Modeling of the acceptance of mobile payment systems in virtual social networks

Abstract:

Although mobile-related technologies are widely accepted in today's society, mobile payment in Virtual Social Networks (VSN) is not among the most widely used mobile services. Throughout this paper analyzed the influence of e-word-of-mouth (eWOM) and the perceived risk in the intention of adopting a novel mobile payment system based on SMS through social networking. Empirical results demonstrate how social influences, through subjective norms, utility, attitude, as well as eWOM and the perceived risk, determine its adoption. Finally, the results obtained in this study reveal interesting implications for the diffusion of mobile payment systems in VSN.

Keywords: *eWOM, Perceived risk, Mobile payment, Virtual social networks*.

Track: *New Technologies and E-Marketing*

1. Adoption of electronic commerce in B2C.

Advances within Information and Communication Technologies (ICT), as well as developments achieved in the field of Smartphones and the proliferation of the access to Internet together with the presence of users among social networks, have improved connectivity and mobility of individuals, causing important impact in terms of productivity, competiveness, economic growth and profitability in business economies and in national economies themselves among several countries (Liébana-Cabanillas, 2012).

Scientific literature has used different formulas to define electronic commerce (e-commerce). For Treese and Stewart (1998) e-commerce represents "the use of global Internet for the purchase and sale of products and services, including post-sale service and support". Kalakota and Whinston (1996) define e-commerce as "the modern method of doing business that takes into account the needs of organizations, merchants and customers to reduce costs by improving the quality of goods, services and distribution". Precisely, those authors identified four reasons for what electronic commerce has grown up getting to reach today's levels: 1) the increase in the volume of transactions at a reduced cost forced many companies to start with those types of activities in order to reduce costs, 2) the existing competence accelerates the interest by companies in providing consumers with better services, 3) consumers themselves are powering competence by demanding more and better services, and 4) technological advances have ameliorated the acceleration in transactions with a higher easiness and a less cost for consumers in regard to the traditional sales channel.

In this context, electronic commerce is now an essential tool for the business development of many companies and has many advantages, including (Armesh, Saljoughi, and Kord, 2010): continuous accessibility, increased quantity and quality of information, direct contact between customers and producers to facilitate interaction, multimedia access to companies' contents, the creation of new products and services, open markets, cost reductions, time savings, immediacy of interaction and the personalization and globalization of markets offers.

Our paper focuses in the study of electronic commerce that is fulfilled through mobile devices. For that reason, our paper is disposed the following way. In the next epigraph, we analyze the types and evolution of this kind of commerce reaching virtual networks. Epigraph 3 establishes the research proposal and hypotheses that will be contrasted with the data analysis. In fourth place, the basic methodological aspects followed throughout this research are covered. In the fifth epigraph, main results obtained from data analysis are exposed. Finally, the pertinent conclusions and implications derived from the study are extracted.

2. New Mobile Commerce (m-commerce) systems: The Evolution of Traditional Trade Systems and Virtual Social Networks.

Scientific literature includes mobile commerce (m-commerce) as a part of e-commerce as it differs only due to the business channel application.

M-commerce is an online trading model where mobile devices perform the classic functions of trade, for example, assisting in information searches, facilitating contact between the consumer and business and completing payments. M-commerce is strategically important for companies because it promotes online sales using a support system that already takes advantage of varied marketing activities, and therefore reinforces the channel itself.

In today's society, the mobile phone has proven itself to be a vital tool in any personal or professional activity, with a very high level of acceptance by consumers (Masamila, Mtenzi, Said, and Tinabo, 2010). According to a recent study from Mobile Life at TNS (2012) carried out over 58 countries, 15% of Spanish users have recently used their mobile phone to buy or

search previous information on their purchase, nevertheless being a fact that it is still far from traditional payment systems. On one hand, the report about electronic commerce B2C from ONTSI (2013) in Spain shows the main online payment system used is credit card payment (62.9%). However, the incidence of this payment method has decreased in favor of exclusively electronic payment platforms, already used today by 14,9% of consumers, reaching the second position, which reinforces the approaches considering mobile payment a fundamental system in the future.

On the other hand, virtual social networks (VSN) have been configured as a multiple service and application tool for both users and companies. Social networking phenomenon has facilitated the use of that tool on a daily basis by millions of users from all over the world. According to the last report from Belgian agency InSites Consulting (2012), seven in ten Internet users are members of at least one social network, highlighting them under this order, Facebook, Twitter and Google+, so at present there exist 1,5 billions of social network users. According to the study about social networks on the Internet from IAB Spain and Elogia (2013) 79% of Internet users are social networking users and 14% of all users recognize having purchased through a social network. The increase according to the same report for the last two years has been of a 57%, emphasizing Facebook social network with an estimated penetration close to 100% among users in this sample (aged 18 to 55).

Therefore, if users keep an increasing presence on this kind of forums by means of the attraction that those VSN have originated (Boyd & Ellison, 2008), it is expected that they will use mobile phone as the first access element (IAB Spain & Elogia, 2013). It is confirmed that, at the moment, they are already starting to purchase on them; consequently, companies will have to position themselves close to customers with the aim of taking advantage of the opportunities that this new environment offers within the payment of their transactions.

