

Understanding the Factors Influencing the Attitude Toward and the Use of Mobile Technology in Developing Countries: A Model of Cellular Phone Use in Guinea

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Abstract

Macro factors are often mentioned to explain the adoption and use of mobile phones in developing countries. Little attention has been paid to micro factors which directly influence the real motivations of the end user. This article examines the influence of microeconomic factors on both individuals' attitude towards and use of cellular telephones. Data were collected through a questionnaire survey from a final sample of 463 cellular phones' users in Guinea. The results obtained tend to corroborate the hypotheses according to which mobility, group characteristics (familiarity), social influence (social pressure and image), and the possession of resources affect the attitude toward and the use of cellular telephones. In contrast, the traditional hypotheses that consider subscription conditions as the main influence to technology use are not verified.

1. Introduction

Cellular phones have transformed the way we carry out our activities. These changes have become more profound as the functionalities of the technology have been enriched. For instance, current cellular phones allow the user to surf the Internet. Whether the user wishes to look up a phone number or an address, trade stocks, read news headlines, get weather bulletins, or carry out business transactions (mobile e-commerce), it is all available!

In the literature, macro factors such as technical variables (ease of implementation of the infrastructure for cellular phones), structural factors (deregulation of the telecommunications sector), and economic dimensions (cost of communication equipment and services), have been highlighted as the primary reason explaining the use of cellular phones in the African context, as well as in developing countries (Minges, 1999; Frempong and Atubra, 2001; Bagchi et al., 2003). It is an implicit assumption that as soon as a new information and communication technology (ICT) is introduced in a country or in an organization, it is automatically used by people, and the consequences follow immediately. This may be a serious error with regard to the productivity paradox (Statopulos and Dehning, 2000). Studies have shown that it is not from

the technology itself, but from its use, that repercussions can be expected to come (Orlikowski, 2000). A careful examination of the literature shows that the problem of ICT diffusion in developing countries is often approached on the macro level by disregarding questions which would help in understanding the effect of (ICT use) factors such as the beliefs and perceptions of users.

The structure of the telecommunications industry, the pricing system, and teledensity certainly offer a good indication of the proportion of individuals who could theoretically have access to cellular phone services, but they do not provide detailed information on the actual use of these services. However, the impacts or the repercussions of a technology depend upon its use. Technological innovations present great opportunities for developing countries, but these countries unfortunately do not benefit from those innovations due to their underuse (Anandarajan, 2002). In fact, the underuse of technological innovations in Africa appears to be the primary cause of ICTs' lack of contribution to organizational performance (Odedra, 1993).

Unfortunately, in the literature dealing with ICT adoption and use in Sub-Saharan Africa, or even to many other developing countries, little attention is paid to micro level factors related to ICTs users such as perception, motivation, social variables, etc., which directly influence the decision to adopt and use these technologies. Studying these micro level factors helps in better understanding the problem surrounding ICT adoption and use by individuals, as well as the resulting outcomes.

The general objective of this study is to investigate the influence of micro level variables on the attitude toward and the use of ICTs by individuals in developing countries. The specific objective is to examine the effects of four micro level variables including: Mobility, the group characteristics (familiarity), the facilitating conditions, and the social influence (social pressure and image) on the attitude toward and the use of cellular phones in Guinea.

This article is structured as follows. First we review the literature surrounding the study. Afterward we present the research model and the hypotheses. Then we describe the methodology adopted to carry out the study. Finally we present the results, their implications and limitations, as well as some avenues for future research. The document ends with a brief conclusion.

2. Background

The theoretical foundation of this study is borrowed from prior research on ICT use. These studies include important findings that were helpful in designing the research model. The following paragraphs present a review of these studies.

Tannenbeaum (1991) mentions that the primary motivation for an individual to use cellular phones is the possibility of having greater control over his/her professional and social activities. The conclusions of this study show that people often use mobile phones in order to discuss business matters while on the road, to respond to clients' urgent needs, and to set up meetings. The study done by Davis (1993) about the social impact of cellular phones suggests that these technologies are useful decision-making tools. This study also indicates that early adopters acquire cellular phones for various reasons: to gain social status; for the pleasure of owning a new tool; or for the necessities of work (contact, coordination, etc.).

Kwon and Chidamaram (2000) go a step farther in attempting to explain the behavior of individuals in adopting cellular phones. These authors use a causal model which relates individual and technological variables in order to understand the process of cellular phone use. The research of Kwon and Chidamaram (2000) is one of the rare studies about cellular phones that has adopted an explanatory thought process. This seems surprising, since the latest types of cellular phones have almost achieved the same level of complexity as traditional ICTs. It is useful to go beyond descriptive studies to explain the factors which help to understand the reasons underlying cellular phone use.

