Influence Factors in Adopting the m-Commerce

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Abstract—The development of mobile devices and wireless communications networks is an opportunity for the companies that want to achieve their customers anywhere and anytime. This work in progress explores the factors that influencing the adoption of m-commerce and proposes a methodology to aggregate the total influence of the incentives on the intention of use. The knowledge of these effects should improve the sale promotions policy, based on incentives, and can influence the adoption of m-commerce. The regression analysis confirms the relationship between the studied variables.

Keywords–Incentives; m-commerce; Technology Acceptance Model (TAM); theory of the forgotten effects.

I. INTRODUCTION

The wireless communication networks are spreading worldwide at a rate ever recorded to date by any other communication technology [1]. It has become an everyday technology that is changing the relationships at work, family, personal relationships and use of leisure time available anywhere and anytime.

To date, the m-commerce had been to buy ringtones, screensavers, games, videos, etc. This is a stagnant market in which there is to think about developing new kinds of content that appeal to the majority, which is a challenge for marketing departments of content providers as stated [2]. The development of mobile technology and the growth of access to navigation via mobile devices open up new possibilities for m-commerce. New kinds of e-commerce transactions, conducted through mobile devices using wireless networks and other wired e-commerce technologies. Is possible group the m-commerce [3] in transactions services (e.g., mobile shopping, ticket purchasing, stock trading), information services (e.g., news, location/traffic information) and entertainment services (e.g., download rings tone, download movies).

The literature on the adoption of the m-commerce is centered in the study of the intrinsic factors that influencing the intention of use of the m-commerce, but the companies need external factors that they can manipulate to influence the users. This research introduces the incentives, as external factor, and evaluates the total effect, direct and indirect, on the intention of use of the m-commerce. We consider that the knowledge of the real impact of the incentives improves the policy of promotions with the objective to influence the m-commerce adoption.

This work is structured in five sections: the first section presents a review on adoption of m-commerce; the second section presents the research model and explains the used factors; the third section is detailing the data collection and the measurement of variables and proposes the analysis methodology; the fourth section shows our preliminary results of the research, and finally, expose the main contributions for the business and scientific community, and comment future research.

II. ADOPTION OF M-COMMERCE

Many authors have defined the concept of m-commerce as the extension of electronic commerce that use wireless devices and telecommunications networks to accede anywhere and anytime to the exchange goods, services and information.

A review of the concept of m-commerce can be obtained from [4]. A base for studying the determinants of the intention of use is the Theory of Reason Action (TRA) [5] Behavior and attitude toward are subjective norm related to behavioral intention. Theory of Planned Behavior (TPB) [6] adding the perceived behavior determinant of the behavioral intention. Numerous studies take the Technology Acceptance Model (TAM) [7], based on TRA, to study the determinants of technology adoption. Many authors have used the TAM model in the study of acceptance of different technological innovations: Internet and mobile Internet, software, laptops, etc. For the purpose of this work should highlight the work in the fields of m-commerce [8][9][10]. Although there are various studies on the potential of wireless technology and mobile services it is necessary to explore new factors that affect the use intention of m-commerce.

III. THE RESEARCH MODEL

A. Objective

The purpose of this work is to understand the influence of the factors that affect the use intention of m-commerce adding the incentives to the TAM. The incentives are external factors that can be manipulated by the enterprises. So the main objective of this research was to determine the overall effect of incentives on the use intention of m-commerce, direct and indirect effect through other factors.

B. Proposed research model

The context and the incentives have significant impact on users' behavior. We introduce in the model the incentives (I) as antecedent of the intention of use of the m-commerce (BI_m).

H1: The incentives have a direct positive effect on intention of use of the m-commerce.

The incentive strategies influence the attitude toward the technology and the perceived usefulness (PU) in the self check-in service. Therefore we introduce in the model the incentives as antecedent of the attitude and PU.

H2: The incentives have a direct positive effect on attitude toward m-commerce.

H3: The incentives have a direct positive effect on perceived usefulness.

Considering the uses and gratifications theory a person who receives incentives will be most happy. Greater happiness can influence the perception. Based on the uses and gratifications theory, several studies [7] show the influence of intrinsic motivation in the decision to use mobile services. We introduce in the model the incentives as antecedent of the perceived enjoyment (PE).

H4: The incentives have a direct positive effect on perceived enjoyment.

Perceived ease of use (PEOU) as "the degree to believe that which a person using a particular system is free of effort" and observed a positive interaction of PEOU with the PU [7]. PEOU has been considered as an important determinant in adoption of past information technologies such as intranet [11], 3G [12], online banking [13][14] wireless internet [15], Internet commerce [16] and m-commerce [17][18][19][20][21]. We introduce in the model the PEOU as antecedent of the PU.