New payment systems emerge from proper ICT developments in the field of economic transactions between companies and their clients. Specifically, they appear as a way to solve certain problems related to the usage of physical money (Tamayo, 1999) such as: 1) reducing the cost of money and available payment methods 2) creating more flexibility in small purchases and instant payments, 3) increasing security and fraud protection, and 4) the emergence of e-commerce online payments.

Even if mobile payment systems are considered a growing business (Karnouskos & Vilmos, 2004), it is regarded as the payment system of the future (Zhu, 2010) due to the heavy penetration of mobile users, what suggests that this tool will be crucial within economic transactions fulfilled among VSN environments (Liébana-Cabanillas, 2012). Our research focuses specifically on a new payment system that is characterized by the use of SMS technology, specifically Zong, belonging to PayPal.

2. Research Proposal and research hypothesis

The aim of this research is to develop a model of acceptance regarding mobile payment systems including, among other determinants (such as utility, ease of use and subjective norms), the effect of eWOM and the perceived risk in the intention of adopting a new SMS mobile payment tool in VSN, in particular Facebook, as this network counts with a penetration of 54% of total population (BlueMarkets, 2013). Therefore, we are suggesting an extension of TAM classical model, as being considered the most expanded within the adoption of mobile commercial services (Wei et al., 2011), having been used across similar investigations in our area (e.g. Yang, Lu, Gupta, Caso, and Zhang et al., 2012; Ramos de Luna, Montoro-Ríos, and Liébana-Cabanillas, 2013).

We will assume as sufficiently justified TAM model hypotheses reflected on our model under designation H1 to H8 (Davis, Bagozzi, and Warshaw, 1989), and collected in Table 1, as they have been backed up among numerous researches (Lee, Hu, and Yeh, 2003; Sánchez-Franco & Roldán, 2005), focusing the object of discussion on eWOM and the perceived risk as determining variables within the intention to use of the new mobile payment tool proposed.

Table 1: Research hypothesis

Hypothesis	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
Effect	SN	SN	SN	PEOU	PEOU	PU	PU	ATT	PR	EWOM
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	PEOU	IU	PU	AT	PU	ATT	IU	IU	IU	IU

eWOM implies "any positive or negative statement made by potential, actual, or former customers about a product or company, which is made available to a multitude of people and institutions via the Internet" (Hennig-Thurau, Gwinner, Walsh and Gremler, 2004). Those comments will influence on behaviors and will improve the intention to use of the new tool as it has been confirmed in the adoption of social network games (Hansen & Lee, 2013) and online shopping (Hsu, Lin, and Chiang, 2013), among others. For this reason we propose the following hypothesis:

H9: E-word-of-mouth has a positive effect on the intention of use of the proposed mobile payment system.

On the other hand, the two aspects of perceived risk defined by Bauer (1960) are related to the approach in this research. The components of risk are twofold: uncertainty, where the consumer does not know what will happen when making the purchase; and the possible negative consequences of the purchase. Different research show that risk has a negative influence on intended use (Jiraporn, Mathupayas, and Atcharawan, 2011), thereby leading to the following hypothesis:

H10: The perceived risk in the new mobile payment system adversely affects their intended use.

3. Methodology.

Our research involved a national panel of Internet users that navigate through an experimental scenario of a Facebook profile (Table 2), where they watch a video that explains the proposed new payment system. The payment system is called Zong, which permits the purchase of multiple physical and online content using a mobile device through a very simple procedure that allows you to process payment for purchases in different formats (internet, social networks, television and even POS-point of sale).

Table 2: Research Design Summary

Sample: Internet users with a Facebook profile	Sample Error*: 2,35%
Sample Type: Convenience Sampling	Date of Fieldwork: January and February 2012
Sample Size: 1.735	

* For the estimate of a proportion where P=Q=0.5 and a confidence level of 95% according to the principles of simple random sampling.

To test the suitability of the measurement scales used, different exploratory and confirmatory analyses of data reliability and validity were employed using SPSS 15.0 and AMOS 18 software, respectively.

5. Data analysis

5.1. Exploratory and Confirmatory Analysis.

First, Cronbach's alpha indicator was used to measure the reliability of the scales, using 0.7 as a reference value (Nunnally, 1978). In this case all variable values were good or very good ($\alpha > 0.8$).

Then a Principal Components Factor Analysis was performed to check the degree of unidimensionality of the scales. The analysis was deemed appropriate for the variables being studied because: 1) the proportion of variance the variables have in common (KMO) always exceeds the value of 0.5, 2) the Bartlett test of sphericity is significant (Sign. = 0.000), thus rejecting the null hypothesis concerning the lack of differences between the correlation matrix and the identity matrix, and 3) the correlation coefficients of the anti-image correlation matrix outside the main slope show lower values. Finally, we verified the existence of high communalities ($\lambda_i > 0.5$) in the variables being analyzed, which implies that all are well represented in the space of factors and factorial loads in the indicators exceed the recommended minimum ($R^2 > 0.5$). Therefore, it can be concluded that the measurement scales have a unidimensional structure. To test the convergent and divergent validity of the scales a confirmatory factor analysis (CFA) was conducted. Convergent validity was assessed through the factorial load of the indicators. It was found that the coefficients are significantly different from zero, and further that the burden between latent and observed variables is high in all cases (> 0.7) after the removal of one of the ease-of-use items. Therefore, the latent variables adequately explain the observed variables (Luque & Del Barrio, 2000).

