

Key Drivers of Mobile Commerce Adoption. An Exploratory Study of Spanish Mobile Users

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Abstract

Despite dramatic differences between non-store shoppers were discovered, very limited research has been conducted to examine them. This paper analyses the background of M-commerce and key drivers of future M-commerce decision among Spanish mobile users. Our objective is two-fold: (1) to determine the influence of relations with the Mobile (frequency of Mobile use, length of Mobile use and Mobile affinity), demographics, non-store shopping previous experience (mail, catalogue, Television and Internet) and attitude to M-commerce and its influence on the M-commerce decision and (2) to identify key drivers of future M-commerce intention. We examined data from 606 personal interviews given to Spanish mobile users (270 Mobile shoppers and 336 non Mobile-shoppers) over 14 years old. Data analysis shows that age, attitude towards M-commerce, Internet shopping previous experience and relations with the Mobile (frequency, length of Mobile use and Mobile affinity) are the main predictors of M-commerce decision while age, length of Mobile use, Mobile affinity, consumer attitude towards M-commerce and previous M-commerce experience are the most relevant factors influencing future M-commerce intention. Based on these empirical results this research enables companies to know the key drivers influencing M-commerce adoption and, therefore, what aspects to highlight in their marketing strategies.

Key words: M-commerce, Consumer behaviour, Distance shopping, Affinity, Mobile users.

1 Introduction

Information and Computer Technologies (ICTs) are currently experiencing spectacular growth and gradually entering our homes. People are becoming increasingly familiar with the use of Internet and also the new mobile terminals such as electronic diaries and mobile phones.

Mobile telephony is growing fast, in combination with the development of wireless technology [31]. According to Wireless Week (2004) there were 94.9 million M-Commerce users worldwide in 2003 and the segment is expected to grow to 1.67 billion by 2008. Global income from M-Commerce was \$6.86 billion in 2003 and is expected to reach \$554.37 billion in 2008 [70].

At present, the Spanish mobile market has a penetration rate of 91.63% with 39.4 million mobile subscribers [48]. Spain has three mobile operators (see Table 1). With more than 18 million subscribers and a 48% market share, Telefónica Movistar dominates the Spanish market. Around 60% of Spanish end-users are prepaid users, but the trend is downward as the result of improved contract conditions to gain user loyalty [66].

Table 1: Spanish mobile telecom operators
 Source: [47], [48]

	Mobile operators		
	Telefónica Móviles (www.movistar.com)	Vodafone (www.vodafone.es)	Amena (www.amena.es)
Main shareholders	La Caixa BBVA	Grupo Vodafone	France Telecom
End-user market share in millions			
2001	15.71 (55.8%)	7.55 (29%)	4.87 (17.3%)
2002	18.10 (56.1%)	8.15 (25.3%)	6.00 (18.6%)
2003	18.87 (53.5%)	9.18 (26%)	7.22 (20.4%)
2004	18.70 (49.1%)	10.40 (27.4%)	8.90 (23.5%)
2005	18.91 (48%)	12.21 (31%)	8.27 (21%)
Average Monthly Revenue per User (ARPU)/ (euros)			
2004	32.4	35.4	28
2005	34.2	36.0	29

Non-store retailing is a form of retailing in which consumer contact occurs outside the confines of the retail store, such as vending machines and electronic shopping, at home personal selling, and catalogue buying [1]. The domain of activities where direct channels use and consumer purchase behaviour overlap can be called Non-store consumer purchase behaviour. [67] defines M-commerce as the buying and selling of goods and services using wireless hand-held devices such as mobile telephones or personal data assistants (PDAs). M-commerce may be thus regarded as an extension of Electronic commerce to wireless mediums [9]. This paper accordingly defines M-shopper as “the consumer who buys goods and services by using mobile access to computer-mediated networks with the help of an electronic device”. Non-store shoppers are not a homogeneous group [12], [23], [24], [32]. Although dramatic differences were discovered between non-store shoppers, there are still not enough studies that examine the demographic, behavioural and attitudinal differences among M-shoppers.

While published work on M-commerce applications and technologies and the different mobile operators and their services is becoming more abundant and representative [4], [8], [9], [18], [22], [25], [36], [39], [40], there is a lack of literature on the profile of users who buy products/services through the different mobile operators and on the analysis of the factors which most influence M-shopping behaviour and the processes of adopting M-commerce [9], [43], [49], [72], [73].

This work aims to present an in-depth study of M-commerce adoption, analysing the variables which influence the M-commerce decision. Our objective is two-fold: (1) to determine the influence of relations with the Mobile (frequency of Mobile use, length of Mobile use and Mobile affinity), demographics, non-store shopping previous experience (mail, catalogue, Television and Internet) and the attitude to M-commerce and its influence on the M-commerce decision and (2) to identify key drivers of future M-commerce intention. The study is divided in two parts. The first part includes the literature review and development of the working hypotheses. The second part includes the methodology used in the empirical study of a sample of 606 Spanish Mobile users and the data analysis.

