

UDC 339.1:004.738.5]:621.395.721.5(497.7)

## EMPIRICAL EVIDENCE OF SUCCESS FACTORS FOR MOBILE COMMERCE ADOPTION IN THE REPUBLIC OF MACEDONIA USING TAM-MODEL

**Saso Josimovski, Ph.D.,**

Faculty of Economics, Ss. Cyril and Methodius University in Skopje, Macedonia  
sasojos@eccf.ukim.edu.mk

**Dimitar Jovevski, Ph.D.,**

Faculty of Economics, Ss. Cyril and Methodius University in Skopje, Macedonia  
djovevski@eccf.ukim.edu.mk

**Lidija Pulevska Ivanovska, Ph.D.,**

Faculty of Economics, Ss. Cyril and Methodius University in Skopje, Macedonia  
lidijap@eccf.ukim.edu.mk

**Vaska Cobanova, M.Sc.,**

Faculty of Economics, Ss. Cyril and Methodius University in Skopje, Macedonia  
vaska.chobanova@gmail.com

---

### Abstract

*Abstract - Mobile commerce (MC) is a relatively new service for Macedonian consumers and is about to be more broadly introduced on the Macedonian market. This paper aims to clarify the concept and the key factors that affect successful adoption of mobile commerce in the Republic of Macedonia. This is done through research on the acceptance of MC and its actual use. Based on previous surveys and theories, the Technology Acceptance Model (TAM) is used alongside other factors in order to determine the adoption of mobile commerce.*

*From the research of different theories, a conceptual model was developed based on the TAM-model. In terms of the research results it can be concluded that usefulness, ease of use and risk have direct influence on the attitude toward use, and also that these factors influence the actual use of the technology. In other words, it was proven that six out of seven factors are relevant for a successful adoption of mobile commerce in the Republic of Macedonia*

**Keywords:** mobile commerce, mobile payments, TAM, key success factors, business models.

---

## 1. Introduction

Literature on critical success factors of mobile commerce covers many aspects, including technology, business, and social factors. The success factors for a new service, such as mobile commerce, are related to the nature of the service characteristics of the market, the synergy of the project development process and the culture of innovation. There is still no sufficient insight into the critical issue in the design and success factors. This is due to the diverse nature of mobile services, the lack of related methodologies and substantive research that leads and evaluates the innovation, the methods and the tools in this field (Bouwman, Vos, & Haaker, 2008).

Because the wireless protocol is quite a popular technical standard to enable mobile commerce by looking at the key factors for accepting WAP, the critical success factors of mobile commerce can be determined (Xu & Gutiérrez, 2006). In 2003 a model based on the Theory of Planned Behavior (TPB) and Innovation Diffusion Theory (IDT) was built in order to understand the behavior in accepting WAP (Hung, Ku, & Chang, 2002). According to their research, the most important factors are connection speed, cost of service, customer satisfaction, personal innovativeness, ease of use, the impact of other users.

According to Odegard, the critical success factors for adoption of mobile commerce are as follows (Odegard, 2001):

- CIS-effect: keep it simple;
- Kip effect: keep it personal;
- Flexible Finance;
- Partnership for profit;
- Integration for accumulation

Buellingen and Woerter (2004) highlight four critical success factors for mobile commerce acceptance (Buellingen and Woerter, 2004, pp. 1406–1408):

- transmission speed - the speed of data transfer has always been a key factor for users, especially with the increase in their number. It is crucial for mobile communication and should be available at least as a premium service (with a charge). As long broadband through fixed lines is faster and cheaper, the use of the mobile internet will be the exception and will be restricted to professional use. This means that there will be a specialized use of networks to some extent: for example, video games are accessed through fixed networks, while data for travel or news are browsing through mobile networks.
- personalization - the ability to personalize the mobile communication services is one of the main attractions of using mobile networks because it contributes to independence from the location, flexibility, convenience, saving time, timeliness of information and reduced costs of search.
- data security - awareness of data protection has clearly increased in recent years, with the increased use of the Internet for transactions. EU Treaties with the United States for introducing the so-called principle „safe harbor” clarify that the protection of data and the creation of trust is considered a major requirement for the development of electronic business processes. The requirements for data protection are increasingly necessary for the development of mobile commerce.
- pleasant to use - direct and easy access to communication and information services are an important criteria for the spread of the service. It is expected that technical progress at the level of hardware and software will provide mobile users with small mobile devices with touchscreen or voice control, sufficient supply of energy for longer period and an additional interface (eg. infrared, blue-tooth) for communication with other static and mobile terminals. Interactive services will create especially high demands on the design of man-engine interface.