5.2. Data Analysis and Analysis results.

After analyzing the reliability and validity of the initial measurement scales, we tested the research hypotheses in the literature review using structural equation modeling (SEM). The values of the proposed model are consistent with the values established in the literature except the GFI and AGFI, which very close to the recommended values.

The multivariate normality was much higher than the recommended limits therefore, the application of maximum likelihood bootstrapping (500 replicas) was chosen as a method of estimating the model. The decision to use this method was based on the recommendations of Finney and DiStefano (1996). As we worked with continuous data, deviations of skewness and kurtosis were greater than 2 and 7, respectively, and the sample size was large. In the bootstrapping technique, we used the Bollen-Stine corrected p-value and the standard correction of errors of the construct has a confidence level of 95%.

Figure 1: Results for structural model analysis
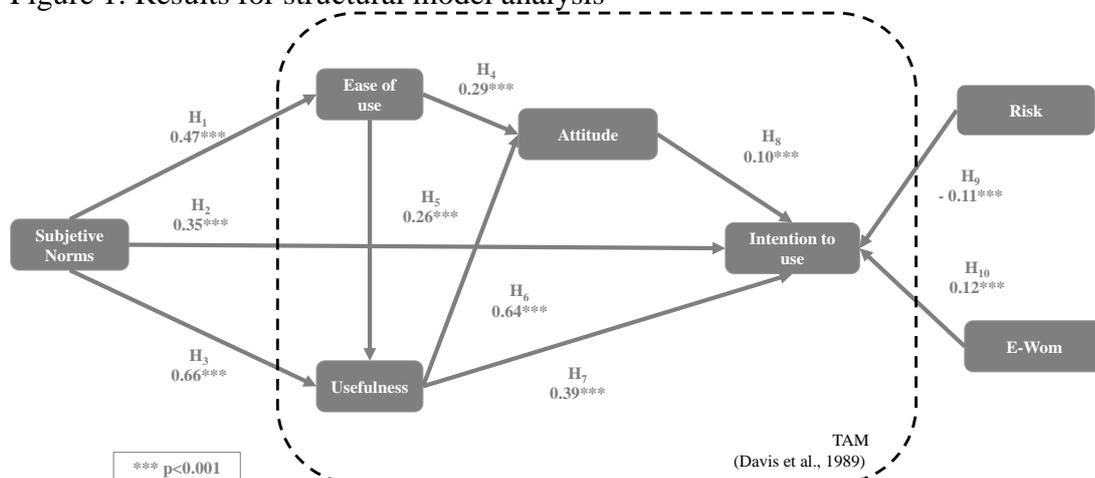
Adjusting the model with absolute, incremental and parsimonious measurements verified that the model's adjustment was reasonably effective (χ^2=3488,02; p=0,00; RMSEA=0,05; TLI=0,96 CFI=0,96; GFI=0,90; PNFI=0,89; AGFI= 0,87).

The results show that all of the hypotheses proposed have empirical support for their acceptance (p <0.001) as shown in Figure 1.

6. Conclusions and Implications.

Payment systems used among commercial activities have been altered by the development of new technologies. Currently there is multiple payment systems used in everyday purchases on the Internet and through social networks. According to the Advanced Payments Report (2011) elaborated by Edgar, Dunn & Company in Association with Payments Cards and Mobile consultants, it is expected the market size for advanced payments in 2016 to be $3,128 billion increasing threefold from 2012 estimated market size of $976 billion. It is important to mention here that this represents the potential market size in 2016 and assumes that some of the issues identified in this report are appropriately addressed by stakeholders.

According to KPMG (2012), cash and credit card transactions will decrease in the future being replaced by transactions operated through mobile phones; mobile payments will top $1 trillion, and in the process the volume of mobile payments will spike up by around 100% per year. For those reasons and VSN potential in our society we have defined a behavior of adoption model backed up by contrasted connections with other researches about TAM model. In our research, it has been stated that in the adoption of the proposed payment system subjective norms derived from the proper network together with utility and attitude, it is determined the intention to use. In addition, the effect of eWOM comments on the social network itself coming from its own contacts and the perceived risk as a reducer of the intention to use, they also result fundamental within the final user's behavior.

In the future, it would be interesting to analyze the perception and influence of external elements (security seals, suppliers' brands, etc.), to compare the behavior among different social networks (Twitter or Pinterest) with multiple payment tools (NFC or QR) as well as valuing possible moderation effects (gender, age and experience) and the cultural differences among groups of users.

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