2 Literature Review

2.1 Mobile relationships

Several authors maintain that consumers with most exposure to new technologies are those who are more willing to adopt direct channels [5], [17], [42], [45], [61].

Distance shoppers modify their behaviour and responses to marketing actions as their experience of the new environments increases [11]. For example, expert Internet shoppers surf more rapidly, their sessions are shorter, they visit a very small number of particular websites and enjoy their surfing experience more than novice users [10], [50]. If we focus on teleshopping, it has been shown that teleshoppers watch significantly more television than non teleshoppers [19], [21] and have greater teleshopping genre exposure [28], [62].

Bearing in mind the results in the literature, we test a similar effect with the following hypotheses:

H.1a) Frequency of Mobile use has a positive influence on M-commerce adoption.

H.1b) Frequency of Mobile use has a positive influence on future M-commerce intention.

H.2a) Length of Mobile use has a positive influence on M-commerce adoption.

H.2b) Length of Mobile use has a positive influence on future M-commerce intention.

A variable which captures the importance of the medium for the individual is affinity. There is evidence that the closer an individual's relationship with a medium, the greater the probability of purchase based on the content observed [3], [16]. Previous studies have found a positive, significant association between affinity and levels of televiewing [53]. It has also been found that this variable is one of the most significant predictors for certain medium relations such as dependency or parasocial interaction [53], [58]. [58] found that there is a positive correlation between Internet affinity and Internet dependency and that Internet purchase intention can be the result of particularly intense Internet dependency relations [58]. This leads us to suggest that Mobile affinity can also help to intensify Mobile shopping. To complement findings of the literature review, we addressed the following hypothesis on the Mobile affinity/M-commerce relation.

H.3a) Mobile affinity has a favourable influence on M-commerce adoption.

H.3b) Mobile affinity has a favourable influence on M-commerce intention.

2.2 Demographics

Previous research shows demographic differences among consumers using the different non-store shopping channels [7], [12], [23], [24], [32], [41], [44].

[24] compared catalogue and in-store shopper profiles and found significant differences in terms of age, education and income, while other authors such as [33] found differences in age, gender and income.

If we focus on teleshopping, previous research describes the American teleshopper as a woman (normally married), middle-aged, over 35 (in the 45-50 age range) in the medium and medium-high income bracket [54], [57], [63], [65], [69], [74]. In contrast, the British shopper has been described as a younger woman with children, between 18-45 years old (the average age is around 30) [52], [54].

One of the most successful systems of direct sales is Internet. Studies focused on countries with low Internet adoption rates (such as Greece or Singapore) report that the E-shopper profile is significantly different from that of the non-shopper and is mainly a young male, with a high level of education and income [61], [68]; in countries with high Internet adoption rates (such as the United States) online shopping has increased among people with different educational and economic levels, assimilating both profiles [23], [60].

Finally, the Mobile shopper in several European countries has been described as much younger than the non M-shopper [6], [48].

The influence of demographics on M-commerce adoption has not been sufficiently studied in the literature and so, in view of the above, we propose the following hypotheses:

H.4a) The individual's demographic profile has a significant influence on M-commerce adoption.

H.4b) The individual's demographic profile has a significant influence on future M-commerce intention.

2.3 Non-store shopping experience

[55] argues that “the adoption of one new idea may trigger the adoption of several others in a cluster which consists of one or more distinguishable elements of technology that are perceived as being interrelated”. The technology cluster concept has been used to examine the adoption of videotext [37], E-Commerce [20] and M-Commerce [73]. This concept posits that consumers are likely to adopt a technology offering the same functions as those already adopted. M-Commerce offers features, such as time saving, convenience, enjoyment and lower prices, which are similar to those offered by other non-store shopping channels.

Finally, it should be highlighted that some prior experience with non-store shopping channels has a positive influence on the adoption of new direct shopping channels, since the consumer acquires skill in purchasing products with no prior physical inspection [17], [35], [59].

In view of the above, it is to be expected that consumers with non-store shopping experience (either through the mobile or other media) purchase more through Mobile and have a stronger future M-commerce intention than those who have never used non-store shopping channels.

Therefore, we propose the following hypotheses:

- H.5a) Non-store shopping experience has a favourable influence on M-commerce adoption.
- H.5b) Non-store shopping experience has a favourable influence on future M-commerce intention.
- H.6) M-commerce experience has a favourable influence on future M-commerce intention.

2.4 Attitude towards M-commerce

The TAM model [13], [14], [15] posits that intention to use a technology is determined by the individual’s attitude towards the use of that technology. The model was developed by [13] to predict individual intention to use information technologies and has been used to predict future shopping intention towards non-store shopping channels such as Internet [51] or mobile [73]. [21] shows that the main predictor of the teleshopping decision is the relative advantage of non-store shopping over traditional channels and the compatibility of this advantage with consumer lifestyles. Studies focused on other non-store shopping channels such as Internet also show that positive or negative attitudes to distance shopping influence non-store shopping adoption [21], [26], [27],[51].

