

## **Mobile Telephony: The Influencing Factors of Using A Mobile Phone by Undergraduate and Graduate Students in Three Global Countries**

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### **ABSTRACT**

*Individual adoption of technology has been studied extensively in the workplace, but far less attention has been paid to adoption of technology in the household (Brown & Venkatesh, 2005). Obviously, mobile phone is now integrated into our daily life. Indeed, according to International Data Corporation (IDC), the market reached 1.472 billion mobile phones sold in the world in 2017 (ZDNet, 2018). In addition, according to Statista, there was*

*4.77 billion mobile phone users worldwide in 2017 while the population was reaching 7.6 billion people, and there will be 5.07 billion mobile phone users worldwide by 2019 (Statista, 2018). The purpose of this study is then to pursue the investigation on the determining factors that make such people around the world are so using the mobile phone. On the basis of the model of acceptance of technology in household (MATH) developed by Brown and Venkatesh (2005) to verify the determining factors in intention to adopt a computer in household by American people, this study extends this moderator-type research model to examine the determining factors in the use of mobile phone in household by undergraduate and graduate students from four universities within three countries over the world. Data were randomly gathered from 750 undergraduate and graduate students from Yaounde in Cameroon, Kinshasa in Congo, and New Brunswick in Canada who own a mobile phone. Data analysis was performed using the structural equation modeling software Partial Least Squares (PLS). The results revealed, among others, that two-third of the variables examined in the study, including the three new variables we added to the Brown and Venkatesh's research model, showed to be determining factors in the use of mobile phone by undergraduate and graduate students.*

**Keywords:** Mobile Telephony; Model of Acceptance of Technology in Household; Moderator-Type Research Model.

## INTRODUCTION

Since numerous years, mobile phone is used for different professional purposes, particularly by senior managers in the workplace. And this technology is more and more used in the workplace since mobile applications have been integrated to

business strategies. Individual adoption of technology has been studied extensively in the workplace, but far less attention has been paid to adoption of technology in the household (Brown & Venkatesh, 2005). Obviously, mobile phone is now integrated into our daily life. Indeed, according to International Data Corporation (IDC), the market reached 1.472 billion mobile phones sold in the world in 2017 (ZDNet, 2018). In addition, according to Statista, there was 4.77 billion mobile phone users worldwide in 2017 while the population was reaching 7.6 billion people, and there will be 5.07 billion mobile phone users worldwide by 2019 (Statista, 2018).

Few studies have been conducted until now which investigate the intention to adopt a mobile phone by people in household (in the case of those who do not yet own a mobile phone) or the use of mobile phone in the everyday life of people in household (in the case of those who own a mobile phone). We can easily see that mobile phone is actually completely transforming the ways of communication of people around the world. It is therefore crucial to more deeply investigate the determining factors in the use of mobile phone by people in household. The purpose of this study is then to pursue this investigation of the determining factors that make such people around the world are so using the mobile phone.

## **LITERATUR REVIEW**

The related literature on the actual research areas of mobile phone is summarized in Table 1. In addition to the summary of literature on the actual research areas of mobile phone presented in Table 1, other researchers have identified some factors which may increase the use of mobile phone by people in household. For example, in a large study conducted in 43 countries over the world, Kauffman and Techatassanasoontorn (2005) noted a faster increase in the use of mobile phone in countries having a more

developed telecommunications infrastructure, being more competitive on the wireless market, and having lower wireless network access costs and less standards regarding the wireless technology. Another study involving 208 users by Wei (2007) showed that different motivations predict diverse uses of mobile phone. According to the Wei's findings, mobile phone establishes a bridge between interpersonal communication and mass communication. A large study conducted by Abu and Tsuji (2010) in 51 countries classified by the Banque Mondiale revealed that, in general, income is a very important factor to adopt a mobile phone in the countries having a fix telephone infrastructure. And, in a study examining the effect of peer influence in the diffusion of the iPhone 3G across a number of communities sampled from a large dataset provided by a major European Mobile Carrier in one country, De Matos et al. (2014) found that, during a period of 11 months, 14% of the iPhone 3Gs sold by this carrier were due to peer influence.

As we can see in the summary of literature related to mobile phone presented above, relatively few studies until now examined the determining factors in the use of mobile phone by people in household. And there are practically no studies performed on the use of mobile phone by students. Thus, the present study brings an important contribution to fill this gap as it allows a better understanding of the impacts of mobile phone usage into people's daily life (in this case, undergraduate and graduate students). It focuses on the following research question: What are the determining factors in the use of mobile phone by undergraduate and graduate students?

**Table 1. Related Literature Survey  
(adapted from Isiklar and Büyüközhan, 2007, p. 267; and updated)**

<b>Mobile phone diffusion and its impacts on people's daily life</b>	
LaRose (1989)	De Matos et al. (2014)
Kwon & Chidambaram (2000)	Fillion & Booto Ekionea (2014)
Botelho & Costa Pinto (2004)	Fortunati & Taipale (2014)
Funk (2005)	Kafyulilo (2014)
Andonova (2006)	Suyinn et al. (2014)
Centrone et al. (2007)	Takao (2014)
Ehlen & Ehlen (2007)	Velmurugan & Velmurugan. (2014)
Fillion & Berthelot (2007)	Paul et al. (2015)
Fillion & Le Dinh (2008)	Darcy et al. (2016)
Kurniawan (2008)	Fillion & Booto Ekionea (2016)
Abu & Tsuji (2010)	Hatuka & Toch (2016)
Sripalawat et al. (2011)	Kim et al. (2016)
Abdul-Karim et al. (2010)	Aitameemy (2017)
Fillion & Booto Ekionea (2010)	Brinkman et al. (2017)
Glajchen (2011)	Liu (2017)
Kuznekoff & Titsworth (2013)	Venkatesh et al. (2017)
Kwun et al. (2013)	Ye & Kankanhalli (2018)
<b>Mobile phone ownership and usage</b>	
LaRose (1989)	Fortunati & Taipale (2014)
Kwon & Chidambaram (2000)	Kafyulilo (2014)
Palen et al. (2000)	Kim & Park (2014)
Aoki & Downes (2003)	Saaksjarvi et al. (2014)
Selwyn (2003)	Suyinn et al. (2014)
Davie et al. (2004)	Takao (2014)
Mazzoni et al. (2007)	Velmurugan & Velmurugan (2014)
Peters et al. (2007)	Fortunati et al. (2015)
Tucker et al. (2007)	Paul et al. (2015)
Sohn & Kim (2008)	Darcy et al. (2016)
Wessels & Drennan (2010)	Hatuka & Toch (2016)
Chong et al. (2010)	Kim et al. (2016)

