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Determinants of the adoption of customer-oriented mobile commerce initiatives

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Abstract

This paper investigates organizations implementing mobile commerce initiatives. Mobile commerce (m-commerce) is defined as the wireless B2B and B2C exchange of operational and financial data within a supply chain. Based on a survey conducted with 159 Canadian and Scandinavian executive managers, this paper tests several theoretical determinants of customer-oriented m-commerce initiatives. Results indicate that i) the adoption of electronic commerce is a strong determinant for the adoption of m-commerce initiatives, ii) software firms are more inclined to adopt m-commerce initiatives, iii) firm size does not influence the adoption of mobile commerce, and iv) contrary to expectations, firms focusing on B2C are not more inclined to adopt m-commerce initiatives. For practitioners, the paper helps better define the profile of potential adopters of m-commerce. On a more theoretical point of view, the results suggest that m-commerce comes as a second step to e-commerce.

Keywords

mobile commerce

Disciplines

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This paper investigates organizations implementing mobile commerce initiatives. Mobile commerce (m-commerce) is defined as the wireless B2B and B2C exchange of operational and financial data within a supply chain. Based on a survey conducted with 159 Canadian and Scandinavian executive managers, this paper tests several theoretical determinants of customer-oriented m-commerce initiatives. Results indicate that i) the adoption of electronic commerce is a strong determinant for the adoption of m-commerce initiatives, ii) software firms are more inclined to adopt m-commerce initiatives, iii) firm size does not influence the adoption of mobile commerce, and iv) contrary to expectations, firms focusing on B2C are not more inclined to adopt m-commerce initiatives. For practitioners, the paper helps better define the profile of potential adopters of m-commerce. On a more theoretical point of view, the results suggest that m-commerce comes as a second step to e-commerce.

1. Introduction

This paper studies the determinants of the adoption of customer-oriented mobile commerce initiatives. It aims at gaining a better understanding of the profile of firms involved in mobile commerce initiatives with the customers.

Mobile commerce (m-commerce) is defined as “monetary transactions conducted over a wireless telecommunication network” (Durlacher, 2002). However, this article adopts a broader perspective of mobile commerce. This paper refers to a broader definition m-commerce by authors such as Elliott and Philips (2004) and Gary and Simon (2002): wireless B2B and B2C exchanges of operational and financial data within a supply chain at different stages of the life cycle of a business relationship.

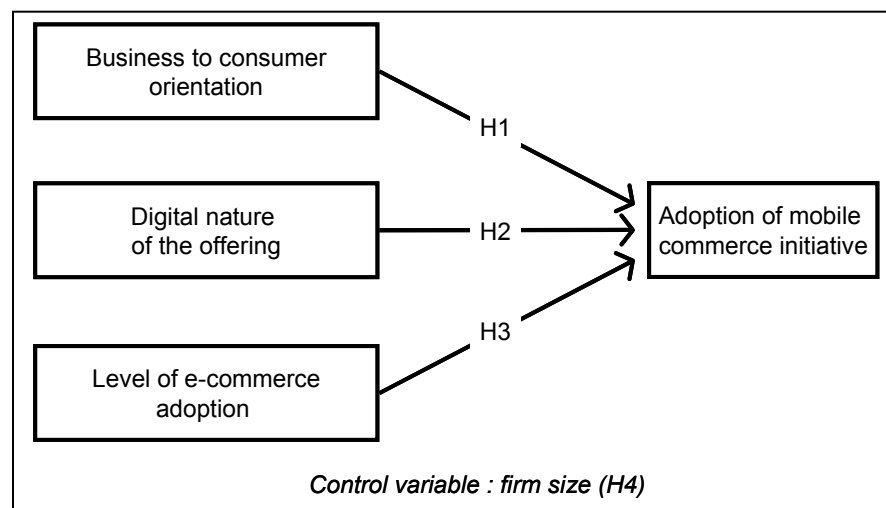
The rapid diffusion of mobile commerce is mainly due to the i) expanding diffusion of mobile terminals (mostly PDAs, mobile phones and laptops) and ii) rise of electronic commerce. For example, in some countries such as Finland, Sweden, Italy and Korea, the penetration rate of mobile phone is well over 80% of the population. Barnes (2002) notes that, in 2002, more than 800 millions mobile terminals were in use worldwide, and that

this number should reach a billion in early 2004. For example, in Korea, more than 30% of mobile phone users carry out m-commerce activities (Viswanath et al., 2003). In conjunction, electronic commerce has been expanding steadily for almost a decade now. Analysts expect B2B e-commerce revenues to grow from US\$ 306 billion in 2003 to US\$ 1 trillion by 2004 in the United States only, (eMarketer, 2003). Driven by these two phenomena, the use of mobile commerce has grown rapidly in recent years. Upkar and Vetter (2002) estimate that 237 million mobile terminal users have conducted m-commerce in 2002, generating revenues of more than US\$ 14 billions, revenues that should reach US\$ 200 billions in 2004. These numbers are impressive when compared to the adoption of other information technologies. This paper tries to analyze the adoption of m-commerce by organisations and identify the determinants that predict this adoption.