According to the theory of reasoned action (TRA), a behavior or an action is influenced by a person's attitude, which in turn is a function of perception or beliefs about the consequences of carrying out the action. The Technology Acceptance Model (Davis (1989) is inspired by TRA and by the innovation diffusion theory (Rogers 1983). The main objectives of TAM are to measure and explain users' perception and

behavior regarding the use or the future adoption of a new information technology (IT).

Following the publication of TAM, numerous models have been proposed. Among them are: TAM2 which is an extended version of TAM (Venkatesh and Davis, 2000), the decomposed theory of planned behavior (DTPB), and social cognitive theory (SCT). These theories are considered the classics in the field of technology adoption, and they have been validated to a very interesting extent by numerous empirical studies (Mathieson, 1991; Taylor and Todd, 1995). Because each of these classic models is best in explaining a specific aspect of IT adoption and use, it is necessary to provide a comprehensive representation of all these contributions. In the absence of such a representation, there is a great risk of ignoring other models' contributions when choosing a particular model as the theoretical framework for a research project.

In complying with this need for an integrative framework, Venkatesh et al. (2003) have proposed a unified model of IT acceptance and use. This model includes the most pertinent factors from the classic models that explain individuals' IT adoption behavior. Unfortunately, like the classic models, the model of Venkatesh et al. (2003) places more emphasis on technological attributes to explain IT adoption.

In general, the classic models in IT adoption are based on the paradigm of rationality. However, human behavior is not explained by rationality alone. Human beings are far from attaining a high level of rationality since they have a simplified view of reality and act by immediate stimuli (Simon, 1977). This being the case, their search for solutions and their analysis are incomplete. We argue that the decision to use a technology is not governed only by rational criteria based exclusively on the innovation's technological qualities as the potential user perceives them. This decision can vary according to the attributes of the situation or the context (Venkatesh and Davis, 2000; Gallivan, 2001; Karahanna et al., 1999; Hiasson and Lovato, 2001; Markus, 1983).

Furthermore, the end user of a technology is also part of a social network which exerts an influence on him/her (Lamb and Kling, 2003). In this study we pay a great attention to social network. Indeed, we take into account some social factors as social norms and image which influence the decision to use cellular phones. We also identify the favorable conditions that maintain the social network (interaction, satisfaction of communication needs, etc.).

Besides, Davis et al. (1989) have already acknowledged the importance of “external variables” influencing technological attributes such as the usefulness and ease of use. More specifically, the authors emphasize that it is solely through usefulness and ease of use that external factors influence attitudes in the adoption of ICT, thus consigning these two variables to the rank of mediating or intermediary variables. Since the influence of these two mediating variables on attitude and on use has been studied and supported in many studies (Gefen and Straub, 2000; Macloskey, 2003; Ma and Liu, 2004), the examination of their influence will be deliberately omitted in this study.

3. Research Model and Hypotheses

Figure 1 shows the research model of the current study. According to this model, micro level variables such as Mobility (Fjetmestad and Hiltz, 1998; and Plant, 2001), group characteristics (Markus, 1987; Carleson and Zmud, 1999; and Ishii, 2004), facilitating conditions (Minges, 1999), and social influence (Davis, 1993; Rogers, 1995; and Anandarajan et al., 2002) determine both users’ attitudes toward and their use of cellular phones. In addition, the model suggests that the use of mobile phones is influenced by users’ attitudes. In the following sections, we define the variables of the research model and we state the causal relationship (hypotheses) among these variables.

and social lives in contemporary society require more often being in touch. Mobility while performing social and professional duty has become one of the realities of the current environment (Brilman, 1996).

Because cellular phones allow users to carry out tasks in spite of spatial and temporal constraints, they may be perceived positively by users, since speed and mobility have become the norms in today’s business environment. Consequently, individuals will be more favorably inclined toward ICTs which permit them to perform work in an effective and efficient way while moving around. This assertion is corroborated by Plant (2001) who has found that cellular phones are adopted primarily because of the mobility they permit. Thus the following hypothesis:

H1: Mobility has a positive influence upon attitudes toward and use of cellular phones.

