THE ROLE OF MOBILE PAYMENT SYSTEMS IN ELECTRONIC COMMERCE

Abstract:

The purpose of this paper is to contribute to the existing research of user behavior in virtual environments. More specifically, this paper studies buying behaviour in social networks and the acceptance of new mobile payment tools that are being used in this environment. To carry out the proposed research, a web experiment to analyse the proposed behavioural model of a new payment tool which employs mobile text messages (SMS) for support was created. The analysis shows how trust, usability, utility and risk are key determinants of the level of intention to use the new proposed tool.

Keywords: *E-Commerce, M-Commerce, Payment methods, virtual environments, trust, ease of use, risk.*

Track: *New Technologies and E-Marketing*

1. Adoption of the Internet and electronic commerce in B2C.

In recent years, developments in the field of information and communications technology (ICT) and the important business applications derived from them, have created significant economic progress in terms of profitability productivity, competitiveness and economic growth for both companies and countries (Lafuente, 2005; Cotec Foundation, 2011).
Scientific literature includes mobile commerce (m-commerce) as a part of electronic commerce (e-commerce) as it differs only due to the business channel application.
Trade through the Internet today is most important potential tool for companies, which means a revolution in both the buying habits of consumers and consumer-business relationship formulas (Sharma and Sheth, 2004). Currently over 90% of total OECD companies have Internet access, but in Spain that number is only 86.6%. Yet the evolution of recent years shows signs of Spain catching up to the average of OECD countries (AETIC, 2010).
Scientific literature has used different formulas to define 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".Electronic commerce is now an essential tool for the business development of many companies and has many advantages, including (Armesh et al., 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. These advantages will only be enhanced with the integration of web 2.0 in online marketing activities in the near future (Hannah and Lybecker, 2010).

2. Mobile Commerce- The Evolution of Traditional Trade Systems.

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 et al., 2010). According to the Telecommunications Market Commission's (CMT), 2010 Annual Report, the Spanish mobile telephony market has 51.6 million mobile lines compared with 20.2 million fixed telephone lines. In light of this data it seems clear that the mobile phone has become an indispensable tool in the daily lives of businesses and individuals (Ondrus and Pigneur, 2009; Verkasalo, 2009; Saifullah and Fauzan, 2011).
The main differences between e-commerce and m-commerce are: 1) the maturity of the former and growth potential of the latter, 2) the greater penetration of e-commerce, 3) the increased accessibility of m-commerce, 4) similar users, 5) the similar levels of personalization available; and finally 6) the diversity of buying motives.

3. New Payment Methods in B2C e-commerce.

ICTs develop new payment systems to improve management of business transactions between companies and their customers and to solve certain problems associated with managing

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**.** Currently, there are multiple classifications that are used to analyse payment systems. The main criteria for classification are: the transaction model (Ramezani, 2008), the amount of the transaction to be performed (Ramezani, 2008), the type of payment validation (Wang and Yuan, 2010), the type device used in the transaction, the nature of the relationships and support used (Ondrus and Pigneur, 2006) and the formula to transfer money from the transaction (Ruiz, 2009).
Although m-commerce is viewed as an activity in an expansion phase (Karnouskos and Vilmos, 2004), it is regarded as the payment system of the future (Zhu, 2010) due to the heavy penetration of mobile users. Our research focuses specifically on a new payment system that is characterised by the use of SMS technology, specifically Zongof PayPal.

4. Research Proposal.

The objective of this research is to develop a simple behaviour model to define the intended use of a new payment tool used via mobile phones among a population of university students.
The novelty of the model lies in the nature of the population where research is done, young people under 25 years old. Since 93% of young Europeans between the ages of 16 and 24 own a mobile phone (EIAA, 2009) and 87% of the phones used by this population in Spain are Internet accessible (Connect, 2008) university students are an ideal sample to study because of the reduced effect of technology on the acceptance of the new tool, since for them, the mobile phone is a tool they use daily. This has led us to assume that the TAM model research analysing similar technologies such as mobile services (Ristola, 2010), online payments (He and Mykytyn, 2007) and mobile ticketing (Mallat et al. 2009), are valid. This research will then focus our attention in other relationships that we also consider determinants.