To complement the contributions of the above studies, we propose the following hypotheses:

- H.7a) A positive attitude to M-commerce has a favourable influence on M-commerce.
- H.7b) A positive attitude to M-commerce has a favourable influence on future M-commerce intention.

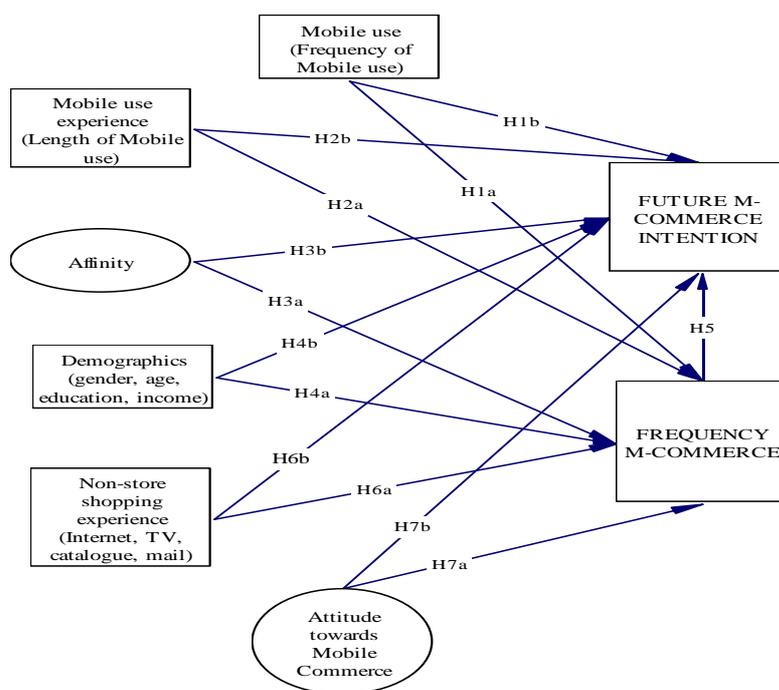


Figure 1: M-Commerce adoption model

The model above (see Figure 1) shows the influence of Mobile relationships (Mobile Affinity, frequency of mobile use and length of mobile use), demographics (age, gender, education and income), non-store shopping experience and attitude towards M-commerce in the present and future M-commerce decision.

3 Methodology

The data for analysis come from a study done in Spain from April to June 2006 on a sample of 606 mobile users over the age of 14. The sample included both M-shoppers and non M-shoppers. As in previous studies [29], [38] the sample was chosen using the convenience sampling method, with a greater proportion of young people (74.1% were between 14-24 years old). Young adults were selected because consumers under 30 have been found to be faster adopters of mobile services in general [38], [48].

Table 2: Profile of respondents

	M-shoppers (n=270)	Non M-shoppers (n=336)	Total (n=606)
GENDER			
Man	47%	56.7%	54%
Woman	53%	43.3%	46%
AGE			
From 14 to 24 years old	74.1%	48.4%	55.6%
From 25 to 34 years old	15.6%	17.9%	17.4%
From 35 to 49 years old	8.1%	19.1%	15.9%
From 50 to 64 years old	2.2%	14%	10.6%
65 or older	0%	0.6%	0.5%
EDUCATION			
No formal education	2.1%	2.7%	2.6%
Primary	31.9%	28.4%	29.3%
Secondary	43%	36.7%	38.6%
University	23%	32.2%	29.5%
INCOME			
I have no salary	56.6%	36.4%	42.2%
Well below average	4.5%	6%	5.5%
Below average	9%	9.3%	9.2%
Average	9%	13.5%	12.2%
Above average	17.2%	24.9%	22.8%
Well above average	3.7%	9.9%	8.1%

Table 3: Mobile use behaviour

	M-shoppers (n=270)	Non M-shoppers (n=336)	Total (n=606)
FREQUENCY OF MOBILE USE			
More than 10 times a day	23.7%	14%	16.8%
Between 5 & 10 times a day	29.6%	22.7%	24.6%
Between 3 & 4 times a day	24.4%	23.9%	24%
Between 1 & 2 times a day	10.4%	22.1%	18.7%
Several times a week	10.4%	12.8%	12.2%
Once a week	1.5%	1.2%	1.3%
Twice a month	-	2.1%	1.6%
Once a month	-	0.3%	0.2%
Less frequently	-	0.9%	0.6%
LENGTH OF MOBILE USE			
Less than 1 year	1.6%	3.4%	2.8%
Between 1 and 2 years	11.1%	10.1%	10.4%
Between 2 and 3 years	28.1%	12.8%	17.2%
Between 3 and 5 years	25.9%	36.4%	33.4%
Between 5 and 8 years	28.1%	31%	30.2%
over 8 years	5.2%	6.3%	6%

Mobile use behaviour was measured by the frequency of mobile use and length of time as mobile user. Mobile use experience was measured following the same criteria used in other research work [6]. It can be seen on table 3 that levels of mobile use are greater in M-shoppers with the data showing that over half of them (53.3%) use the mobile quite frequently (more than 5 times a day). These percentages are no as high in the case of non M-shoppers, with 22.1% stating that they use the mobile only 1-2 times a day and 17.3% even less frequently. The data on length of time as mobile users show that non M-shoppers have used mobiles for the longest, perhaps because they are older and therefore were able to buy one when mobiles were still a luxury item or were only used for professional purposes.