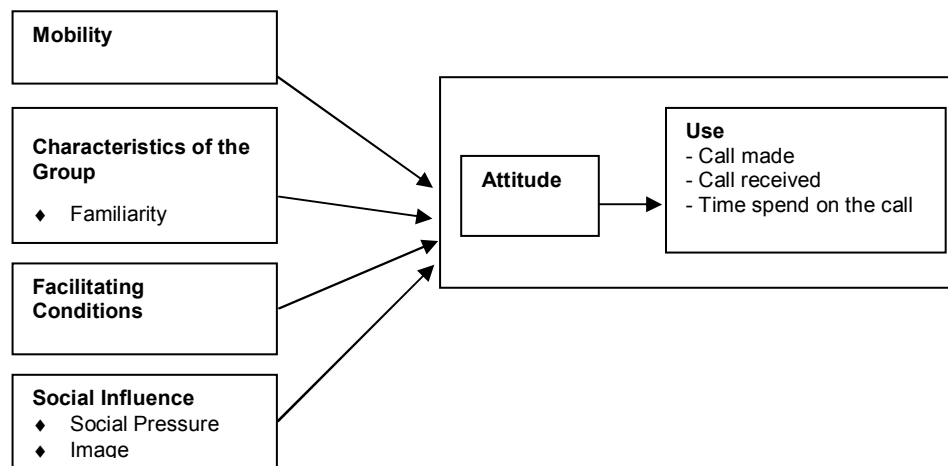


Figure 1: Research model

3.1 Mobility

Mobility can be defined as the ability of a person to move around while still being quite free to perform his/her task and interact with other people. Professional

3.2 Group characteristics (familiarity)

The variable measuring group characteristics is the familiarity between individuals and their interlocutors. The term familiarity as used in this study refers to the degree of simplicity and intimacy in social

relationships or in particular bonds linking individuals who are not necessarily related by birth. People's attitudes towards ICTs can be influenced by the characteristics of their environment and by the nature of the relationships which link them (Carleson and Zmud, 1999). In the absence of favorable circumstances for communication between the members of a group in good terms with each other, there is a strong probability that the critical mass of adopters of ICT would not be formed or would not last.

Familiarity appears to be a factor which could favor the collective use of technologies such as cellular phones. Markus (1987) has shown that the diffusion of a technology devoted to a collective use is not possible without the formation of a critical mass. Familiarity can contribute to the formation and sustainability of a critical mass by allowing the addition of new users based on the quality of their relationships. Moreover, the results of a study by Ishii (2004) show that communication by means of mobile technology is carried out by users who enjoy very privileged interpersonal relationships. We can therefore argue that familiarity has a positive impact on the use of cellular phones. Thus the following hypothesis:

H2: Familiarity has a positive influence on the attitude toward and the use of cellular phones.

3.3 Facilitating conditions

The influence of facilitating conditions upon the use of ICTs has been widely discussed in the literature through various studies (Ajzen, 1991; Karahanna et al., 1999; S. Taylor and Todd, 1995; Thompson et al., 1991; Mathieson et al., 2001). Triandis (1980) states that a behavior cannot be carried out if the objective conditions of the environment prevent it. These objective conditions which encourage or discourage the adoption of a behavior, in our case the use of cellular phones, are called facilitating conditions. According to Mathieson et al. (2001), resources including expertise, the availability of help in case of problems, money, documentation such as a user's guide, etc., represent the facilitating conditions for the adoption and utilization of an ICT. As Rogers (1995), he implicitly names risk-taking, education, and the quality of the social network as being facilitating conditions for the use of an innovation.

In order to explain the accelerated rate of cellular phones' adoption in developing countries, authors have suggested such facilitating conditions as the relative ease of installation of cellular phones infrastructure as compared to traditional telephones and the lengthy

waiting period to subscribe to a landline (Minge 1999). Other facilitating conditions that have retained attention in the literature include pricing systems that give more flexibility to users by allowing them to get the services at their convenience. An example of such pricing system is the prepaid card. According to Minge (1999), subscription conditions explain why cellular phones are a substitute for conventional phones in developing countries, mainly in Africa. It can therefore be assumed that facilitating conditions will favor the use of cellular phones:

H3: Facilitating conditions have a positive influence on the attitude toward and the use of cellular phones.

3.4 Social influence

In this research, the term social influence refers to social pressure and image. Rogers (1995) defines pressure or social norms as the values or behaviors which are the most accepted by the members of a society. Social pressure refers to the belief of an individual that he or she should conform to the practices accepted by those who enjoy a high social status in his or her environment. As for image, it can be defined as the degree to which an innovation is perceived by a person as a source of improvement in social status (Moore and Benbasat, 1991).

In light of the theory of reasoned action, social pressures may be considered as a factor affecting the perception of an individual of whether a given action should be undertaken (Ajzen and Fisbein, 1980). Rogers' innovation diffusion theory also states that technological innovations are adopted by imitation. Anandarajan et al. (2002) have shown that social pressures are among the dominant factors explaining the use of an ICT in the African context. Davis (1993) found that image is playing the primary role in the specific case of the adoption or use of cellular phones. Thus, one can suggest the following hypothesis:

H4: Social influence has a positive influence on the attitude toward and the use of cellular phones.