2. Conceptual model and hypothesis

From the emerging literature on mobile commerce, a model, based on conceptually and empirically grounded determinants of adoption, is presented in figure 1. This predictive model was built to analyze the influence of three types of determinants (digital nature of the offering, business-to-consumer orientation and level of e-commerce adaptation) in the adoption of m-commerce in organizations. Furthermore, a control variable (size of the firms) is also included in the model. The following sections present the conceptual and empirically arguments underpinning each of the hypothesis (H1, H2, H3 and H4).

Figure 1 Proposed conceptual model



2.1 Business to consumer orientation

By definition, mobile commerce offers the possibility to conduct electronic business anywhere and at any time. The nomadic nature of this form of commerce opens a wide range of new business offerings of great value to the mobile users. First, it allows an itinerant offering of products and services usually accessible via wired electronic commerce (e.g. plane tickets, movies schedules, stock price, etc) (Kumar and Zahn, 2003). Second, geographical related offerings such as location-based products and

services are now easy to offer. For example, in an unfamiliar neighborhood, users could search for the location of services such as nearby restaurants, shops, ATMs and public transport through m-commerce (Barnes, 2002). Finally, the third opportunity relates to physical short-ranged transactions. As the majority of people in many occidental economies carry a mobile phone on a permanent basis, this device has the potential of becoming the digital wallet for a good number of transactions. In some countries like Finland, mobile phones are used for physically short-ranged transactions such as paying parking meter charges or buying a soda can from a vending machine (Rupp, 2002; Kumar and Zahn, 2003; Upkar and Vetter, 2002; Buttery and Sago, 2003).

A good number of mobile commerce opportunities, as presented above, are aimed towards the final customer segment (Anckar and D’Incau, 2002). It therefore appears logical to anticipate that firm targeting this market segment might be predisposed to adopt a mobile commerce initiative. The following hypothesis tries to capture this assumption:

H1: Firms having a business-to-consumer orientation (B2C) are predisposed to adopt m-commerce initiative.

2.2 Digital nature of the offering

Mobility and itinerancy are some of the characteristics final users are seeking when they opt for a mobile device. However, being mobile does not necessary translate into the use of the technology in a nomadic state. For example, Hoyoung et al. (2002) found that Korean mobile phone customers use m-commerce interactive functionalities more in a sedentary state (sitting down) than in a nomadic state. The case of WIFI technology is also very interesting in this respect. With downlink connection speeds comparable to fixed wired Internet services, many WIFI adopters now connect wirelessly for their day-to-day activities even though they have access to the more traditional technologies. One could then argue that mobile commerce is just electronic commerce conducted through wireless medium.

Yet, what distinguishes mobile from fixed electronic commerce is the ability to conduct business transactions from anyplace at any time. In such, through m-commerce, users might carry out value-added business interactions that are not available through fixed Internet connections. It is therefore clear that not all commercial activities are well suited for mobile commerce. For example, the small graphical interface on the mobile terminal restricts the completion of complex business interactions (that may require several informations to be displayed simultaneously). Small screen size, limited screen resolution and difficult input mechanisms are some limitations of mobile terminals (Viswanath et al., 2003; Shuk and Kwo, 2003)

It has been argued that different types of digitalized products and services are structurally more convenient in their ability to be offered through mobile commerce (Corradi et al., 1999). Time and geographic-based content is a good example of such digitalized products or services. These location-based services (LBS) are expected to reach 680 million

mobile users globally by 2006 and to generate over US\$ 32 billion in Europe by 2005 (Bharat and Minakatis, 2003)

Latest newsbreaks, travel route information, traffic news alerts and stock prices are examples of content services that have had significant success with mobile phone terminal users (Darling, 2001; Rupp, 2002; Kalakota, 2003; Kris and Frank, 2003). The download of ring tones is also another example of an intangible product/service that represents an important commercial activity of mobile commerce (Kris and Frank, 2003). Based on these arguments, we propose the following hypothesis:

H2: Firms offering digital products are more inclined to sell them through an m-commerce channel than other firms.

2.3 Level of electronic commerce adoption

When it comes to mobile commerce initiative, a few questions come to mind: Is it a logical second step for firms already using e-commerce with their business partners? Or do firms that have not yet implemented e-commerce adopt m-commerce initiatives knowing that m-commerce now best suits their value offering?