According to Charles (2000), there are six critical success factors for successful acceptance of mobile commerce: the integrity of the WAP interface, availability of technology, availability of WAP-infrastructure, interoperability, security, and speed and efficiency. Out of these six factors, the most important one is the security (Charles, Monodee, & Nurek, 2000). Siau and Shen point out that the user's trust is crucial to the growth and success of mobile commerce. They suggest that the conversion of initial trust in continuous trust can maintain the user's trust in mobile commerce and that confidence in the technology and the manufacturer are equally important for maintaining that trust in mobile commerce (Siau and Shen, 2003).

Based on the online survey, there is a compiled list of critical success factors to accelerate the progress of mobile commerce in Europe (Vrechopoulos, 2002, p. 478): improved mobile device interfaces that are pleasant for users, effective applications and services, reduced prices, secure transactions, and high bandwidth network coverage. In a study by Arthur D. Little, several value propositions complement the key factors of the mobile commerce, which offers the advantage of availability anywhere, anytime (Little, 2004):

- Convenience. Powerful and small mobile terminals offer to the users the ability to use services anywhere and anytime. Compared to electronic commerce, mobile commerce is really suitable.
- Localization. Identifying the user with a mobile device adds significant value to mobile commerce before conventional e-commerce through customer satisfaction.
- Personalization. The mobile device will not become a common tool with multiple users and should have a unique identity of its users. Creation of customer services for the end user is essential for optimizing the interaction paths of suppliers (providers) and clients.
- Ubiquity and timeliness. Mobile devices offer access to information in real time from any location through technology that is always enabled.
- Client property. Mobile devices are tailored for person-to-person marketing strategies (P2P), derived from a comprehensive customer base.
- Price. The price structure must be easy to understand.
- Simplicity. Because of the limited screen space on mobile devices, content must be clear and simple. The effort of learning user must be minimal.

Other researchers include success factors of typical services of mobile commerce. For example, Antovski and Gusev (2003) summarize the critical success factors of mobile payments in several groups: ease of use, security, comprehensiveness, expenses and technical acceptability.

## *II Framework for identification of success factors of mobile commerce*

Hilbert classifies the critical success factors into three groups (Hilbert, 2005):

- endogenous factors: internal factors that can be controlled by the business;
- exogenous factors: external factors caused by external causes and cannot be directly controlled;
- moderator factors: have the task to mediate between the "real" success factors and values for success.

In 2006 Feng et al described ten critical success factors for mobile commerce (Feng, Hoegler, & Stucky, 2006). By stating the factors with the letter "F", they propose the following framework for identifying critical success factors of mobile commerce:

**Aspects of Value Creation:** mobile commerce must add value for users so that they have a sense that what they receive is worthy. This is achieved by:

- **F1: Business Model.** Appropriate and sustainable business model.
- **F2: Content innovation.** Implementation of differentiated services for mobile commerce requires a new way of thinking about content that already exists on websites, but it has to be used in an innovative and customized way for mobile devices.

**Aspects of perceived usefulness:** Perceived ease of use is the degree to which a person believes that using a system will be effortless (Venkatesh et al., 2003) and used as an aspect in the technology acceptance model (TAM). This paper later on will use this to determine the acceptance of mobile commerce. Much of the research on the acceptance focuses on improving the effectiveness and efficiency of task related businesses. A small number of studies focusing on the use of mobile services in the leisure and everyday use (Palen, Salzman, & Youngs, 2001) or on the unclear borders for the application of such services in work and leisure. According to these studies, the reasons for the application of mobile services are work-related and leisure.