Gebauer et al. (2010) Wesolowski et al. (2012) Kwun et al. (2013) De Matos et al. (2014)	Hilao & Wichadee (2017) O'Bannon et al. (2017) Ketterer Hobbis (2018) Vernon et al. (2018)
<b>Mobile phone ownership and usage from a behavioral and psychological perspective</b>	
Karjaluoto et al. (2003) Wilska (2003) Davie et al. (2004) Liljander et al. (2007) White et al. (2007) Butt & Phillips (2008) Abu & Tsuji (2010) Kimiloglu et al. (2010) Lane & Manner (2011) Kim & Park (2014)	Suyinn et al. (2014) Takao (2014) Chan (2015) Lin et al. (2015) Takashi (2015) Darcy et al. (2016) Lusinga & Kyobe (2017) Ketterer Hobbis (2018) Vernon et al. (2018)
<b>Effects on human health and daily activities</b>	
Repacholi (2001) Salvucci & Macuga (2002) Weinberger & Richter (2002) Sullman & Baas (2004) Treffner & Barrett (2004) Westerman & Hocking (2004) Balik et al. (2005) Balikci et al. (2005) Eby et al. (2006) Rosenbloom (2006)	Törnros & Bolling (2006) Cocosila & Archer (2010) Kuznekoff & Titsworth (2013) Suyinn et al. (2014) Chan (2015) Lin et al. (2015) Paul et al. (2015) Lusinga & Kyobi (2017) Ketterer Hobbis (2018)
<b>Evaluation and design of mobile phone features for user interface and user satisfaction</b>	
Chuang et al. (2001) Chen et al. (2003) Han & Wong (2003) Chae & Kim (2004)	Haverila (2011) Saaksjarvi et al. (2014) Takashi (2015) Brinkman et al. (2017)

Han et al. (2004) Lee et al. (2006) Kimiloglu et al. (2010)	O'Bannon et al. (2017) Venkatesh et al. (2017) Ye & Kankanhalli (2018)
<b>Analytical evaluations of mobile phone-related observations</b>	
Tam & Tummala (2001) Campbelland Russo (2003) Han & Wong (2003) Wang & Sung (2003)	Lai et al. (2006) Haque et al. (2010) Liu (2010) Lusinga & Kyobi (2017)
<b>Comparative analysis on the use of mobile phone according to the cultures</b>	
Zhang & Maruping (2008) Lee & Lee (2010) Wesolowski et al. (2012)	Kim & Park (2014) Takao (2014) Velmurugan & Velmurugan (2014)
<b>New mobile phone generation on the form of mobile computer and virtual life</b>	
Brown (2008) Hurlburt et al. (2011) Murugesan (2011)	Kwun et al. (2013) De Matos et al. (2014) Fortunati et al. (2015)

The paper builds on the conduct of hypothetico-deductive scientific research in organizational sciences (see Fillion, 2004) and it is structured as follows: first, the theoretical approach which guides the study is developed; second, the methodology followed to conduct the study is described; finally, the data analysis and the results of the study are presented and discussed.

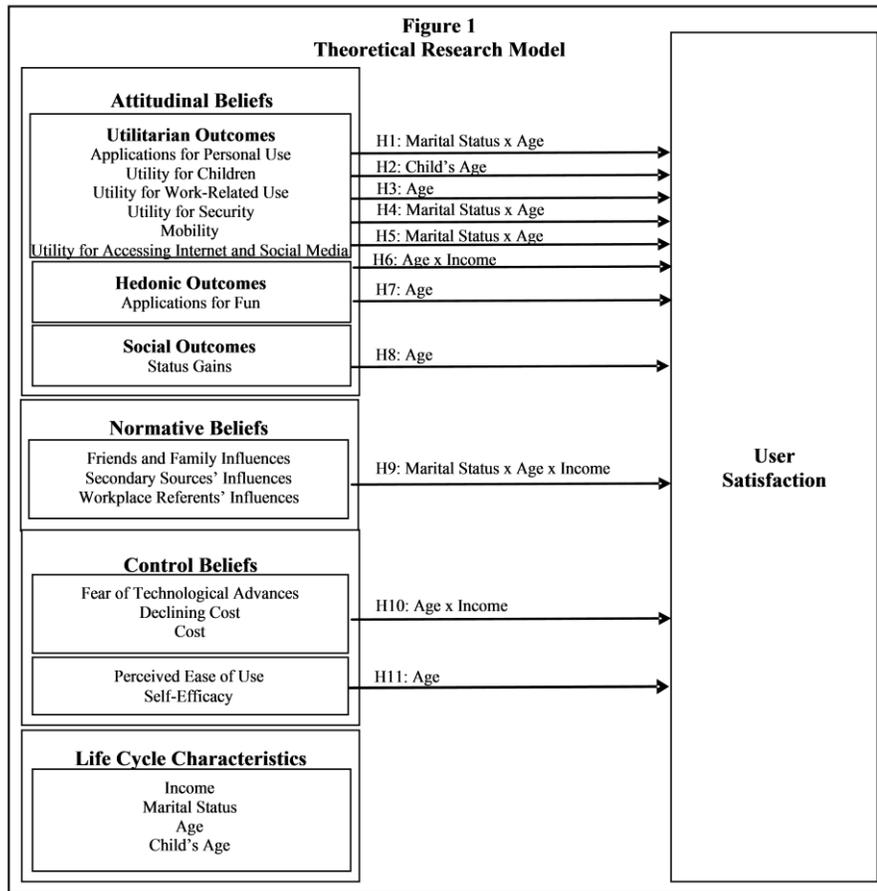
## **THEORETICAL DEVELOPMENT**

This study is based on the theoretical foundations developed by Venkatesh and Brown (2001) to investigate the factors driving personal computer adoption in American homes as well as those developed by Brown and Venkatesh (2005) to verify the determining factors in intention to adopt a personal computer in

household by American people. In fact, Brown and Venkatesh (2005) performed the first quantitative test of the recently developed model of adoption of technology in household (MATH) and they proposed and tested a theoretical extension of MATH integrating some demographic characteristics varying across different life cycle stages as moderating variables. In this study, we tested user satisfaction as dependent variable instead of behavioral intention given the undergraduate and graduate students investigated already own a mobile phone. And we extended the Brown and Venkatesh's model with the addition of three new independent variables in order to verify whether the students are using a mobile phone for a matters of security, mobility, and access to Internet and social media. The resulting theoretical research model is depicted in Figure 1.