3.5 Attitude toward use

Attitude may be defined as the degree of positive or negative feelings toward performing the defined behavior (Ajzen, 1975). Triandis (1980), however, defines attitude as "affect," which means the feeling of joy, pleasure, disgust, discontent, or hatred one associates with a given behavior. According to the

theory of reasoned action, attitudes guide, influence, or predict actual behaviors (Ajzen and Fisbein, 1980). Ajzen (2002) notes that attitude has a cognitive component and an affective component. Attitude thus finds its expression in the end user's evaluation of an ICT. Hence, individuals who have a favorable attitude toward a technological innovation based on their favorable feelings about this innovation are more inclined to adopt it. A favorable attitude, then, appears to be a factor which explains and predicts the adoption of new ICTs. Based on what precedes, we can state the following hypothesis:

H5: Attitude has a positive influence on cellular phone use.

After having stated the hypotheses of this research, a methodological process is required to verify the causal relations proposed. The following paragraphs are devoted to the research methodology.

4. Methodology

Data for this study were collected through a questionnaire survey that was divided into six sections. Each section was devoted to each variable of the research model: Mobility, group characteristics, facilitating conditions, social influence, attitude of the users, and the amount of use. A Likert scale with seven points, where 1 represents strong disagreement and 7 represents strong agreement, was used to measure all the variables of the model, except the use variable. Mobility, group characteristics, facilitating conditions, social influence, and attitude of the users were measured. Measurements of the variables in the current research were inspired by previous studies and adapted to the context of this study. More specifically, items measuring the attitude (three items) came from Davis et al., (1989). Group characteristics (Familiarity) measurements (three items) were inspired by Carleson and Zmud, (1999). Items for the image variable (three items) were derived from Moore and Benbasat (1991). Measurements for the social pressure (three items) were borrowed from Ajzen and Fisbein (1980) and (Anandarajan et al., 2002). Items measuring the mobility variable (three items) were designed by the authors of the current study. Facilitating conditions measurements (five items) were adapted from Mathieson et al., (2001).

In light of the studies of Limayem et al. (1997), Igbaria (1994), and Kwon (1996), three indicators were defined for the use of cellular phones: the average number of calls received per day, the average number

of calls made per day, and the average time spent daily using the cellular phone.

Content validity was assessed by performing a pre-test of the questionnaire before its final distribution to the respondents. The pre-test was conducted in two phases. First, we designed a preliminary version of the questionnaire which was given to researchers in the field of IT and information systems (IS), and to experts in the mobile phone industry. These individuals were chosen based on their experience, expertise, and more importantly their knowledge of Guinean telecommunication characteristics. Each individual provided some comments on the formulation, the syntax, and the number of items included in the questionnaire. Taking into account the various comments, we made a few changes to the questionnaire. For example, for the social influence variable, we made a clear distinction between the social pressure and of the image. The various comments also permitted us to eliminate biases which could exist in the questionnaire. In the second phase of the pre-test, we gave the modified questionnaire obtained from the first phase to 20 cellular phone users in Guinea. The purpose of this second pre-test was to get some feedback about the questionnaire from actual cell phones users. This phase was conducted by 12 individuals whose role was to interact with the respondents and to take notes. The pre-test of the questionnaire allowed us to clarify and refine the meaning of questions which were less well understood. It resulted in a final questionnaire with a greater content validity.

There are many ways of administering a questionnaire: By direct contact, by postal mailing, by telephone, and online. To the best of our knowledge there was no directory of cellular phones subscribers in Guinea from which it would be possible to identify these users' mailing addresses and to contact them by mail. The investment required to create such a list would be high and would be beyond the scope of this study. Due to the above limitations, the survey in this study was conducted using the direct contact method. We chose with great care 12 investigators with a high level of experience in administering questionnaires, and who understood totally the rigor required in this study. These persons were trained to perform the survey's tasks.

A total of 1000 questionnaires were distributed. Respondents were randomly selected across Guinea at locations where cellular phone subscribers might be found: Workplaces, homes, schools, meeting places, etc. The researchers and the investigators met with the

respondents in order to give them the questionnaire for completion. In many cases, the investigators left the questionnaires with the respondents and picked them up when they were completed. All investigators were instructed to follow the same guidelines. There were no incentives other than the possibility we offered to respondents to share the final results of the study. The above data collection method was adopted for two reasons: First, as stated before, no cellular phones directories exist; second; not everyone has a postal address in Guinea. Although the investigators have a direct contact with the respondents, no discussion of the responses took place during the questionnaire completion process. In addition, responses' homogeneity was reduced because the respondents came from a variety of sectors (see table 1). Furthermore, the way the questionnaire was designed and the order of the questions prevent potential method bias.