- **F3: Business-support.** Improving business performance, effectiveness and efficiency.
- **F4: Supporting leisure time.** Ubiquitous use for entertainment, emergency and special purpose, as well as location-based services.

**Aspect of perceived usability.** According to Boston Consulting Group, one-third of mobile users have left the trade only after several attempts because there is a big difference in terms of what the technology can do, and what the user expects (Boston Consulting Group, 2000).

- **F5: System and Content Quality.** The quality system includes measures like 24-hour availability, online response time, speed of loading, visual appearance, etc. Quality includes updating content, clarity, timeliness, accuracy, etc.
- **F6: Trust.** Trust includes security and privacy.
- **F7: Support.** Monitoring the status, maintenance of accounts, payment alternatives, individual preferences and FAQ-support.

**Aspects of perceived ease of use:** Mobile devices have capabilities that can be used anywhere and any-time, but have limitations, such as small screens, limited input capabilities and interaction, low speed data transmission, etc., all of which affect the adoption of mobile commerce. The use is facilitated with better organization of content, good design and presentation.

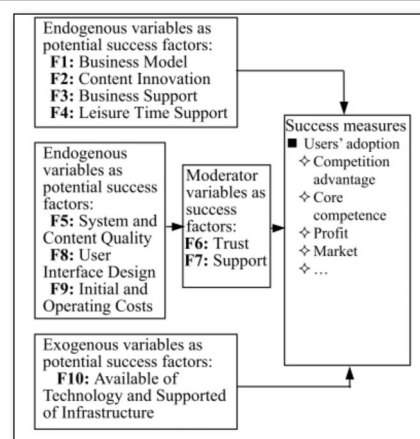
- **F8: User interface design.** The innovative design will facilitate the acceptance of mobile commerce.
- **F9: Initial and operating costs.** They should be in appropriate relation with the value that the customer receives from the mobile application.

Exogenous (external) factors:

- **F10: Availability of technology and support infrastructure.** The limitation in technology and infrastructure of mobile communications can not be controlled by the company, the service provider and operator.

The principal factors that potentially have positive impact of mobile commerce are illustrated in Figure 1.

**Figure 1.**  
Framework for identification of  
success factors of mobile commerce

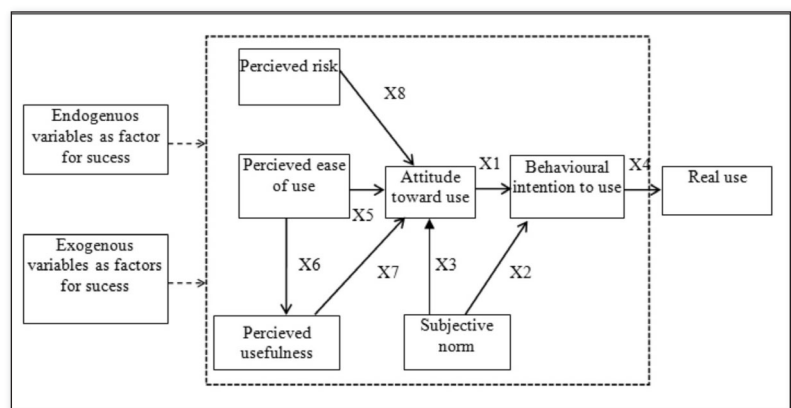


Many of the researches for the acceptance of new technologies are more dedicated to e-commerce and less to mobile commerce. The reason for this is because mobile commerce is at an early stage, and many people have not had the opportunity to use and accept it as part of their everyday life. Studies for acceptance of electronic commerce serve as a basis for the research of acceptance of mobile commerce because it can be treated as acceptance of new technology (Pedersen, Methlie, & Thorbjørnsen, 2002). There are different theories for the use of mobile commerce which use different terminology, but it is about the same concepts. In order to create a better research in this paper, different theories will be combined in one model. Among these theories, the most important and influential theories are: theory of reasoned action (Fishbein and Ajzen, 1975), the model for acceptance of technology, an expanded model for acceptance of technology (Venkatesh and Davis, 2000), the theory of planned behaviour (Ajzen, 1991) and, more recently, a unified theory of acceptance and use of technology (Venkatesh et al., 2003). For the purpose of this research, we shall use the extended technology acceptance model - TAM. This model integrates multiple factors to determine the acceptance of mobile commerce. The proposed model is empirically tested using data collected from a survey on mobile commerce.