Figure 1 shows that Brown and Venkatesh (2005) integrated MATH and Household Life Cycle in the following way. MATH presents five attitudinal beliefs grouped into three sets of outcomes: utilitarian, hedonic, and social. Utilitarian beliefs are most consistent with those found in the workplace and can be divided into beliefs related to personal use, children, and work (we added beliefs related to security, mobility, and access to Internet and social media). The extension of MATH suggested and tested by Brown and Venkatesh (2005) presents three normative beliefs: influence of friends and family, secondary sources, and workplace referents. As for control beliefs, they are represented in MATH by five factors: fear of technological advances, declining cost, cost, perceived ease of use, and self-efficacy. And, according to Brown and Venkatesh (2005), integrating MATH with a life cycle view, including income, age, child's age, and marital status, allows to provide a richer explanation of household personal computer (PC) adoption (household mobile phone use, in this study) than those provided by MATH alone. Finally, as shown in Figure 1, the

dependant variable of the theoretical research model developed is related to user satisfaction (satisfaction in the use of mobile phone by undergraduate and graduate students).



In the remainder of the section, we develop eleven research hypotheses (H1-H11) related to the theoretical research model suggested in Figure 1. It is important here to note that these eleven

research hypotheses are adapted from the Brown and Venkatesh (2005) paper. In fact, in the present study, we test the same research hypotheses than Brown and Venkatesh (2005) did in their study and we test three new research hypotheses related to the three new independent variables we added to the research model. Also, we use a different technology (mobile phone instead of personal computer), a different dependent variable (user satisfaction instead of behavioral intention), a different methodology (an in-class randomized survey instead of a nationwide survey with the assistance of a market research firm and an electronics retail store), as well as a different sample (undergraduate and graduate students from four universities of three global countries (Cameroon, Congo, and Canada) instead of American people).

HYPOTHESIS 1 (H1). Marital status and age will moderate the relationship between applications for personal use and satisfaction of using a mobile phone at home.

HYPOTHESIS 2 (H2). Child's age will moderate the relationship between utility for children and satisfaction of using a mobile phone at home.

HYPOTHESIS 3 (H3). Age will moderate the relationship between utility for work-related use and satisfaction of using a mobile phone at home.

HYPOTHESIS 4 (H4). Marital status and age will moderate the relationship between utility for security and satisfaction of using a mobile phone at home.

HYPOTHESIS 5 (H5). Marital status and age will moderate the relationship between mobility and satisfaction of using a mobile phone at home.

HYPOTHESIS 6 (H6). Age and income will moderate the relationship between utility for accessing Internet and social media and satisfaction of using a mobile phone at home.

HYPOTHESIS 7 (H7). Age will moderate the relationship between applications for fun and satisfaction of using a mobile phone at home.

HYPOTHESIS 8 (H8). Age will moderate the relationship between status gains and satisfaction of using a mobile phone at home.

HYPOTHESIS 9 (H9). Age, marital status, and income will moderate the relationship between the normative beliefs ((a) friends and family influences; (b) secondary sources' influences; and (c) workplace referents' influences) and satisfaction of using a mobile phone at home.

HYPOTHESIS 10 (H10). Age and income will moderate the relationship between the external control beliefs ((a) fear of technological advances; (b) declining cost; and (c) cost) and satisfaction of using a mobile phone at home.

HYPOTHESIS 11 (H11). Age will moderate the relationship between the internal control beliefs ((a) perceived ease of use; and (b) self-efficacy) and satisfaction of using a mobile phone at home.

In the next section of the paper, we describe the methodology followed to conduct the study.

## **METHODOLOGY**

This study was designed to gather information on mobile phone adoption decisions from undergraduate and graduate students. Indeed, the focus of the study is on university students who own a mobile phone. So we conducted in-class survey research with undergraduate and graduate students from four universities

within three global countries: University of Yaounde I and University of Yaounde II from Yaounde in Cameroon, School of Commerce from Kinshasa in Congo, and University of Moncton from New Brunswick in Canada. In this section, we describe the instrument development and validation, the sample and data collection, as well as the data analysis process.

### **Instrument Development and Validation**

To conduct the study, we used the survey instrument developed and validated by Brown and Venkatesh (2005) to which we added four new scales, the first three measuring other dimensions in satisfaction in the use of mobile phone by people in household, that is, utility for security, mobility, and utility for accessing Internet and social media, and the last one measuring user satisfaction as such. The survey instrument was then translated in French (a large part of the population in Africa is speaking French) and both the French and English versions were evaluated by peers. This review assessed face and content validity (see Straub, 1989). As a result, changes were made to reword items and, in some cases, to drop items that were possibly ambiguous, consistent with Moore and Benbasat's (1991) as well as DeVellis's (2003) recommendations for scale development. Subsequent to this, we distributed the survey instrument to a group of MBA students for evaluation. Once again, minor wording changes were made. Finally, we performed some adjustments to the format and appearance of the instrument, as suggested by both peers and MBA students. As the instrument was already validated by Brown and Venkatesh (2005) and showed to be of a great reliability, that we used the scale developed by Hobbs and Osburn (1989) and validated in their study as well as in several other studies to measure user satisfaction, and that we added only few items to

measure the new variables utility for security, mobility, and utility for accessing Internet and social media, then we have not performed a pilot-test with a small sample. The evaluations by both peers and MBA students were giving us some confidence that we could proceed with a large-scale data collection.