Table 4: Distance shopping experience

Non-store shopping experience	Mail	22.9%	17.1%	18.8%
	Catalogue	44.3%	32.1%	35.6%
	Television	15.3%	10.7%	12%
	Internet	48.9%	29.7%	35.2%

Consumers' non-store shopping experience was measured by asking if they had used other direct shopping systems (mail, catalogue, television and Internet) as shown on table 4. M-shoppers are more experienced non store shoppers than non M-shoppers with Internet being the most popular of all the direct shopping channels (48.9%).

Table 5: Mobile Affinity and Attitude towards M- Commerce

MOBILE AFFINITY	M-shoppers (n=270)	Non M-shoppers (n=336)	Total (n=606)
Using the Mobile is one of my main daily activities	3.38	2.46	2.72
If the Mobile is down I really miss it	3.50	2.84	3.03
The Mobile is important in my life	3.41	2.90	3.04
I can't go for several days without using the Mobile	2.87	3.00	2.96
I would be lost without the Mobile	3.08	2.49	2.66
ATTITUDE TO M-SHOPPING	M-shoppers (n=270)	Non M-shoppers (n=336)	Total (n=606)
Mobile shopping is appealing	2.88	2.22	2.41
Mobile shopping is convenient	3.56	2.83	3.04
Mobile shopping is involving	2.70	2.58	2.61
Mobile shopping is fascinating	3.17	2.34	2.58
Mobile shopping is interesting	3.29	2.47	2.70
Mobile shopping is valuable	2.89	2.35	2.51
Mobile shopping is exciting	2.87	2.32	2.48
Mobile shopping is secure	2.56	2.16	2.27
Mobile shopping is needed	2.05	1.83	1.89
Mobile shopping is a good idea	3.32	2.62	2.82
Mobile shopping is useful	3.17	2.53	2.71

A 5 item scale from previous studies was used to measure Mobile Affinity [53] as shown in Table 5. Evaluation for each item ranged from 1 "totally disagree" to 5 "totally agree". Attitude to M-commerce was measured by using an adaptation of Zaichkowsky's Personal Involvement Inventory Scale [75]. We used a five point Likert scale. Table 5 shows that M-shoppers consider the mobile more important and more necessary than non M-shoppers. Moreover, M-shoppers show a more positive attitude to purchasing through the system than Non M-Shoppers.

Table 6: M-commerce adoption and future M-commerce intention

FREQUENCY OF M-COMMERCE	FUTURE M-COMMERCE INTENTION			
	M-Shopper		M-Shopper	M-Non shopper
Not purchase	55.45%	No, definitely not	7.4%	45.9%
Once	28.10%	Probably not	8.9%	35.5%
2-4 times	12.25%	Indifferent	24.4%	12.3%
5-7 times	2.10%	Probably yes	40%	5.4%
8-10 times	2.10%	Yes, definitely	19.3%	0.9%

M-commerce behaviour was determined by asking interviewees about the purchase frequency of products/services they have already purchased through the mobile and future M-commerce intention by the response to the question

"Would you buy through the Mobile over the next few years?" on a 5 point Likert scale where 1: "No definitely not", 2: "Probably not", 3: "Indifferent", 4: "Probably yes" and 5: "Yes definitely". Despite the fact that 55.45% of those interviewed had not yet purchased any product and/or service through the mobile, 44.55% had done so in the last year, with M-shoppers being most willing to continue to purchase in the future (59.3%).

Table 7: Spanish Mobile services

MOBILE SERVICES	M-shoppers (n=270)	Non M-shoppers (n=336)
Logos	58.4%	23.3%
Monophonic and Polyphonic Ring Tones	77.9%	37.2%
Songs	58.1%	31.4%
Videos	19.9%	18.6%
Tickets for shows	4.4%	30.2%
Mobile Top-up	41.9%	34.9%
Vending goods	3%	9.2%
Information services	14%	11.6%
Vote services (SMS)	33.1%	9.3%
SMS for prize draws	30.9%	9.3%

Table 7 shows that Monophonic and Polyphonic Ring Tones (77.9%), logos (58.4%) and songs (58.1%) are the most purchased products. The mobile is also used to top up credit (41.9%) and send SMS to vote (33.1%) or take part in prize draws (30.9%). Interviewees who have still not made an M-purchase would be willing to purchase ring tones and songs (37.2% and 31.4% respectively), and to top up credit (34.9%) and purchase games (30.2%). These are low cost products which considerably reduces the perceived purchase risk.