H5: The perceived ease of use has a direct positive effect on perceived usefulness.

An application of the m-commerce easier to use will also more funny to use [22][23][24][25][26]. We introduce in the model the PEOU as antecedent of the PE.

H6: The perceived ease of use has a direct positive effect on perceived enjoyment.

PU as "the degree to believe that which a person using a particular system would enhance his or her job performance" and observed a positive interaction of PE with the PU [7]. Similarly, [27][28] and [29] working this hypothesis. We introduce in the model the PE as antecedent of the PU.

H7: The perceived enjoyment has a direct positive effect on perceived usefulness.

PU and the PE as antecedent of attitude applied to technology acceptance [7][24][25][30]. Similarly, the PE is present in the studies of [31][32]. We introduce in the model the PU and the PE as antecedents of the attitude.

H8: The perceived usefulness has a direct positive effect on attitude toward m-commerce.

H9: The perceived enjoyment has a direct positive effect on attitude toward m-commerce.

TAM propose the attitude toward particular system as antecedent of the behavioral intention of use following the TRA and the TPB. Then we introduce in the model the attitude as antecedent of the intention of use of the m-commerce (BI_m).

H10: The attitude toward m-commerce have a direct positive effect on intention of use of the m-commerce.

The social influence is present in the TRA [5] and the TPB [6] as antecedent of behavioral intention through the subjective norms. We introduce in the model the social influence (SI) as antecedent of the PE and the attitude toward the m-commerce (Attm).

H11: Social influence has a direct positive effect on perceived enjoyment.

H12: Social influence has direct positive effect on attitude toward the m-commerce.

IV. METHODOLOGY

A. Data collection

We made a survey with students because they are more susceptible to use this kind of services. A total 367 questionnaires have been validated. The sample is formed of 60.3% of women and 39.7% of men, with ages between 19 and 37 years. As for the experience in online purchase, 95.6% have occasionally bought on the Internet and 14.7% have bought some product through the mobile devices.

B. Measurement of variables

A literature review facilitates the scales for measure the constructs. According to [33][34] a factor analysis allows checking the validity of measurement scales. All items should be higher of 0.6. A Cronbach's alpha analysis was done in order to analyze the reliability of the used scales and to test internal consistency of the scales. All factors exceed 0.7, as recommended [35].

Likert scales (ranging from 1 to 7), with anchors ranging from ''strongly disagree'' to ''strongly agree'' were used for all questions.
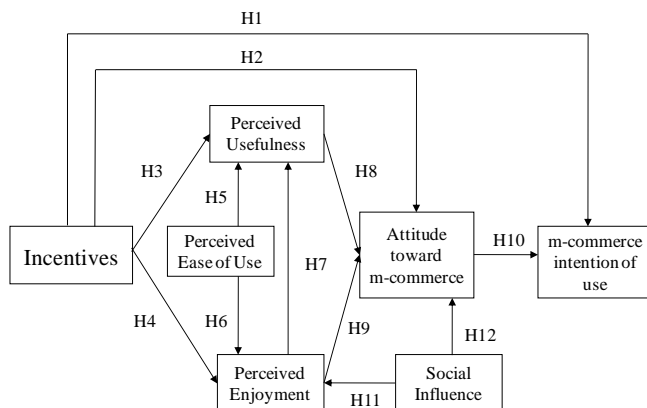

Figure 1. Reseach model.

TABLE I.   THE SCALES' FIT

Sacales	Items	KMO	Total Variance Explained	Cronbach's Alpha
PE	1-9	0.835	58.316%	0.907
PU	10-14	0.864	82.529%	0.946
PEOU	15-20	0.807	66.822%	0.896
SI	28-31	0.676	86.896%	0.949
A	32-37	0.87	75.006%	0.933
BIm	38-40	0.733	86.089%	0.918
I	41-45	0.85	83.842%	0.947

We use the software SPSS 17 to make the factor analysis and the reliability test. We confirm, in a preliminary analysis the validity and the reliability of all scales considered keeping in mind the adjustment measures previously discussed.

C. Factors influences

To calculate the influence of each factor on the proposed constructs (perceived usefulness, perceived enjoyment, attitudes toward the m-commerce and intention of use of the m-commerce) has made four multiple regression analysis. The table II shows the preliminary results.

D. Incidences of first order and higher

The incidence between two variables is the cause-effect relationship of one variable on another. The simplest case is the incidence of first order (e.g., A affects B) where A is the cause of B. Second order is considered where the impact is not direct (e.g., A affects B through C).