### **Sample and Data Collection**

First, in this study, we chose surveying undergraduate and graduate students over 18 years from University of Yaounde I (French language) and University of Yaounde II (English Language) in Cameroon; School of Commerce (English language) of Kinshasa in Congo; and University of Moncton (French language) of New Brunswick in Canada who own a mobile phone. To do that, in the summer semester, undergraduate and graduate students from University of Yaounde I and University of Yaounde II in Cameroon have been randomly selected from different business administration courses in order to answer our research survey in-class. And in the fall semester and the beginning of the winter semester, undergraduate and graduate students from the School of Commerce in Congo and the University of Moncton in Canada have also been randomly selected from different business administration courses to answer our survey in-class. The sample in the present study is then a randomized sample, which is largely valued in the scientific world given the high level of generalization of the results got from such a sample. Once a student had the necessary characteristics to answer the survey and was agreeing to answer it, one of the researchers in this study was there to guide him/her to rate each item of the survey on a seven points Likert-type scale (1: strongly disagree... 7: strongly agree). In addition, the student was asked to answer some demographic questions.

Finally, it is important here to mention that no incentive has been used in order to try increasing the response rate of the study.

Following this data collection process, 240 students from University of Moncton in Canada answered our survey, 265 students from the School of Commerce in Congo, and 249 students from University of Yaounde I and University of Yaounde II in Cameroon answered our survey. In the whole, 754 students completed our survey. But one survey from University of Moncton in Canada and three surveys from the School of Commerce in Congo have been rejected given they were lacking too much data. So, the final sample of the study consisted of 750 undergraduate and graduate students: 239 from University of Moncton in Canada; 262 from the School of Commerce in Congo; and 249 from University of Yaounde I and University of Yaounde II in Cameroon.

### **Data Analysis Process**

The data analysis of the study was performed using a structural equation modeling software, that is, Partial Least Squares (PLS-Graph 3.0). Using PLS, data have no need to follow a normal distribution and it can easily deal with small samples if the sample is at least 10 times greater than the number of items measuring the variable having the greatest weight in terms of items into the model (Barclay et al., 1995; Fornell & Bookstein, 1982). Recently, some authors (see Goodhue et al., 2012) tried to refute this evidence but, in our view, they did not succeed well. In addition, PLS is appropriate when the objective is a causal predictive test instead of the test of a whole theory (Barclay et al., 1995; Chin, 1998) as it is the case in this study. And, to ensure the stability of the model developed to test the research hypotheses, we used the PLS bootstrap resampling procedure (the interested reader is referred to a more detailed exposition of bootstrapping (see Chin

1998; Chin et al. 2003; Efron & Tibshirani, 1993)) with an iteration of 100 sub-sample extracted from the initial sample (750 undergraduate and graduate students). Some analyses were also performed using the Statistical Package for the Social Sciences software (IBM SPSS Statistics 25). The data analysis and the results follow.

## **DATA ANALYSIS AND RESULTS**

In this section of the paper, the data analysis and the results of the study are presented. We begin to provide some characteristics of the participants. Finally, we describe the results got from PLS analyses to test the research hypotheses and we discuss about some implications.

### **Participants**

The participants in this study (undergraduate and graduate students) were relatively young, with a mean of 24.36 years and a standard deviation of 6.25 years. More than half of the participants were male (60%). More than 90% of the participants were single (88%) or married (6.8%). The gross yearly income of the respondents in the study was in the range of \$0 to \$40 000 CAD. Indeed, 88.5% of the respondents were winning between \$0 and \$9 999 CAD, 7.5% were winning between \$10 000 and \$19 999 CAD, 1% were winning between \$20 000 and \$29 999 CAD, and 1.8% were winning between \$30 000 and \$39 999 CAD. As for the level of education, 7.4% of the participants in the study got a high-school diploma, 7% had a college degree, 48.8% completed a baccalaureate, 14.6% got a master, and 2.7% got a doctorate. Only 9.6% of the participants in the study had children. Finally, 30% of the respondents were making about 55 phone calls a week, 8.1% were

making about 40 phone calls a week, 12.9% were making about 35 phone calls a week, and 22.8% were making between 15 and 25 phone calls a week.

### **Validation of the PLS Model to Test Hypotheses**

First, to ensure the reliability of a construct or a variable using PLS, we must verify the three following properties: individual item reliability, internal consistency, and discriminant validity (Yoo & Alavi 2001; see the paper for more details).

To verify individual item reliability, a confirmatory factor analysis (CFA) was performed on independent and dependent variables of the theoretical research model. A single iteration of the CFA was necessary given all loadings of the variables were superior to 0.50 and then none item was withdrawn nor transferred in another variable in which the loading would have been higher. Indeed, in the whole, items had high loadings, which suppose a high level of internal consistency of their corresponding variables. In addition, loadings of each variable were superior to cross-loadings with other variables of the model. Hence the first criterion of discriminant validity was satisfied.

And to get composite reliability indexes and average variance extracted (AVE) in order to satisfy the second criterion of discriminant validity and to verify internal consistency of the variables, we used PLS bootstrap resampling procedure with an iteration of 100 sub-sample extracted from the initial sample (750 undergraduate and graduate students).

PLS analysis shows that all square roots of AVE (boldfaced elements on the diagonal of the correlation matrix) are higher than the correlations with other variables of the model. In other words, each variable shares more variance with its measures than it shares with other variables in the model. As a result, discriminant

validity is verified. Finally, as supposed previously, PLS analysis showed high composite reliability indexes for all variables of the theoretical research model. The variables have therefore a high internal consistency, with composite reliability indexes ranging from 0.73 to 0.92.

### **Hypothesis Testing**

First, to get the significant variables in the study and the percentage of variance explained ( $R^2$  coefficient) by all the variables of the theoretical research model, we developed a PLS model similar to those of Fillion (2005), Fillion and Booto Ekionea (2010), Fillion et al. (2010), Fillion and Booto Ekionea (2016), Limayem and DeSanctis (2000), and Yoo and Alavi (2001). And to ensure the stability of the model, we used the PLS bootstrap resampling procedure with an iteration of 100 sub-sample extracted from the initial sample (750 undergraduate and graduate students). The PLS model is depicted in Figure 2.