4 Data Analysis

4.1 Validation of the measurement scales

The measurement scales used in this study (Mobile Affinity and Attitude to M-Commerce) were verified to ensure that they comply with the psychometric properties established in the literature.

Mobile Affinity and Attitude to M-Commerce were measured as in previous studies using a unidimensional scale with five and eleven items respectively. The results obtained in the scale reliability analysis using Cronbach's alpha show satisfactory values, exceeding the minimum threshold of 0.7 points in all cases (Mobile affinity=0.829; Attitude to M-Commerce=0.929).

Before analysing convergent and discriminant validity, the dimensionality of the measurement instruments was analysed using principal components exploratory factor analysis with Varimax rotation. Items for the variables Mobile affinity and Attitude to M-Commerce show appropriate unidimensional results, because only one factor is extracted from each of the proposed scales with significant explained variance in all cases (over 60%) (Mobile affinity=65.59; Attitude to M-commerce =69.36) and factor loads above the recommended minimum of 0.5.

Confirmatory analysis was used to evaluate convergent and discriminant scale validity, with statistical software EQS version 6.1 and Maximum Likelihood Estimation. Given that, model fit was not initially acceptable; the composition of some of the scales used was changed. AFIN4 and AFIN5 were eliminated from the Mobile Affinity scale and items ACT2, ACT3, ACT9 and ACT11 from the Attitude to M-Commerce scale. After eliminating these items, all the factor regression coefficients were significant ($t > 2.56$), standardised loads were above 0.5 and a good model fit was obtained (Likelihood ratio Chi Square= 112.196, $df = 34$, $p < 0.05$; Normed Fit Index (NFI)= 0.981; Non-normed Fit Index (NNFI)=0.964; Comparative Fit Index (CFI)=0.973; Incremental Fix Index (IFI)=0.973; Root Mean Square Error of Approximation (RMSEA)=0.070. These results confirm there is convergent validity. Discriminant validity was evaluated by verifying that the correlation between affinity and attitude (0.410) was not significantly higher than 0.8 points. Second, we checked that the value 1 did not appear in the interval of trust of the correlations between the scales (Mobile affinity-Attitude to M-Commerce: 0.318; 0.502). The results obtained confirm there is discriminant validity. Content validity was guaranteed by using scales whose reliability and validity had been previously verified by other authors in previous studies.

4.2 Hypotheses testing

Hypotheses were tested using structural equation models. [64], highlight two main advantages of this technique. Firstly, structural equation models mean that measurement error can be explicitly incorporated into marketing models and its influence on the degree of fit can be analysed. Secondly, with this technique relations between model variables can be studied simultaneously. The robust maximum likelihood estimation method was used due to this

estimation method guarantees estimation consistency even though some of the variables are ordinal [2], [34]. Because robust estimation methods were used, only the fit indicators in EQS for this estimation procedure are given.

The first step in model testing was to estimate the goodness-of-fit of the hypothesized research model (see table 8). We used three types of goodness-of-fit measures: (1) Absolute fit measures that assess only the overall model fit with no adjustment for the degree of overfitting that might occur, (2) Incremental fit measures that compare the proposed model to a comparison model and (3) Parsimonious fit measures that adjust the measures of fit to provide a comparison between models with differing numbers of estimated coefficients, the purpose being to determine the amount of fit achieved by each estimated coefficient.

As for the initial model, most of the goodness-of-fit statistics indicate that the model shows a poor fit with the data (see Table 8). We use the likelihood-ratio Chi-square as absolute fit measure. Low Chi-square values, which result in statistical significance levels greater than 0.05 indicate that the observed and estimated matrices are not statistically different (Chi-square of the initial model = 3857.867; $p < 0.001$). The Root Mean Square Error of Approximation (RMSEA) attempts to correct for the tendency of the Chi-square statistic to reject any specified model with a sufficiently large sample. RMSEA value is representative of the goodness-of-fit that could be expected if the model were estimated in the population. Values ranging from 0.05 to 0.08 are deemed acceptable (RMSEA of the initial model = 0.107). We considered the following Incremental fit measures: the Normed Fit index (NFI), the Non-normed Fit Index (NNFI) which combines a measure of parsimony into a comparative index between the proposed and null models, the Incremental Fit Index (IFI) and the Comparative Fit Index (CFI). All the incremental fit measures considered represent comparisons between the estimated model and a null or independence model. The values lie between zero and 1.0 and larger values indicated higher levels of goodness-of-fit (NFI= 0.701; NNFI= 0.650; IFI= 0.775; CFI= 0.982).

The normed Chi-square is the ratio of the Chi-square divided by the degrees of freedom [34]. It provides two ways to assess inappropriate models: a model overfitted which is typified by values less than 1.0 and models that are not yet truly representative of the observed data, with values greater than an upper threshold, either 2.0 or 3.0 (Normed Chi-square of the initial model = 16.7). The Akaike information criterion (AIC) compares models with differing numbers of constructs. AIC values closer to zero indicates better fit and greater parsimony.