Naruse and Kim (2002) suggest evidence in favor of the second step presumption. They argue that firms who are using fixed e-commerce more intensively are more inclined to adopt m-commerce. Companies adopting mobile commerce already have first-hand experience with electronic commerce; therefore, firms first build their electronic commerce infrastructure and then use mobile commerce as a complementary channel to offer additional value to its customers (Tsalgatidou and Pitoura, 2001). Based on these arguments, we introduce a third hypothesis:

H3: The level of e-commerce adoption is a determinant of the adoption of m-commerce initiatives.

2.4 Size of the firm effect

In the diffusion of innovation literature, firm size is often a key adoption determinant. In an e-commerce context, empirical evidence suggests that several factors facilitate the adoption of e-commerce by larger firms. These firms have more available resources to set up e-business initiatives, which enables them to benefit from economies of scale (Zhu et al., 2002). Larger firms also have more power to impose their electronic commerce strategy on upstream and downstream business partners, which is considered an important success factor for interactive innovations (Markus, 1990).

Although electronic data interchange (EDI) originated in larger organizations such as financial institutions and manufacturing integrators in the automotive and electronic industries (Chen and Williams, 1998), the advent of the Internet has contributed to the drastic reduction of costs related to the implementation and support of e-commerce infrastructure, thus offering electronic integration to small- and medium-sized

organizations. Moreover, in several industries, many innovative business models have been developed by smaller new entrants to overcome larger established players. The rapid ascent of Amazon in the book selling business, which has now become the largest bookstore in the world, is a good example of a new business model in a traditional sector.

In an m-commerce context, both small and large firms have succeeded in the development of strategies to capture the benefits from this new wireless channel. In Canada, a radio frequency identification tag is used by many motorists to speed up the payment of petrol at pumps. Many shops in Finland have implemented short-range transaction devices to enable customers to purchase products with the use of their mobile phone terminals. Therefore, we propose to control the proposed conceptual model with the following hypothesis:

H4: Firm size is not a determinant of the adoption of m-commerce initiative.

3. Methodology

The proposed conceptual model is tested with data gathered from a survey conducted with 159 Canadian and Scandinavian¹ executive managers in the wireless communication industry. The wireless communication sector encompasses the whole industry value chain, ranging from hardware manufacturers, software developers, wireless operators, retailers & distributors, wireless content providers to business and technical consultants for the wireless industry. This sector, formed of technologically lead-using firms, was selected knowing that these firms have probably had to deal with m-commerce initiatives. Canada and the five Scandinavian countries were selected for their similar economies and their important level of Internet, electronic commerce and mobile phone penetration (eMarketer, 2003; Coursaris et al., 2003). Data was collected through an electronic questionnaire (email solicitation) from December 2001 to January 2002. Respondents were offered a benchmarking report for their collaboration to the study. Of the 1078 respondents contacted, 159 completed the survey (15.1% response rate).

The variables (and their operationalization) used to test the proposed conceptual model are:

- **Mobile commerce adoption** is measured with a binary variable where “1” represents the firms that have implemented a mobile commerce initiative.
- **Business-to-consumer orientation** is measured with a binary variable where “1” stands for firms targeting final customers.
- **Digital nature of the offering** is measured with a binary variable where “1” corresponds to firms offering intangible products and services that can be digitalized and transmitted over a wireless marketing channel.
- **Level of electronic commerce adoption** is measured by a ratio of electronic commerce adoption. This ratio is the means of the binary adoption of electronic commerce in eleven sales and marketing activities (1-promote your organization

¹ Finland, Sweden, Norway, Denmark and Iceland

and/or products services, 2-find and compare information, 3-negotiate prices and sale conditions, 4-place and manage orders, 5-sell online products/services, 6-collaborate to generate sales forecasts, 7-provide after-sales service, 8-tailor offerings to customers, 9-provide online advice, guidance and recommendations to your customers, 10-plan, manage, and execute marketing campaigns, 11-transfert payment information and funds).

- **Firm size** is measured by the number of employees.

The following table presents some basic information on the five variables (descriptive statistics). The upper part of the table (row 1 to 3) presents the proportion of respondents who have adopted a mobile commerce initiative, who have a business-to-consumer orientation and who offer digitalized products and services. The lower part of the table (row 4 and 5) presents the descriptive statistics of the level of e-commerce adoption and the size of the responding firms². The high standard deviation for the firm size variable clearly indicates that the responding firms are represented by both very small and large organizations.