Figure 2 shows that all the independent variables of our theoretical research model, are explaining 89.6% of the variance on the dependant variable user satisfaction. And two-third of these variables are significant, that is, they are determining factors in satisfaction of using a mobile phone by people in household (undergraduate and graduate students). More specifically, the eight more significant variables are cost ( $t = 4.811$ ,  $\beta = 0.226$ ,  $p < 0.001$ ), utility for security ( $t = 3.619$ ,  $\beta = 0.149$ ,  $p < 0.001$ ), self-efficacy ( $t = 4.937$ ,  $\beta = 0.248$ ,  $p < 0.001$ ), perceived ease of use ( $t = 5.924$ ,  $\beta = 0.286$ ,  $p < 0.001$ ), applications for personal use ( $t = 4.228$ ,  $\beta = 0.187$ ,  $p < 0.001$ ), utility for accessing Internet and social media ( $t = 4.729$ ,  $\beta = 0.226$ ,  $p < 0.001$ ), mobility ( $t = 4.512$ ,  $\beta = 0.194$ ,  $p < 0.001$ ), and applications for fun ( $t = 4.612$ ,  $\beta = 0.213$ ,  $p < 0.001$ ). And two other variables are significant at the

levels of 0.01 and 0.05, respectively. These are utility for work-related use ( $t = 2.328$ ,  $\beta = 0.131$ ,  $p < 0.01$ ) and utility for children ( $t = 1.722$ ,  $\beta = 0.097$ ,  $p < 0.05$ ).

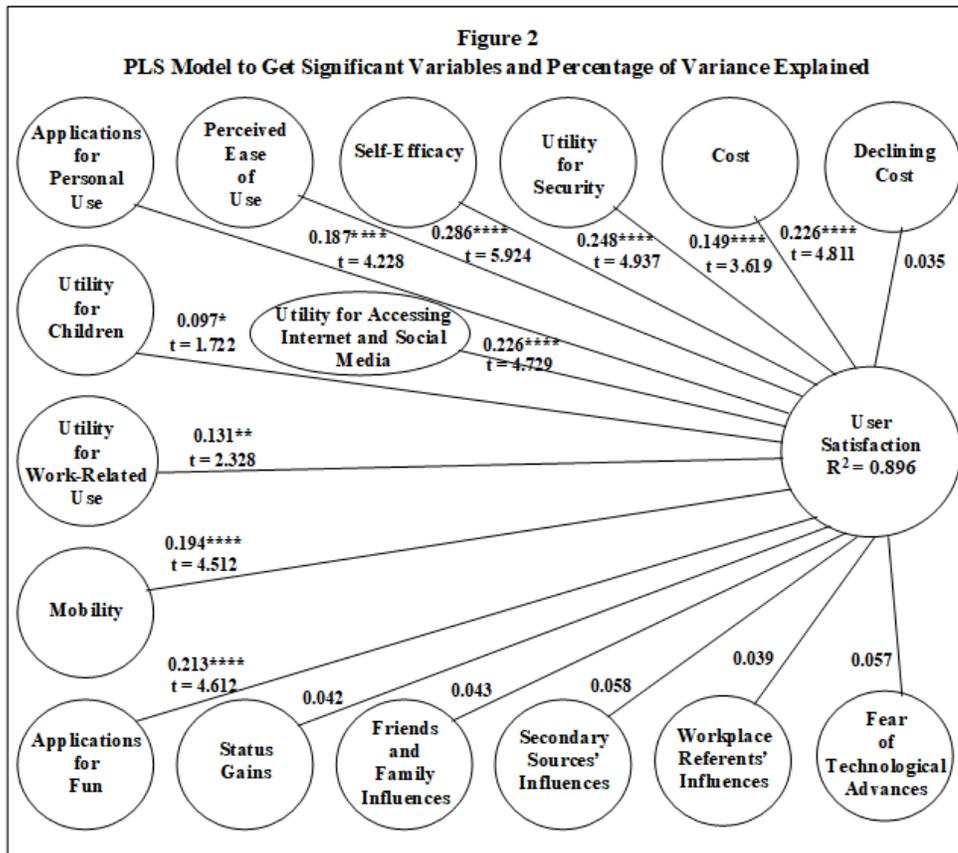
Finally, to measure interaction effect of moderator variables (e.g., the life cycle stage characteristics: income (I), marital status (MS), age (A), and child's age (CA)) in order to verify hypotheses 1 to 11, we used the PLS procedure proposed by Chin et al. (2003) (see the paper for more details). On the other hand, in a review of 26 papers assessing interaction effect of moderator variables published between 1991 and 2000 into information systems (IS) journals, Carte and Russell (2003) found nine errors frequently committed by researchers when they estimate such an effect, and provided solutions (see their paper for more details). So we tried to avoid these nine errors in applying their solutions to test hypotheses 1 to 11. Indeed, among others, in the verification of hypotheses 1 to 11 that follows, interaction effect of a moderator variable is significant if, and only if, the path between the latent variable (the multiplication of items of independent and moderator variables forming interaction effect) and the dependent variable is significant, as well as if the change in  $R^2$  coefficient (the difference between the  $R^2$  calculated before the addition of interaction effect and those calculated after the addition of interaction effect ( $\Delta R^2$ , pronounced delta  $R^2$ )) is greater than 0.

For a matter of space, given that the test of hypotheses 1 to 11 required the development of several PLS structural equation models (two models per hypothesis or sub-hypothesis, that is, 32 models), we summarize PLS analyses to test each hypothesis and the summaries are presented according to the same divisions as the theoretical research model: *attitudinal beliefs*, *normative beliefs*, and *control beliefs*. And, as for the PLS model developed to get the significant variables in the study and the percentage of variance explained by all the variables of the theoretical research

model previously (see Figure 2), for each PLS model developed, we used the PLS bootstrap resampling procedure with an iteration of 100 sub-sample extracted from the initial sample (undergraduate and graduate students) to ensure the stability of the model.

### *Attitudinal Beliefs*

Concerning hypothesis 1 related to the independent variable applications for personal use (APU), the path from the latent variable APU\*MS\*A to the dependent variable user satisfaction is significant ( $t = 2.102$ ,  $\beta = 0.113$ ,  $p < 0.05$ ) and there is a change in  $R^2$  ( $\Delta R^2 = 0.002$ ). Thus, as we expected, the moderator variables marital status and age have an influence on the relationship between applications for personal use and satisfaction of using a mobile phone by people in household. Also hypothesis 1 is supported. Concerning hypothesis 2 related to the independent variable utility for children (UC). The path from the latent variable UC\*CA to the dependent variable user satisfaction is not significant ( $t = 0.494$ ,  $\beta = 0.027$ ) and there is no change in  $R^2$  ( $\Delta R^2 = 0$ ). So, contrary as we formulated in the hypothesis, the moderator variable child's age has not an influence on the relationship between utility for children and satisfaction of using a mobile phone by people in household.



