online Inform Rev. 2011; 35(4):636–52.
16. Availaible from: http://en.wikipedia.org/wiki/Exploratory_ factor_analysis#cite_note_Norris_1