TAM has been extended, and originally consisted of perceived ease of use, perceived usefulness, attitude towards usage, behavioral intention to use and the actual use of the system. Perceived usefulness and perceived ease of use are the most important determinants of system use, and attitude toward using (feelings of advantage or disadvantage of the system) directly predicts behavioral intention to use (due to the position and usefulness), which determines the actual use of the system. In 2000, Venkatesh and Davis added the social factors (subjective norm, voluntariness, and image) and organizational factors (quality of output, job significance, relevant result) to the TAM (Venkatesh and Davis, 2000). These factors define expanded TAM-model, i.e. TAM2 (Venkatesh and Davis, 2000). According to them, social and cognitive instrumental processes significantly affect the acceptance, perceived usefulness and perceived ease of use, which directly influence actual use of the system. TAM3 includes factors from TAM2 and perceived risk (financial, psychological, social, and other risks in online transactions) (Venkatesh and Bala, 2008, p. 278).

Based on the research of different theories and models, eight hypotheses were developed. Three of those hypotheses have been derived from the theory of reasons action (Fishbien and Ajzen, 1975) and four from the TAM-model. The last hypothesis was developed as a result of a new factor (perceived risk of use), which was added in the TAM-model. This factor was developed base on the interviews with users in Macedonia who already have used mobile commerce. From the analysis of the different theories a conceptual model for successful acceptance of mobile commerce with seven factors was developed.

**Figure 2.**  
Conceptual model of  
factors for successful  
adoption of  
mobile commerce



### III Empirical research

#### Research

For the purpose of this study, a survey has been used. The sample for testing consisted of 106 active Macedonian users of mobile communications. The descriptive statistics show that 56% of the users were from Skopje 8% from Strumica, 7% from Prilep. Regarding the age, 68% were at age 25-34; 19% were at age 18-24. From the analyzed users, 90% were aware that they can use their phone for mobile transactions. Out of all the analyzed users 39% had already made some payment with their phone (parking ticket), while 22% had made payments in some store for shopping goods.

Later, the collected data was analyzed using the Structural Equation Modeling (SEM) technique to validate, evaluate, and analyze the relationships between the endogenous and exogenous factors in the conceptual model. Variables that are not showing any impact of other factors are independent or exogenous factors. Those are: usefulness, ease of use, risk and norm. The variables that affect other variables are dependent or endogenous variables, which are attitudes and intentions of use.

To test the reliability, an internal consistency of this model was analyzed and reviewed using Cronbach's alpha. Construct validity is the extent to which a set of measured items actually reflects the theoretical latent construct. (Bagozzi and Yi, 2012; Hair et al., 2009).

Cronbach's alphas assessing the internal consistency of the study's measures are in range from 0.851 to 0.875 for all individual factors. They were above the acceptable threshold of 0.70, suggesting adequate reliability (Bagozzi and Yi, 2012). Also Cronbach's alpha was assessed for the endogenous and exogenous factors in general. All measures are in the range from 0.719 to 0.906.

#### Reliability test

Factors	Latent variables	Cronbach's alpha
Easy of use	4	0.797
Usefulness	4	0.906
Norm	2	0.827
Intention of use	2	0.719

The fit of the measurement model was assessed using the following statistics and indices: Chi-square, the ratio of the Chi-square to the degrees of freedom (df), Normative Fit Index (NFI), and Root Mean Squared Error (RMSEA). Chi-square/df values less than 3 indicate a good model fit and between 2.0 and 5.0 is acceptable level (Groenland and Stalpers, 2012). CFI values in range of 0.80 to 0.90 indicate a confidence level (Schreiber et al., 2006). RMSEA values less than 0.90 indicate good fit (Fornell and Larker, 1981).