As a result, hypothesis 2 is not supported. For hypothesis 3 related to the independent variable utility for work-related use (UWRU), the path from the latent variable UWRU\*A to the dependent variable user satisfaction is significant ( $t = 2.084$ ,  $\beta = 0.108$ ,  $p < 0.05$ ) and there is a small change in  $R^2$  ( $\Delta R^2 = 0.002$ ). Then, as we thought, the moderator variable age has an influence on the relationship between utility for work-related use and satisfaction of using a mobile phone by people in household.

Hypothesis 3 is therefore supported. The scenario is similar for hypothesis 4 related to the independent variable utility for security (US). The path from the latent variable US\*MS\*A to the dependant variable user satisfaction is significant ( $t = 2.216$ ,  $\beta = 0.124$ ,  $p < 0.05$ ) and there is a small change in  $R^2$  ( $\Delta R^2 = 0.001$ ). So, as we anticipated, the moderator variables marital status and age have an influence on the relationship between utility for security and satisfaction of using a mobile phone by people in household. Consequently, hypothesis 4 is supported. The scenario is also similar for hypothesis 5 related to the independent variable mobility (M). The path from the latent variable M\*MS\*A to the dependant variable user satisfaction is significant ( $t = 2.730$ ,  $\beta = 0.162$ ,  $p < 0.005$ ) and there is a change in  $R^2$  ( $\Delta R^2 = 0.003$ ). Thus, as we expected, the moderator variables marital status and age have an influence on the relationship between mobility and satisfaction of using a mobile phone by people in household. As a result, hypothesis 5 is also supported. The scenario is also similar for hypothesis 6 related to the independent variable utility for accessing Internet and social media (UISM). The path from the latent variable UISM\*A\*I to the dependant variable user satisfaction is significant ( $t = 2.140$ ,  $\beta = 0.115$ ,  $p < 0.05$ ) and there is a small change in  $R^2$  ( $\Delta R^2 = 0.001$ ). So, as we thought, the moderator variables age and income have an influence on the relationship between utility for accessing Internet and social media and satisfaction of using a mobile phone by people in household. Hypothesis 6 is then also supported. And the scenario is still similar for hypothesis 7 related to the independent variable applications for fun (AF). The path from the latent variable AF\*A to the dependent variable user satisfaction is significant ( $t = 2.327$ ,  $\beta = 0.130$ ,  $p < 0.01$ ) and there is a change in  $R^2$  ( $\Delta R^2 = 0.006$ ). Thus, as we anticipated, the moderator variable age has an influence on the relationship between applications for fun and

satisfaction of using a mobile phone by people in household. As a result, hypothesis 7 is also supported. But the scenario is different for hypothesis 8 related to the independent variable status gains (SG). The path from the latent variable SG\*A to the dependent variable user satisfaction is not significant ( $t = 0.228$ ,  $\beta = -0.013$ ) and there is no change in  $R^2$  ( $\Delta R^2 = 0$ ). Then, contrary to our expectations, the moderator variable age has not an influence on the relationship between status gains and satisfaction of using a mobile phone by people in household. Consequently, hypothesis 8 is not supported.

#### *Normative Beliefs*

In the case of hypothesis 9-a related to the independent variable friends and family influences (FFI), the path from the latent variable FFI\*MS\*A\*I to the dependent variable user satisfaction is significant ( $t = 2.640$ ,  $\beta = 0.149$ ,  $p < 0.005$ ) and there is a small change in  $R^2$  ( $\Delta R^2 = 0.001$ ). So, as we expected, the moderator variables marital status, age, and income have an influence on the relationship between friends and family influences and satisfaction of using a mobile phone by people in household. Hypothesis 9-a is then supported. Concerning hypothesis 9-b related to the independent variable secondary sources' influences (SSI), the path from the latent variable SSI\*MS\*A\*I to the dependent variable user satisfaction is not significant ( $t = 1.132$ ,  $\beta = -0.073$ ) but there is a change in  $R^2$  ( $\Delta R^2 = 0.003$ ). Thus, contrary to what we thought, the moderator variables marital status, age, and income have not an influence on the relationship between secondary sources' influences and satisfaction of using a mobile phone by people in household. And hypothesis 9-b is not supported. The scenario is similar for hypothesis 9-c related to the independent variable workplace referents' influences (WRI). The path from the latent variable WRI\*MS\*A\*I to the dependent

variable user satisfaction is not significant ( $t = 0.409$ ,  $\beta = -0.025$ ) but there is a small change in  $R^2$  ( $\Delta R^2 = 0.001$ ). Then, contrary to what we formulated in the hypothesis, the moderator variables marital status, age, and income have not an influence on the relationship between workplace referents' influences and satisfaction of using a mobile phone by people in household. Consequently, as hypothesis 9-b, hypothesis 9-c is not supported.

### *Control Beliefs*

Regarding hypothesis 10-a related to the independent variable fear of technological advances (FTA), the path from the latent variable FTA\* $\Delta$ \*I to the dependent variable user satisfaction is very significant ( $t = 2.672$ ,  $\beta = 0.156$ ,  $p < 0.005$ ) and there is a good change in  $R^2$  ( $\Delta R^2 = 0.010$ ). Thus, as we expected, the moderator variables age and income have an influence on the relationship between fear of technological advances and satisfaction of using a mobile phone by people in household. Hypothesis 10-a is therefore supported. For hypothesis 10-b related to the independent variable declining cost (DC). The path from the latent variable DC\* $\Delta$ \*I to the dependent variable user satisfaction is not significant ( $t = 1.246$ ,  $\beta = -0.076$ ) but there is a change in  $R^2$  ( $\Delta R^2 = 0.003$ ). So, contrary to what we thought, the moderator variables age and income have not an influence on the relationship between declining cost and satisfaction of using a mobile phone by people in household. Consequently, hypothesis 10-b is not supported. But the scenario is different for hypothesis 10-c related to the independent variable cost (C). The path from the latent variable C\* $\Delta$ \*I to the dependent variable user satisfaction is very significant ( $t = 4.192$ ,  $\beta = 0.181$ ,  $p < 0.001$ ) and there is a small change in  $R^2$  ( $\Delta R^2 = 0.002$ ). Thus, as we expected, the moderator variables age and income have an influence on the relationship between cost and satisfaction of using a mobile phone