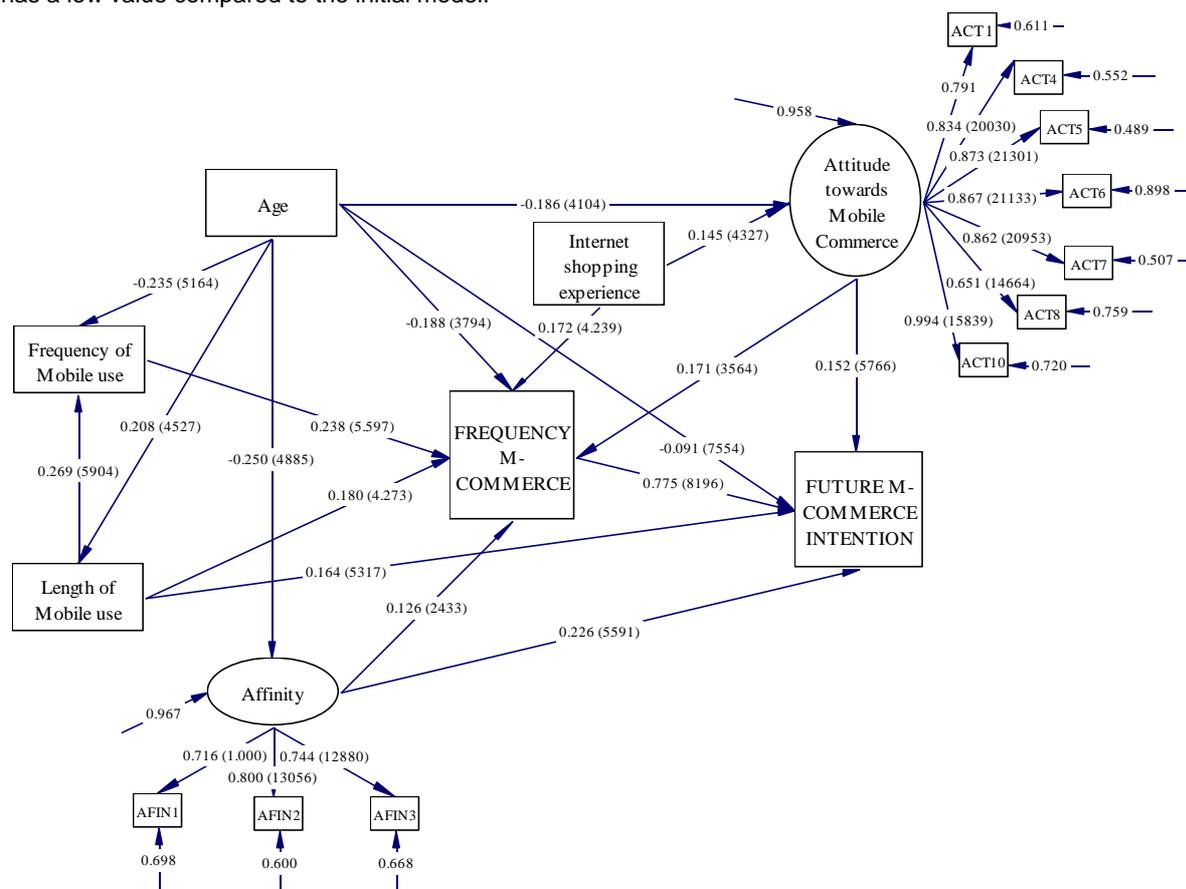
Table 8: Goodness of fit for the proposed model

Fit measurements	Optimum recommended level	Initial model	Final model
X ² (gl): p-value	p>0.05	3857.867 (231) <0.001	210.25 (91) 0.0024
Absolute fit measurements			
RMSEA	<0.08	0.107	0.05
Incremental fit measurements			
NFI	>0.9	0.701	0.984
NNFI	>0.9	0.650	0.956
IFI	Close to 1	0.775	0.992
CFI	Close to 1	0.982	0.992
Parsimonious fit measurements			
Normed X ²	Between 1,2 and 3	16.7	2.2
AIC	Low value	472.753	18.653

The initial model estimation indicates the need to re-specify the hypothetical model eliminating the following non significant relations: (1) gender, education, income-M-commerce (gender-M-commerce: 0.002, $t=1.474$; education-M-commerce: 0.031, $t=1.189$; income-M-commerce: 0.014, $t=0.969$), (2) gender, education, income-future M-commerce intention (gender-M-commerce intention: 0.007, $t=1.878$; education-M-commerce intention: 0.073, $t=1.274$; income-M-commerce intention: 0.053, $t=1.123$) (3) frequency of mobile use-future M-commerce intention (0.172, $t=1.603$) (4) non-store shopping experience-M-commerce (Mail-M-Commerce: 0.008, $t=1.412$; Catalogue-M-Commerce: 0.004, $t=1.219$; TV-M-Commerce: 0.010, $t=1.523$), (5) non-store shopping experience- future M-commerce intention (Mail-M-Commerce intention: 0.187, $t=1.594$; Catalogue-M-Commerce intention: 0.352, $t=1.193$; TV-M-Commerce intention: 0.224, $t=1.594$; Internet-M-Commerce intention: 0.042, $t=1.236$). Finally, we added the relations (1) age-frequency of mobile use; (2) age-length of mobile use; (3) age-attitude towards M-commerce; (4) age-affinity (5) non-store (Internet) shopping experience-attitude towards M-commerce.