The factor loadings, composite reliabilities, and average variance extracted for the model constructs are shown in Table I. From the table it can be concluded that  $\chi^2$  and the level of freedom is at acceptable level. NFI index is between 0.80 and 0.90, which is a good fit. RMSEA has a value of 0.095 which is showing confident level of fit of the model (Bagozzi and Yi, 2012). According to Hair (2010), low level of RMSA index in SEM is a result of several factors. One of the reasons is the small size of the sample, which is the case in this research.

## SEM testing with 7 constructs

$\chi^2$	1913.429
Level of freedom	520
Level of probability	0.000
GFI	0.854
AGFI	0.764
RMSEA	0.095
NFI	0.891

To evaluate the fit of the proposed model, the fit of the whole model was tested and assessed. The magnitude (i.e., statistical significance) and direction (i.e., positive or negative) of the individual parameters (i.e., the path coefficients) were assessed. Overall, the goodness-of-fit indices show that the proposed model has a good degree of fit with the data; the ratio of the Chi-square to the degrees of freedom was 1.91, a number smaller than 4.0 is considered very good (Hair et al., 2009), the NFI 0.891 was within 0.8 to 0.9 confidence level (Bagozzi and Yi, 2012) and the RMSEA 0.095, less than 0.1, which is considered a good fit (Schreiber et al., 2006).

The path coefficients and corresponding standard errors and t-values are presented in Table III.

## Standardized regression coefficients of SEM

Path coefficients			t-value	p-value
Usefulness	←	Easy of use	.981	***
Attitude toward use	←	Usefulness	.367	***
Attitude toward use	←	Easy of use	.454	.018*
Attitude toward use	←	Norm	.022	.735
Attitude toward use	←	Risk	1.123	.007**
Intention of use	←	Attitude toward use	.902	***
Intention of use	←	Norm	-.032	.721
Actual use	←	Intention of use	1.355	***

Note:\*\*\* p-value <0.01; \*\* p-value <0.05; \* p-value <0.10

From these values, it can be concluded that 6 out of 8 regression coefficients are statistically significant. Statistical significance is expected to be in the range of p-value <0.10 because of the size of the sample (Hair et al., 2009). All regressive coefficients are positive except the one (Norm-Intention of use), but there is no statistical significance.

Statistical significance can be found between the next regressive coefficients: Easy of use-Usefulness; Usefulness-Attitude toward use; Easy of use-Attitude toward use; Risk-Attitude toward use; Attitude toward use-intention of use; Intention of use-Actual use. Out of all relations, the strongest one is the Intention of use-Actual use (t-value 1.355) and the Risk-Attitude toward use (t-value 1.123) and the weakest is the Usefulness -Attitude toward use (t-value 0.367). Based on the statistical significance of the regressive coefficients it can be concluded that 6 of 8 initial hypotheses were confirmed.

## Conclusion

The research subject in this paper was the analysis of group of success factors for mobile commerce adoption in the Republic of Macedonia. These success factors were analyzed by using the TAM-model. The list of success factors was divided in two groups: endogenous and exogenous.

The results of the conducted SEM research confirm six of the eight proposed hypotheses. SEM research shows that statistical significance exists between Easy of use-Usefulness; Usefulness-Attitude toward use; Easy of use-Attitude toward use; Risk-Attitude toward use; Attitude toward use-intention of use; Intention of use-Actual use. SEM shows that Usefulness, Easy of use and Risk have significant impact on Attitude toward use of one technology. Further Attitude toward use of one technology have impact on Intention of use of a technology and this critical factor has significant impact on Actual use of one technology.

From the result of the six analyzed successful factors, which are part of the TAM-model, extended with one success factor (risk) it was proven that the most important factors for adoption of mobile commerce in the Republic of Macedonia are: Easy of use; Usefulness and Risk. These factors are responsible for the Intention of use and Actual use of the mobile commerce.