by people in household. As a result, hypothesis 10-c is supported. Finally, concerning hypothesis 11-a related to the independent variable perceived ease of use (PEU), the path from the latent variable PEU\*A to the dependent variable user satisfaction is significant ( $t = 2.182$ ,  $\beta = -0.116$ ,  $p < 0.05$ ) and there is a small change in  $R^2$  ( $\Delta R^2 = 0.001$ ). So, as we formulated in the hypothesis, the moderator variable age has an influence on the relationship between perceived ease of use and satisfaction of using a mobile phone by people in household. And hypothesis 11-a is then supported. The scenario is similar regarding hypothesis 11-b related to the independent variable self-efficacy (SE). The path from the latent variable SE\*A to the dependent variable user satisfaction is significant ( $t = 1.687$ ,  $\beta = -0.096$ ,  $p < 0.05$ ) and there is a change in  $R^2$  ( $\Delta R^2 = 0.002$ ). Thus, as we thought, the moderator variable age has an influence on the relationship between self-efficacy and satisfaction of using a mobile phone by people in household. Consequently, hypothesis 11-b is also supported.

In summary, eleven hypotheses (including sub-hypotheses) have been supported in our study, that is, H1, H3, H4, H5, H6, H7, H9-a, H10-a, H10-c, H11-a, and H11-b. Thus, the moderator variables (e.g., the household life cycle) age, marital status, and income had several moderating effects in the present study given practically all hypotheses we formulated have been supported. On the other hand, the moderator variable child's age had not a significant moderating effect on the relationship between utility for children and satisfaction of using a mobile phone at home, and the moderator variables age, marital status and income had not a significant moderating effect on the relationship between status gains, secondary sources' influences, workplace referents' influences, and declining cost, and satisfaction of using a mobile

phone at home. Hence hypotheses H2, H8, H9-b, H9-c, and H10-b were not supported.

In the next and last section of the paper, we discuss about some implications of the more important findings of the study as well as the future directions and limitations.

## DISCUSSION AND CONCLUSIONS

This last section is devoted to a discussion about the more important findings of the study and some conclusions. And, to support our discussion and conclusions, we provide the reader with a more detailed view of the PLS structural equation model developed to get the significant variables in the study, including the percentage of variance explained by each variable (see Table 2).

As shown in Table 2 (and Figure 2), the sixteen independent variables examined in this study explained 89.6 percent ( $R^2 = 0.896$ ) of the variance in satisfaction of using a mobile phone by people in household. This percentage of variance explained by the independent variables is very high and it means that we have now practically all the independent variables which are explaining the variance on the dependent variable user satisfaction when the technology investigated is the mobile phone. And we can also see in Table 2 that the ten variables who showed to be significant (see also the significant beta path coefficients in Figure 2), that is, applications for personal use, utility for children, utility for work-related use, utility for security, mobility, utility for accessing Internet and social media, applications for fun, cost, perceived ease of use, and self-efficacy explained alone 80.7 percent of the variance in satisfaction of using a mobile phone by people in household.

Thus, these ten variables are assuredly extremely important factors to take into account in future studies on the mobile phone

and on the part of mobile phone providers, and more particularly mobility, utility for accessing Internet and social media, applications for fun, cost, perceived ease of use, and self-efficacy which explained alone 65.3 percent of this variance (see Table 2).

**Table 2. Beta Path Coefficients, T-Values, and Percentages of Variance Explained of Variables**

<i>Variable</i>	<i>Beta</i>	<i>t</i>	<i>R<sup>2</sup></i>
Applications for Personal Use	0.187****	4.228	0.067
Utility for Children	0.097*	1.722	0.011
Utility for Work-Related Use	0.131**	2.328	0.033
Utility for Security	0.149****	3.619	0.043
Mobility	0.194****	4.512	0.072
Utility for Accessing Internet and Social Media	0.226****	4.729	0.120
Applications for Fun	0.213****	4.612	0.087
Status Gains	0.042	0.912	0.010
Friends and Family Influences	0.043	0.968	0.011
Secondary Sources' Influences	0.058	1.173	0.018
Workplace Referents' Influences	0.039	0.989	0.015
Fear of Technological Advances	0.057	1.088	0.021
Declining Cost	0.035	0.792	0.014
Cost	0.226****	4.811	0.098
Perceived Ease of Use	0.286****	5.924	0.157
Self-Efficacy	0.248****	4.937	0.119

\*p < 0.05; \*\*p < 0.01; \*\*\*\*p < 0.001 (one-tailed test).

It is extremely interesting to see here that the three new independent variables we added to the Brown and Venkatesh's (2005) theoretical research model, that is, utility for security, mobility, and utility for accessing Internet and social media, all showed to be very significant (p < 0.001) in satisfaction of using a

mobile phone by people in household and explained alone 23.5 percent of the variance in satisfaction of using a mobile phone by people in household. Indeed, the present study showed that people are, to some extent, using a mobile phone for a matter of security, mobility (the mobile phone provides them with the possibility to use only this telephone to perform all their personal and professional activities), and access to Internet and social media. So, here are three new important variables that we can add to the integrated research model of MATH and household life cycle characteristics suggested by Brown and Venkatesh (2005) to test in future studies, depending on the technology investigated of course. In addition, these three new variables may be included in the sales marketing plan of mobile phone providers.