5. Results

463 usable responses were received, representing a response rate of 46.3%. Below are the characteristics of the respondents.

5.1 Profile

Sixty-three percent (63%) of the respondents were males compared to 37% of females. Respondents were relatively young as almost 62% of them were less than 41 years old. Interestingly, respondents seemed to be familiarized with cellular phone usage as more than 65% of them had been using their phones for more than 3 years. Additionally, 55% of the respondents occupied a managerial position or own their business, while the income of 42% of the respondents was higher than the average income in Guinea. Finally, almost 90% of cellular phone users in Guinea were highly educated.

5.2 Reliability of Measurements

The reliability of variables measurements was assessed by calculating the Cronbach's Alpha coefficient. As can be seen on table 1, Cronbach's Alpha coefficient is higher than 0.7 for the measurements of the social influence and familiarity variables, and higher than 0.6 for the measurements of the resources possession variable. According to Peterson (1994), measurement scales comprising 2 or 3 items have a weaker reliability than those with more than three items. Cortina (1993) has shown that Alpha Cronbach provides information on the degree to which

each item of a variable correlates with at least one other item of that variable. To the extent, mobility and attitude have only respectively 2 and 3 items, and given that the correlation between these items is significant, we can consider them as reliable (Teo et al., 1999).

Table 1: Reliability and Convergent Validity Assessment

| Variables or factors | No. Items | Cronbach's Alpha |
|---|-----------|------------------|
| Group characteristics Familiarity | 2 | 0.7797 |
| Mobility | 2 | 0.5599 |
| Facilitating conditions Possession of resources | 3 | 0.6235 |
| | 2 | 0.6112 |
| Subscription | | |
| Social influence | 5 | 0.7841 |
| Attitude | 3 | 0.5981 |

5.3 Testing for Validity

The validity of variables measurements was assessed through convergent validity and discriminant validity. Convergent and discriminant validities in this study were evaluated using principal component analysis (PCA) and following the rules suggested by Kaiser (1958), Blau and al. (1993), and Evrard and al. (2003).

The results of the PCA shown in table 1 indicate that the measurements of group characteristics (familiarity) and mobility are unidimensional. However, two items from familiarity and mobility were dropped from subsequent analysis because their loadings on their respective factors were not significant. The results of the PCA in table 1 also indicate that facilitating conditions is a multidimensional factor. As suggested by the theory, the data in this study shows that the facilitating conditions construct comprises two factors: Possession of resources and subscription. The multidimensional nature of this construct will be preserved for the remaining of the analysis. We can therefore conclude that the measures support convergent validity.

A factorial analysis of principal components was performed to assess the discriminant validity. The analysis generated 5 factors instead of 6 because the items measuring the social pressure and the image were grouped together to form a unique variable. The resulting variable was named "Social influence".

Familiarity, mobility, possession of resources, and subscription were loaded into different factors as expected. Based on the preceding, we can assume the independence of the model variables.

5.4 Tests of the hypotheses

Research hypotheses were tested using the simple and multiple linear regression method. As previously stated, attitude and use are the dependent variables in this study, whereas task *characteristics (mobility), group characteristics (familiarity), facilitating conditions (possession of resources and subscription) and social influence (social pressure and image) are the explanatory variables.* The results of the test of the hypotheses involving users' attitudes are shown in the following table 2.

As can be seen in table 2, all together, the independent variables explain 23.2% of the total variation of cellular phone users' attitudes. By order of importance, the variables which explain the user's attitude are: group characteristics (familiarity), facilitating conditions (possession of resources and subscription), and social influence (social pressure and image). These results partly confirm the hypotheses of direct dependencies or link which presume that external factors have an influence upon the attitude of cellular phone users.