In terms of companies in the Republic of Macedonia these mean that successful adoption of mobile commerce is directly depended form the innovative design of the service, appropriate relation with the value, and perceived improvement of business performance.

From the customer point of view successful adoption of mobile commerce is directly depended form the accepted level of risk, state of the art design, user experience, and efficient use of application. If these factors are fulfill from bought sides will lead to Intention of use, and Intention of use will result with actual use of mobile commerce.

Having in mind all mentioned above it is important for future development and successful adaption of mobile commerce in Republic of Macedonia to focus on appropriate value of the services for the customer, low level of perceived risk from the customer point of view, innovative design and unique user experience during the use and deployment of mobile commerce.



## References

- Ajzen, I., (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50, pp.179–211.
- Antovski, L. and Gusev, M., (2003). M-payments. In 25th Int. Conf. Information Technology Interfaces /ITI 2003. pp. 95–100.
- Bagozzi, R.P., Yi, Y., 2012. Specification, evaluation, and interpretation of structural equation models. *J. Acad. Mark. Sci.* 40, 8–34.
- Bouwman, H. et al., (2008). Mobile service innovation and business models H. Bouwman, H. De Vos, & T. Haaker, eds., Berlin Heidelberg: Springer-Verlag.
- Buellingen, F. and Woerter, M., (2004). Development perspectives, firm strategies and applications in mobile commerce. *Journal of Business Research*, 57(12), pp.1402–1408.
- Charles, L. et al., (2000). The critical success factors for mobile commerce. Rondebosch: University of Cape Town.
- Feng, H. et al., (2006). "Exploring the critical success factors for mobile commerce, *Proceedings from the 2006 International Conference on Mobile Business IEEE*.
- Fishbein, M. and Ajzen, I., (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*, Addison-Wesley Pub. Co.
- Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E., 2009. *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Prentice Hall.
- Hilbert, A., (2005). *Critical Success Factors for Data Mining Projects. Data Analysis and Decision Support*, pp.232–240.
- Hung, S. et al., (2002). Critical Factors of WAP services Adoption: An Empirical Study.
- Little, A.D., (2004). Global M-payments Report 2004 - Making M-Payments a Reality, July 2004.
- Odegaard, P., (2001). Solving the m-maze. Global Telecoms Business. Available at :<http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Solving+the+m+maze#0> [Accessed May 11, 2014].
- Palen, L. et al., (2001). Discovery and Integration of Mobile Communications in Everyday Life, *Personal and Ubiquitous Computing Journal*, Volume 5: pp. 109-122
- Pedersen, P.E. et al., (2002). Understanding mobile commerce end-user adoption: a triangulation perspective and suggestions for an exploratory service evaluation framework. In *System Proceedings of the 35th Hawaii International Conference on System Sciences. IEEE*, pp. 1–8.
- Schreiber, J.B., Stege, F.K., King, J., Amaury, N., Barlow, E.A., 2006. Reporting Structural Equation Modeling and Confirmatory Factor Analysis Results: A Review. *J. Educ. Res.* 99, 323–338.
- Siau, K. and Shen, Z., (2003). Mobile communications and mobile services. *International Journal of Mobile Communications*, 1(Nos. 1/2), pp.3–14.
- Smith, B., (2002). Under the radar. *Wireless Week*, pp.38–39.
- Venkatesh, V. and Bala, H., (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision sciences*, 39(2), pp.273–315.
- Venkatesh, V. and Davis, F.D., (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science*, 46(2), pp.186–204.
- Venkatesh, V., Morris, M., et al., (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 27(3), pp.425–478.
- Vrechopoulos, A., (2002). Critical success factors for accelerating mobile commerce diffusion in Europe. In 15th Bled Electronic Commerce Conference eReality: Constructing the eEconomy Bled, Slovenia, June 17 - 19, 2002. pp. 477–492.
- Xu, G. and Gutiérrez, J., (2006). An exploratory study of killer applications and critical success factors in m-commerce. *Journal of Electronic Commerce in Organizations*, 4(3), pp.63–79.