In the large-scale study in which Brown and Venkatesh (2005) integrated MATH and some household life cycle characteristics as moderating variables, the integrated model explained 74 percent of the variance in intention to adopt a personal computer for home use of 746 American people, a substantial increase of 24 percent over baseline MATH that explained 50 percent of the variance. In a previous study in which they investigated the intention to buy a mobile phone by people in household, Fillion and Berthelot (2007) used the theoretical research model suggested by Brown and Venkatesh (2005) to which they added the two independent variables utility for security and mobility. And their model explained 50 percent of the variance in intention to buy a mobile phone by 307 Canadian people, and the new variables utility for security and mobility explained 5.6 percent of the variance on the dependant variable behavioral intention. In another previous study in which they investigated the user satisfaction of using a mobile phone by people in household, Fillion and Booto Ekionea (2010) also used the theoretical research model suggested by Brown and Venkatesh (2005) to which they also added the two

independent variables utility for security and mobility. And their model explained 50 percent of the variance in satisfaction of using a mobile phone by 327 Canadian people, and the new variables utility for security and mobility explained 10.8 percent of the variance on the dependant variable user satisfaction. In a more recent study in which they investigated the user satisfaction of using a mobile phone by people in household, Fillion and Booto Ekionea (2016) also used the theoretical research model suggested by Brown and Venkatesh (2005) to which they also added the two independent variables utility for security and mobility. And their model explained 49.1 percent of the variance in satisfaction of using a mobile phone by 505 Cameroonian people, and the new variables utility for security and mobility explained 2.4 percent of the variance on the dependant variable user satisfaction. And, in the present study in which we investigated the user satisfaction of using a mobile phone by people in household, we also used the theoretical research model suggested by Brown and Venkatesh (2005) to which we added the same two independent variables utility for security and mobility, and we added another independent variable, utility for accessing Internet and social media. And our model explained 89.6 percent of the variance in satisfaction of using a mobile phone by 750 undergraduate and graduate students from Canada, Cameroon, and Congo, and the new variables utility for security, mobility, and utility for accessing Internet and social media explained 23.5 percent of the variance on the dependant variable user satisfaction. So, from all of these studies above, we can draw some very important conclusions.

First, we can conclude that the variable user satisfaction is as much appropriate as dependent variable in the theoretical research model suggested by Brown and Venkatesh (2005) than is behavioral intention given the percentage of variance explained is as much higher with user satisfaction than it is with behavioral

intention. Second, the country in which the people are investigated seems not to be very important since several studies performed in Africa, Canada, and US, are providing about the same results concerning the percentage of variance explained by the independent variables on behavioral intention or user satisfaction, and the new independent variables integrated by the authors to the research model developed by Brown and Venkatesh (2005) have a relatively similar behavior. Third, it seems that when we investigate students (relatively younger than people in general investigated in the other studies and in several different countries) the theoretical research model developed by Brown and Venkatesh (2005), extended with the three new variables we added to their model, shows a very different behavior given two-third of the variables are significant, our three new variables are all three very significant ( $p < 0.001$ ) and explain 23.5 percent of the variance, and all the independent variables are explaining 89.6 percent of the variance on the dependant variable user satisfaction. The sample investigated becomes then very important. Finally, in the present study, we found several interesting things to help advance knowledge in this new and exciting field of adoption and use of technology in households.

First, we found ten very important variables that seem to be good predictors in satisfaction of using a mobile phone by people in household, and more particularly perceived ease of use and self-efficacy, as well as one of the three new variables we added to the Brown and Venkatesh's (2005) model, utility for accessing Internet and social media (see Table 2). These ten variables are also very important to take into account by mobile phone providers to design new mobile phones still better adapted to people's needs and to perform their sales marketing. Second, we found that people (undergraduate and graduate students) are, to some extent, using a mobile phone for a matter of security, mobility, and access to

Internet and social media, given our three new variables utility for security, mobility, and utility for accessing Internet and social media, showed to be very significant (see Table 2). Third, we found that it is as much appropriate to use the dependent variable user satisfaction than the dependent variable behavioral intention in the research model proposed by Brown and Venkatesh (2005), given the percentage of variance explained in intention to adopt a mobile phone for household use is quite similar than those explained in user satisfaction, even higher in user satisfaction in the present study. The dependent variable *use behavior* proposed by Thompson et al. (1991) may also be tested in future studies. Also, we suggest the test of new independent variables that may explain a greater percentage of variance in satisfaction of using a mobile phone by people in household in future studies. To that end, we recommend three new independent variables in the next paragraph. Finally, the results of this study provided the evidence that it is far better to use the household life cycle variables as moderating variables in the research model, as suggested by Brown and Venkatesh (2005), given the percentage of variance explained in intention to adopt a new technology in household by the model tested by these authors was significantly higher, and it is still significantly higher in the present study.

It would be interesting in future studies to add some other new variables to the actual theoretical research model (those suggested by Brown and Venkatesh (2005) augmented with the three new variables tested in several previous studies (see Fillion & Berthelot, 2007; Fillion & Le Dinh, 2008; Fillion & Booto Ekionea, 2010, Fillion & Booto Ekionea, 2016, and the present study), depending on the technology investigated naturally, in order to try to explain still more variance (maybe near from 100%) in satisfaction of using a new technology in household. For example, the variable *attention* may be added in social outcomes (a lot of people, particularly young

and old people, are feeling to be alone in our actual stressing world, in which both men and women are working and get very busy, so the mobile phone may be an excellent way to communicate with other people every time and everywhere to get the feeling to be less alone), the variable *social norm* may also be added in social outcomes (who knows, people may be using a mobile phone just to do as everybody!), and the variable *control* may be added in utilitarian outcomes (some people may be using a mobile phone to control other people in their family or others; may be another kind of Big Brother!). It would be also interesting to test the actual theoretical research model in other situations and with other populations.

Regarding the limitations of this study, as pointed out by Brown and Venkatesh (2005), the primary limitation is the reliance on a single informant (in this study, a student which is part of the family). It is possible that other members of the household would have provided different responses concerning the motivations to use a mobile phone at home. Future research in household use of technology should incorporate responses from multiple members of the household to truly assess the nature of household use. A second limitation of the study is that all of the respondents in the study might not have had the same time allowed to answer the survey in each business course and in each of the three countries. Indeed, the professors of each business course in each country and in the three countries might not have allowed the same time to the students selected by the researchers to answer the survey at the beginning of the course. Another limitation of the study is the administration of the survey in-class by different researchers. Some respondents may have differently understood some items of the survey instrument depending on different explanations from the part of the researchers and then provided more or less precise ratings on these items, introducing the possibility of some response bias. But

the method we privileged in this study to administer the survey instrument is not an exception to the rule. Each method has its strengths and its limitations.

To conclude, much more research will be needed on the use of technology in households in order to better understand its impacts on people's daily life. The research will allow, among others, at least to minimize, if not to remove, some negative impacts of technology in people's daily life in the future and to develop new technologies still better adapted to people's needs. So we will continue to inquire into this exciting field.

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