Table 2: Results of the Test of Hypotheses Related to Attitude

| Hypotheses | Dependant variables (User attitude) | | |
|--------------------------------|-------------------------------------|--------------|--------------|
| | β | T | Signif. T |
| Independent variables | | | |
| Group characteristics | 0.397 | 8.902 | 0.000 |
| Possession of resources | 0.098 | 2.234 | 0.026 |
| Subscription | -0.041 | -0.060 | 0.338 |
| Mobility | 0.077 | 1.816 | 0.070 |
| Social influence | 0.094 | 2.177 | 0.030 |
| Coefficient of determination | 23.2% | | |
| Ficher's F coefficient | 27.342 | | |
| Significance of F (α) | 0.000 | | |
| Watson-Durbin's coefficient | 1.786 | | |

As for the hypotheses involving the cellular phone use, some interesting results can be drawn from the

statistical analysis (see tables 3a, 3b and 3c). First, results from tables 3a through 3c show that among the independent variables, two variables have a direct and significant effect on the level of use as expressed by the average number of calls received per day. These variables are: Possession of resources and social influence. Based on these results, we can conclude that the level of use (*average number of calls received*) may be explained mainly by the direct influence of possession of resources and social influence.

Second, the results also indicate that two variables have a direct and significant effect on the level of use as expressed by the *average number of calls made per day*. These variables are: *Possession of resources and mobility*. These results allow us to conclude that the level of use (*average number of calls made per day*) may be explained mainly by the direct influence of possession of resources and the direct impact of *mobility*.

Third, the results indicate that among the independent variables, *subscription and mobility* have a direct effect on the level of use as expressed by the average time spent on calls per day. This suggests that the level of use (*average time spent per day*) may be explained mainly by *Mobility* and negative influence of *subscription*.

Finally, it appears in tables 3a, 5b and 5c that the user's attitude toward use doesn't explain any indicator of use (signif. T >0.05).

Table 3a: Results of the Test of Hypotheses Related to Use

| | Calls received | | | |
|------------------------------------|----------------|---------------|---------------|--------------|
| | Correlation | β | T | Signif. T |
| Group characteristics: Familiarity | 0.055 | 0.056 | 1.033 | 0.302 |
| Possession of resources | 0.190 | 0.205 | 4.147 | 0.000 |
| Subscription | 0.001 | -0.058 | -1.190 | 0.235 |
| Task characteristics: Mobility | 0.070 | 0.071 | 1.483 | 0.139 |
| Social influence | | -0.154 | -3.162 | 0.002 |
| Attitude | | -0.035 | -0.669 | 0.504 |
| Coefficient of determination | 6.8% | | | |
| Ficher's F coefficient | 5.328 | | | |
| Significance of F (α) | 0.000 | | | |
| Watson-Durbin's coefficient | 1.865 | | | |

Table 3b: Results of the Test of Hypotheses Related to Use (Continued)

| | Calls made | | | |
|------------------------------------|--------------|--------------|--------------|--------------|
| | Correlation | β | T | Signif. T |
| Group characteristics: Familiarity | 0.064 | .019 | 0.347 | 0.729 |
| Possession of resources | 0.233 | 0.220 | 4.449 | 0.000 |
| Subscription | 0.098 | 0.034 | 0.696 | 0.487 |
| Mobility | 0.147 | 0.133 | 2.812 | 0.005 |
| Social influence | -0.017 | -0.039 | -0.810 | 0.418 |
| Attitude | | -0.060 | -1.150 | 0.251 |
| Coefficient of determination | 7.7% | | | |
| Ficher's F coefficient | 5.990 | | | |
| Significance of F (α) | 0.000 | | | |
| Watson-Durbin's coefficient | 1.849 | | | |

Table 3c: Results of the Test of Hypotheses Related to Use (Continued)

| | Time spent | | | |
|------------------------------------|--------------|---------------|---------------|--------------|
| | Correlation | β | T | Signif. T |
| Group characteristics: Familiarity | 0.106 | -0.105 | -1.854 | 0.064 |
| Possession of resources | 0.028 | 0.088 | 1.685 | 0.093 |
| Subscription | 0.105 | -0.118 | -2.316 | 0.021 |
| Mobility | 0.072 | 0.104 | 2.084 | 0.038 |
| Social influence | -0.074 | -0.044 | -0.858 | 0.392 |
| Attitude | | -0.033 | -0.612 | 0.541 |
| Coefficient of determination | 4.1% | | | |
| Ficher's F coefficient | 2.875 | | | |
| Significance of F (α) | 0.009 | | | |
| Watson-Durbin's coefficient | 1.927 | | | |

6. Discussion

The tests of the hypotheses have shown that group characteristics (**0.397**), the possession of resources (**0.098**), and social influence (**0.094**) have a direct influence on both the user's attitude and cellular phone use. First, let's examine the relationship between the group characteristics and the user's attitude toward cellular phone use. The users' attitude is directly and positively influenced by the group characteristics (familiarity). This result shows that a person who has a network of correspondents with whom he/she shares harmonious ties will have a favorable attitude regarding cellular phones. This result strengthens the premise of the critical mass theory according to which the

adoption of interactive ICTs such as the cellular phone across a community or a country requires the formation of a critical mass of adopters. The sustainability of this critical mass depends on a number of factors including the interdependence (ties among users). Without ties or familiarity among users, which gives rise to the need for interaction, the interest for communicating could disappear and the existence of the critical mass could be compromised. Moreover, this result reinforces the conclusions reached by Ishii (2004) which suggests that communication through mobile technologies takes place among people who enjoy harmonious ties. According to the current study, the user's favorable attitude regarding cellular phones may be due to the need for interaction.