In the the model there are incidences of first order: I → A Incentives (I) affect the attitude (Attm). But there are also incidences of second order: I → A → BI_m, Incentives (I) have an indirect effect on the intention of use of m-commerce (BI_m) through attitude toward the m-commerce (Attm).

With the intention of determining the overall effect of incentives on the intended use of m-commerce use the theory of the forgotten effects. To calculate the maxmin convolution of the impact of A on C from the impact of A on B and the incidence of B on C using the formula [36]:

$$\mu\,(a_i,\,c_k) = V\,(\mu\,(a_i,b_j)\ \Lambda\ \mu\,(b_j,c_k)) \qquad (1)$$

For all a_i, b_j y c_k 　　　 i = 1, 2, 3,…
　　　　　　　　　　　　 j = 1, 2, 3,…
　　　　　　　　　　　　 k = 1, 2, 3,…

Maxmin convolution can be represented with the symbol (°) so that the process can be summarized as follows:

$$m_{ac} = m_{ab} \circ m_{bc} \qquad (2)$$

In the case of an incidence of order 3:

$$m_{ad} = m_{ab} \circ m_{bc} \circ m_{cd} \qquad (3)$$

Given that the maxmin convolution satisfies the associative property:

$$m_{ab} \circ (m_{bc} \circ m_{cd}) = (m_{ab} \circ m_{bc}) \circ m_{cd} \qquad (4)$$

In the case of incentives (I) there are incidences of first (I → BI_m), second (I → A → BI_m), third (I → PU → A → BI_m) and fourth order (I → PE → PU → A → BI_m) on the intention 　of 　use of m-commerce 　(BI_m). As develop the following:

$$m_{I\,BIm} = m_{I\,PE} \circ m_{PE\,PU} \circ m_{PU\,A} \circ m_{A\,BIm} \qquad (5)$$

V.   RESULTS

An exploratory analysis has been made with 67 questionnaires of the sample. The results of regression analysis can be seen in the following table:

TABLE II.   REGRESSION ANALYSIS OUTPUTS

Dependent variable: Intention of use of the m-commerce.
Adjusted R^2: 0.859　　　　　　　SE: 0.483

Independent variables	B	SE	t	Sig
Attitude	0.698	0.110	6.367	0.000
PE	0.208	0.113	1.837	0.071
Incentives	0.087	0.047	1.852	0.069

Dependent variable: Attitude toward the m-commerce.
Adjusted R^2: 0.833　　　　　　　SE: 0.505

Independent variables	B	SE	t	Sig
PE	0.495	0.101	4.892	0.000
PU	0.251	0.067	3.768	0.000
Incentives	0.142	0.048	2.932	0.005
Social Influence	0.049	0.012	3.981	0.000

Dependent variable: Perceived usefulness.
Adjusted R^2: 0.671　　　　　　　SE: 0.839

Independent variables	B	SE	t	Sig
PE	0.454	0.131	3.457	0.001
PEOU	0.383	0.088	4.365	0.000
Incentives	0.321	0.070	4.605	0.000

Dependent variable: Perceived enjoyment.
Adjusted R^2: 0.501　　　　　　　SE: 0.678

Independent variables	B	SE	t	Sig
POEU	0.166	0.068	2.457	0.017
Incentives	0.141	0.053	2.646	0.010
Social Influence	0.070	0.014	5.075	0.000

All variables in the regression models are significant (Sig<0,1). Then is possible to confirm the hypothesis of the

research model. Although is necessary develop a confirmatory analysis with the 367 questionnaires of the sample.

Confirmed the hypothesis we calculate the impact of incentives on the set of constructs studied in the model with the proposed methodology based on the theory of forgotten effects.

VI.   CONCLUSION AND FUTURE WORK

The development of the methodology proposed will allow study the aggregate effect of one factor on another, keeping in mind direct and indirect effects. It is important to aggregate the effects to know the importance of the factors in the acceptance of m-commerce process. Besides the incentives is a controllable factor for the company, so it can be used as a tool to improve the acceptance of m-commerce.

The combination of the regression analysis and forgotten effects provide a solution to aggregate all influences, direct and indirect, that exists between two variables. Other kind of analysis such as structural equation models obtain result from a group of factors on others but does not offer solution to find the total effect of one variable on another.

If the responsible of decision-making knows the total effects of the incentives on the intention of use of m-commerce then can influence to the users. The findings of this research can incorporate in the sales promotion policy to accelerate the acceptance of this new channel and augmenting sales.

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