As Figure 2 shows, the final model has an excellent fit. The Chi-square value of 210.25 with 91 degrees of freedom is statistically significant at the 0.000 significance level. However, the Chi-square is too sensitive to sample size differences especially in cases where the sample size exceeds 200 respondents. With this in mind, we examined a number of other measures. RMSEA has a value of 0.05 which falls in the acceptable range of 0.08 or less. All the incremental fit measures (NFI, NNFI, IFI and CFI) indicate that the model is acceptable because they exceeded 0.9.

The normed Chi-squared measure with a value of 2.2, falls within the threshold limits for this measure and the AIC has a low value compared to the initial model.



*t values in brackets ($t > 3.291$; $p < 0.001$).

Figure 2: M-commerce adoption final model*

As it can be seen the initial model has been modified and substantially simplified by eliminating some of the initial relations because they were not statistically significant, hence a rejected hypotheses in our study. The results suggest that frequency of Mobile use has a significant effect on M-commerce frequency (H1a. 0.238; $t=5.597$) but it does not affect future M-commerce intention. These results provide support for H1a but do not support H1b. Length of Mobile use has positive effects on M-commerce frequency (H2a. 0.180; $t=4.273$) and future M-commerce intention (H2b. 0.164; $t=5.317$), which provides support for H2a and H2b. In addition to these relations, we found that length of mobile use influences frequency of mobile use (0.269; $t=5.904$). Affinity has significant and positive effects on M-commerce frequency (H3a. 0.126; $t=2.433$) and the future M-commerce intention (H3b. 0.226; $t=5.591$). These results support H3a and H3b.

Contrary to our hypotheses, gender, education and income have no significant effect on M-commerce frequency or future M-commerce intention. These results only provide partial support for H4a and H4b. Age has significant and negative effects on M-commerce frequency (H4a. -0.188; $t= 3.794$) and future M-commerce intention (H4b. -0.091; $t=7.554$). In addition to these relations, we found that age influences frequency of mobile use (-0.235; $t=5.164$), length of mobile use (0.208; $t=4.527$), attitude towards M-commerce (-0.186; $t=4.104$) and Mobile affinity (-0.250; $t=4.885$).

Previous experience of Internet shopping has significant positive effects on M-commerce frequency (H5a. 0.172; $t=4.239$). Non-store shopping experience, however, does not influence the future M-commerce intention. This result does not support H5b and provides only partial support for H5a. In addition to these relations, we had found that Internet shopping experience does influence the attitude towards M-commerce (0.145; $t=4.327$).

The effect of M-commerce on future M-commerce intention was statistically significant (H6. 0.775; $t=8.196$). This provides support for H6. Attitude towards M-commerce has positive effects on M-commerce frequency (H7a. 0.171; $t=3.564$) and future M-commerce intention (H7b. 0.152; $t=5.766$), which provides support for H7a and H7b.

5 Discussion and managerial implications

In recent years, the use of new Information and Communication Technologies like mobile telephony has experienced unprecedented growth, providing consumers with new ways of relating and more agile, personalised communication. The mobile's complementary nature and synergy with other direct sales systems such as Internet and television, have made it an excellent Interactive Marketing tool which helps companies to complement their communication and sales actions in other media.

Given the generalised use of mobiles and the scarcity of studies which analyse the profile of the users of this system, this work has contributed to the research by providing an understanding of the factors influencing M-commerce adoption. We have analysed the influence of relations with the mobile, consumer demographic profile, non-store shopping previous experience, the influence of the attitude to M-commerce and affinity with the medium on M-commerce behaviour and we have identified the key drivers of future M-commerce intention.

Data analysis shows that age, relations with the mobile (frequency, length of mobile use and Mobile affinity), Internet shopping previous experience, attitude towards M-commerce are the main predictors of M-commerce decision while age, length of mobile use, consumer attitude towards M-commerce, affinity and previous M-commerce experience are the most relevant factors influencing future M-commerce intention.

Data analysis has highlighted the fact that age is the only demographic variable which can predict M-commerce behaviour, Mobile Affinity and future M-commerce intention. A possible explanation for this is that the new technological progress in mobile telephony makes it necessary to bear in mind the individual's capacity to understand the changes and complexities of the new technologies and to develop a positive attitude towards them [46], [71]. Young people use the mobile telephone from a very early age and for them it is a source of communication and entertainment as well as an alternative shopping channel. Young consumers show the most positive attitude towards innovation and change and thus are more willing to accept new services and contents offered by the different mobile phone operators. They are definitely the group with the most favourable attitudes towards the direct shopping channels.