The results also show that there exists a statistically significant relationship between social influence and the user's attitude. In other words, the attitudes of cellular phones' users, in the Guinean environment, are influenced by the actions of an informal leader or of reference groups. These results are consistent with those of Anandarajan et al. (2002), which show that social pressure is one of the dominant factors influencing IT users' attitudes in the African context.

According to the results of this study, the attitude toward cellular phones is directly influenced by the possession of resources. This result helps to understand in part the low rate of connections or teledensity due essentially to excessive communication service charges in the Guinean context. This result also explains why, according to Mbarika (2002), 75% of telecommunication revenue in Sub-Saharan African countries comes from prices paid by government agencies and from for-profit organizations which have great financial resources. This result can also indicate that the cellular phone is still viewed as a costly technology in the Guinean environment.

The research results show that subscription conditions and Mobility have no influence on the user's attitude toward cellular phones in the Guinean context. The lack of a significant effect of the subscription conditions on the attitude seems quite surprising since this factor had been designated as one of the major determinants promoting a favorable attitude towards cellular phone use, especially in developing countries.

The analysis of the relationships between independent variables and use (the three levels of use) has shown that it is the possession of resources, mobility, group characteristics (familiarity), and social influence which result in significant relationships with cellular phones use. Indeed, the possession of resources (**0.190**) has a direct influence on the average number of calls received as well as the average number of calls made per day. In order to maintain communication activities regarding the strong role played by resources there would be a need for people who are capable of devoting more financial resources toward making telephone calls. Furthermore, communication service charges in Guinea appear to be exorbitant when compared to the average income per inhabitant. This situation might explain why, according to the statistics from the Guinean Telecommunications Services and the International Telecommunications Union, less than 2% of Guineans have a cellular phone.

The mobility (**0.147**) has only a direct influence on the level of use as expressed in terms of the number of

calls made and the average time spent on calls per day. This result suggests that an individual whose activities require him/her to travel frequently will use a cellular phone (to make calls) even if he/she does not have a favorable attitude towards it and he/she does not see it as useful, easy to use, or a source of intrinsic motivation. This result does not seem surprising as several studies like Plant (2001) have shown that mobility appears among the most important causes of cellular phone use.

The results have also shown that social influence (**0.154**) negatively influences only one indicator of use, namely the average number of calls received by day. However, social influence has been considered to be among the important factors which explain behavior toward ICT in the African context. This research has shown that the importance given to this variable should be reconsidered.

At this stage of analysis, let's mention certain relationships that have led to surprises: (1) The negative relationship between subscription and the level of use as expressed by the average duration of the call; and (2) the negative relation between social influence and the average number of calls received. The result involving subscription appears to be the most unexpected. Indeed, we note that the conditions of subscription, namely the relative ease of installation of cellular phone infrastructures as compared to landline phones, the pricing system (prepaid card) and the long waiting time to sign up for landline phone service explain the popularity of cellular phones (Minges, 1999).

Studies like Minge (1999) mentioned that payment of cellular phones use in Africa relies heavily on prepaid cards, which allows people to simply buy cards when they have the money. At first glance, this is useful when people live in precariously economic conditions such as in Africa. Viewed under this perspective, we can say that the pricing system of cellular phone use in Africa (Guinea) is more flexible, indeed more attractive than the one adopted in developed countries such as Canada.

However, our results have shown that subscription conditions influence only one of the indicators of use and that relationship is negative. This situation could be explained by the high cost and the difficulties (services availability and delay) to have cellular services in Guinea. This situation is likely to change in the near future since more and more cellular phone companies are doing business in Guinea. For instance, it seems that favorable pricing conditions (prepaid cards, longer

delay to sign up for a landline phone) are not the only factors explaining the increasing use of cellular phones in Guinea. Even though prepaid cards are attractive, we must however underline that the cost of the device (cellular phone) and the service costs are still high in comparison with the average yearly income per inhabitant. This average yearly income is estimated at \$394 US in Guinea (UNDP, 2003), which means that Guineans earn, on average, less than two dollars per day. The high cost of communication services could explain the negative relationship between length of call and subscription. Higher communication services in developing countries have been highlighted earlier by Minge (1999).