5. Proposed Research Hypothesis.

The first element of our model is trust (on line). This implies the belief that the company will meet its commitments providing mutual benefits (Ranaweera et al., 2005). On the Internet, perceived lack of trust is increased in economic transactions (Pitta et al., 2006), which requires companies to be proactive to reduce user uncertainty (Aldás et al, 2011). Different studies show that there is a positive relationship between trust and intention to use (Zhou and Lu, 2011), supporting our first hypothesis:*H1: The trust level of online users positively influences the intention to use new mobile payment systems.*
Ease of use is the second component of the proposed model. It refers to the individual's perception that using a particular system is free from stress or simply easy to do (Davis, 1989, Taylor and Todd, 1995). The effect of perceived ease of use on intention has also been demonstrated in numerous researches related to Internet use (Luque et al. 2007), mobile services (Zhou, 2011), e-commerce (Smith, 2005), etc. For this reason we propose the following hypothesis:*H2: The perceived ease of use of the new tool has a positive impact on the intention to use new mobile payment systems.*
Perceived usefulness is defined as the potential user's subjective probability that using a particular system will enhance job performance in an organizational context (Davis et al., 1989), therefore directly affecting the intended use. This relationship has been tested in different fields of study, for example, online banking (Chong et al., 2010), mobile services (Quan et al. 2010), and virtual communities (Hossain and Silva, 2009), which confirms the third hypotheses:*H3: Perceived usefulness positively influences intention to use the new*

mobile payment systems.
Finally, the two aspects of perceived risk defined by Bauer (1960) are related to the approach in this research. The components of risk are two fold: uncertainty, where the consumer does not know what will happen when making the purchase; and the possible negative consequences of the purchase. Different studies show that risk has a negative influence on intended use (Daud et al., 2011; Jiraporn et al., 2011), thereby leading to the following hypothesis:*H4: The perceived risk in the new mobile payment system adversely affects their intended use.*

6. Methodology.

The research was conducted through a web questionnaire answered by a sample of students from the Faculty of Business, at the University of Granada who volunteered after seeing the operation of the mobile payment tool was being studied.

Sample: University Students	Sample Error*: 6,91%
Sample Type: Convenience Sampling	Date of Fieldwork: November 2011
Sample Size: 201 valid cases	

** 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.

6.1.Exploratory and Confirmatory Analysis.

First, Cronbach's alpha indicator was used to measure the reliability of the scales (see Appendix 2), 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 analysed, 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 and Del Barrio, 2000).

6.2.Data Analysis and Analysis results.

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

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%.

COFICIENTE	RMSA	GFI	AGFI	CFI	NFI	CMIN/F
Model Value/ Recommended Value*	0,06 (≤0,08)	0,88 (≥0,90)	0,85 (≥0,90)	0,96 (≥0,90)	0,92(≥0,90)	1,79 (Between 1 y 3)

** Hair et al. (1999), Luque and Del Barrio (2000), Li and Lai (2008) and Muñoz (2008)*

The results show that all of the hypotheses have empirical support for their acceptance. Detailed results show confidence, ease of use and usefulness, influence positively (H1: β = 0.52, H2: β = 0.17, H3: β = 0.46, respectively) and risk influences negatively (H4: β = -0.16), on intention to use the new mobile payment method.

Finally, it is also noteworthy that this simple model may partially explain the intention to use a new payment system supported by mobile technology (R^2 = 0,499).

7. Conclusions and Implication for Management.

Payment systems used in commercial activity have been altered by the development of new technologies. Currently there are multiple payment systems used in everyday purchases on the Internet and through social networks. Furthermore, since currently 90% have access to at least one mobile terminal, and 24% maintain Internet access in the terminal (EUROSTAT, 2011), it seems logical that the market is moving towards the implementation of the mobile phone as a purchase and payment tool. Currently sales through smart phones represent over 10% of all transactions on eBay in the UK, reflecting the growth potential associated with this type of trading and payment in the future.

For these reasons we propose a behavioural model that defines the intention to use a new payment system supported by mobile phones so that the user has access to flexible and secure financial transactions in both personal and professional activity. Given that university students express a high level of engagement with mobile technology (the whole sample owns mobile phones and are used to interacting with them) the population surveyed has removed some relationships to the TAM model, allowing a simple, yet scientifically adequate model with four variables (trust, ease of use, usefulness and risk) to be developed in regard to mobile payment systems.

In the future, it would be interesting to see the influence mobile payment systems have on the on-line shopping experience and the potential impact that satisfactory results have on the intended use of new payment tools. It would also be interesting to study the moderating effect of user gender.

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