It is also worth noting the positive influence of age on length of mobile use. A possible explanation for this is the fact that less than ten years ago the mobile in Spain was a very expensive item with limited performance, mainly used in a professional capacity by a specific segment of the population and was therefore something which young people could not afford.

Gender, education and incomes have not turned out to be determinant factors in the M-purchase decision. The possible differences due to gender in M-shoppers (and all virtual environments in general) tend to disappear as a consequence of changes in social habits and in the greater level of introduction and development of the new technologies [45], [60]. Thus, the findings of this study confirm the results of other research [45], [56] which highlights the fact that women are becoming increasingly familiar with virtual environments and that mobile use is becoming more and more widespread [60].

M-commerce previous experience has a positive influence on future M-commerce intention, suggesting that a consumer who has previously purchased through the Mobile is likely to make a purchase in the future. Making Internet purchases does also have a significant influence on the M-commerce decision. These findings are consistent with previous studies using the technology cluster concept that concludes "the adoption of new communication technologies is best predicted by the adoption of functionally similar technologies and user perception toward them" [55], [73]. Consumers who have purchased a product or service through Internet have broken the barriers to non-store shopping and therefore are more predisposed to M-commerce.

Internet shopping experience has also been found to be a positive influence on M-commerce attitude, perhaps due to important complementarity between the two shopping methods, as the mobile is one of the main formats for Internet access. This attitude leads to greater levels of M-purchase and more favourable future behaviour intentions.

Attitude towards M-commerce predicts actual and future M-commerce behaviour. It has been shown that consumers with the best opinion of the system have the strongest current and future M-commerce intention thus confirming that intention to use a given technology is determined by the individual's attitude towards using that technology [13], [14].

Mobile Affinity, frequency of Mobile use and length of mobile use influence M-commerce frequency. This result is in agreement with that of previous studies which show that the closer an individual's relationship with a medium, the greater the probability of purchase [3], [16] and that consumers with most exposure to new technologies are those who are more willing to use distance shopping channels [5], [17], [42], [45], [61].

A possible explanation for the influence of length of time as user on M-commerce and mobile use may be the increased performance and services offered by mobiles nowadays: full colour screens, MP3 players and integrated videos, loudspeakers, polyphonic ring tones, high speed Internet connectivity, etc., making these devices a perfect medium for reproducing all types of contents offering the consumer a wide range of possibilities and consequently increasing mobile use.

This research enables companies to know the key drivers influencing M-commerce adoption and, therefore, what aspects to highlight in their marketing strategies. The priority segment for companies to consider when launching their marketing campaigns should be that of young people, heavy Mobile-users, both men and women, preferably with previous experience of Internet shopping. Companies which use Mobile as a shopping channel should be able to offer new, innovative services and contents with added value to improve consumers' opinion of the M-commerce system as it would allow consumers to maintain a relation with the Mobile and to increase the probability of purchase.

The complementary use of Internet is recommended since the similarities between both methods and their important advantages may favour the adoption of non-store shopping systems, enabling companies which sell through the mobile to obtain marketing synergies.

In terms of the limitations of this study, there are complementary aspects not included in the questionnaire which we think would be interesting to analyse. Specifically, we have not analysed the impact of motivations and barriers on M-commerce adoption. For this reason, and bearing in mind the lack of research in this field, we think it would be very useful to complement this study with the development and validation of a scale to measure M-commerce motivations and perceived risk. Therefore, we are considering as a line of research, to propose and empirically test a general model of M-commerce behaviour. The consumer's cultural background is one of the aspects which can influence the creation of a favourable climate for developing and consolidating distance shopping [30]. For this reason, we consider that another interesting line of research would be to contrast the validity of the proposed behavioural model with samples of consumers from other cultures and compare the results obtained.

Finally, another limitation is the homogeneity of the sample formed by young consumers and the sampling technique used. Young consumers are an appropriate sample because they represent the younger end of the market for M-Commerce that managers want to attract owing to their long-term potential as affluent customers. Lack of randomness in the sample, however, limits its generalizability to a larger population; but since the main purpose of this exploratory study was to develop a model of M-Commerce, this is a minor limitation [26]. Moreover, the convenience sampling technique is being increasingly used in commercial research [29], [38]. While students are likely to be enthusiastic adopters of M-commerce, their relatively low income may influence the nature of the services which they adopt. Currently the products and services acquired by mobile are low cost and related to entertainment and leisure which contributes to their being more widely accepted by young people. For this reason, and despite that fact that this research analyses the profile of the consumer willing to acquire products and services which are currently marketed through the mobile, it would be interesting to repeat the study when the range of products and services has been increased to find out whether the results obtained are still valid.

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