Table 1 Descriptive statistics

	Proportion of the respondents	
Mobile commerce adoption	54.1 %	
Business to consumer orientation	17.0 %	
Digital nature of the offering	44.0%	
	Mean	St.dev.
Level of electronic commerce adoption	60.9%	41.4%
Firm size ^a	237.7	1166.6

4. Results and analysis

Using the five variables, a logistic hierarchical regression was executed to test the proposed the conceptual model presented in section 2; the dependant variable of this logistic regression naturally being mobile commerce adoption. Table 2 presents the results of this logistic hierarchical regression. The first model tests the influence of firm size. The second model captures the other three independent variables. Interaction effects have also been tested in a third model, but results do not significantly add to the overall predicted percentage of the proposed model. Table 2 shows that the regression of the second model explains significantly more variance than first model's regression, classifying adequately 81.5% of the respondents.

² It should be noted that the logarithmic transformation of the firm size is used in this study to ensure a normal distribution of the variable.

Table 2 Logistic hierarchical regression (n=159)

	Model 1		Model 2	
	B	Sig	B	Sig
Control variable				
Firm size ^a	0.166		0.089	
Independent variables				
Business to consumer orientation			0.224	
Digital nature of the offering			0.838 *	
Level of e-commerce adoption			4.469 ****	
Cox & Snell R ²	0.4 %		41.6%	
Nagelkerke R ²	0.5 %		55.6%	
Overall predicted percentage	54.8%		81.5%	
H&L Test	Sig 0.490		Sig 0.830	
-2 Log Likelihood	216.013		132.205	
Omnibus test of model coefficient ^b	****			

* p < 0.1 ; ** p < 0.05 ; *** p < 0.01 ; **** p < 0.001

^a Logarithmic transformation of the firm size.

^b Chi-square test (Model 2 – Model 1).

All four hypotheses are analyzed through the results of the logistic regression in table 2. Three of them are supported (see table 3) and the results of each are discussed in the following paragraphs.

Table 3 Results of the analysis of the proposed hypotheses

Hypotheses	Conclusion
H1: Firms targeting customer (B2C)	Not supported
H2: Software firms	Supported
H3: Level of e-commerce adoption	Supported
H4: Firm Size	Supported

According to our results, the prior adoption of e-commerce is the most significant predictor of m-commerce adoption (which supports the third hypothesis). The significance of the results (4.469) shows that an experience in e-commerce activities is often followed up by the implementation of m-commerce initiatives. Issues such as the technological infrastructure in place, the culture of the firm along with the organizational learning aspect of e-commerce have been looked after for e-commerce initiatives and now facilitate the implementation of m-commerce initiatives. Consequently, mobile commerce is merely seen as a complementary distribution channel to offer product and services.

Another significant result is the nature of products or services offered by companies. In our sample of firms, software-producing firms are more likely to adopt m-commerce initiatives to sell their products/services (0.838). Hence, m-commerce seems to address the distribution of digitalized products, which supports our second hypothesis. Nevertheless, future research initiatives should assess the stability of this result considering the increased use of m-commerce in supply chain planning and execution.

This digitalized distribution through m-commerce is mainly oriented towards businesses. The first hypothesis relating to the adoption of m-commerce initiatives by B2C oriented

firms is not supported by our analysis (0.224). Firms targeting final customers are not more likely to adopt m-commerce initiatives than firms targeting other types of customers (manufacturers, distributors, etc.). This result may be surprising at first knowing that a large number of product and services are available to mobile phones users. However, when taking into account the definition of m-commerce, which involves not only transactions but also the exchange of information, it is evident that users will use m-commerce initiatives to carry out business activities. For instance, a sales representative will access an ERP system through m-commerce to obtain the latest inventory or production information pertaining to a product. Employees of a firm may also use mobile commerce internally; for example, a machinist may use m-commerce to obtain task definition or quality control processes for its next production lot.

Finally, the fourth hypothesis is also supported by our results; size firm (0.089) is not a determinant in the adoption of m-commerce. M-commerce is accessible to all firms (large and small) and is used by firms of all size in their day-to-day activities. This results is not surprising knowing that m-commerce attracts many small software developing companies.

5. Conclusion

Mobile commerce is still considered a technology in emergence but early results show that it is a natural follow-up to electronic commerce. Our study explored the adoption of m-commerce in organizations and helps understand the role of specific determinants in the adoption of m-commerce. The results will also guide companies, mainly those offering m-commerce related products, in the selection of their offering (digitalized products) and in the pursue of future commercial opportunities (complementary to e-commerce initiatives). The specific setting (telecommunication industry) of this study limits the generalization of the results. It would be interesting to confirm the results in similar sectors (e-commerce and technology-driven), but also to compare the adoption of m-commerce in more traditional sectors such as music (digitalized products) or retail (physical products) industries.

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