The negative relationship between social influence and the number of calls received, on one hand, and the inexistence of significant links between social influence and the two other indicators of use (calls made and the average time spent) on the other hand, can be explained by the current state of the Guinean telephone network. This network is characterized by extremely high service charges and mediocre service quality (i.e.: saturated network), unavailability of services, etc. Because of these problems, subscription to a cellular telephone service in Guinea does not always receive the endorsement of informal leaders within the social network. Moreover, these leaders tend to discourage the use of cellular phone services.

The results of this research have shown that the attitude of the Guinean respondents has no significant effect on their cellular phone use behavior. However, in a great majority of studies related to the explanation of human behavior, it is clearly established that attitude predicts action. The explanation for this result is cultural in nature, as social bonds are very important in Africa, including Guinea. The convictions of an individual will be those of the group, and it is the group which provides opinions, organizational structures, obligations, and security. Individuals draw their strength from the group, and it is within the group that they satisfy their psychological needs. In return, the individual owes loyalty and allegiance to his or her community in the form of respect of established social norms, which quite often lead the individual to adopt behaviors which may have nothing to do with his or her personal attitudes and expectations. Therefore social relationships need to be given particular consideration when studying individuals' attitudes toward the use of ICTs.

In summary, it clearly appears from the above discussion that technical variables (ease of installation of cellular phone infrastructures), structural factors

(irregularity of the telecommunication sector), and economic dimensions (prices), usually highlighted by previous studies such as Minge (1999), are important determinants of the supply of cellular phone services implementation. But they do not exclusively explain the adoption and use of this technology, especially in the Guinean environment as shown in this study. Besides, our study seems to be a cross-sectional study focusing on the late stage of cellular phone adoption (or post adoption). The results have demonstrated that the relationship between users' attitude and use of cellular phones is not significant while the link between social influence and use is significant. This finding is contrary to certain longitudinal studies which have shown that social influence or pressure becomes less or not important in post adoption. This finding may be related to social cultural context of Guinea as explained earlier. It is important to mention that factors of technology adoption are not only influenced by time effect but they are also sensitive to the context of adoption.

7. Contributions, implications and limits

In this era of knowledge economy where no nation can avoid using ICTs at the risk of becoming irreversibly marginalized, the results of the study could help in ensuring a greater success in the use of ICTs in developing countries with a similar cultural environment to that of Guinea. Indeed, the results could assist governments and international organizations in their search for a solution to build an information-based society in developing countries. An information-based society is often defined as a world in which everyone has the possibility to create, obtain, use and share information and knowledge, and in which individuals, communities and populations can realize the totality of their potential and make long-lasting improvements in their quality of life. New information and communication technologies make possible instantaneous exchanges of information and the implementation of innovative applications in numerous fields such as public administration, commerce, education, health care, etc.

In order to attain a true information-based society and allow countries to profit from opportunities offered by technological innovations, it is important to understand the factors governing the use of these innovations by individuals. While some developed countries are already well advanced in this undertaking, there are numerous developing countries such as Guinea which are experiencing great difficulties. We

consider that our study will help lessening these difficulties since it has permitted to determine and explain factors influencing the use of cellular phones which are a specific type of ICT.

This study leads us to question the dominant arguments explaining the rapid pace of the adoption and use of cellular phones in developing countries in general, and specifically in Guinea. The waiting time for subscription and the ease of installation of cellular phone infrastructures are not the only factors to consider when explaining people's motivations in using cellular phones in these countries. This research suggests emphasizing also alternative factors to explain the adoption and use of cellular phones in developing countries (i.e. Guinea). Those factors include: Mobility, familiarity, and possession of resources.

Policies for promoting the mobile technology sector in economically disadvantaged regions such as Guinea should give great importance to the fulfillment of resource acquisitions and use requirements. In this sense, it is essential for us to understand that the promotion of the telecommunication sector in general and that of the cellular phone in particular, involves the participation of people with strong financial resources. Relying primarily on these financially privileged people can facilitate the creation and sustainability of the critical mass of adopters in Guinea where the scarcity of financial resources constitutes a reality that is hard to ignore. Additionally, policies centered on free competition with its corollary of low prices should be promoted.

Nevertheless, the current research has some limitations. Indeed, this study is based on the perception of users. But, taking into consideration the size of the sample as well as the diversity of the respondents and their sectors of activity, it is reasonable to think that such a limitation does not compromise the validity of the empirical results. It is also possible that the data collected in the current study and dealing with cellular phone use may not easily be generalized to other ICTs and to other developing countries. Consequently, the model and measurement instrument developed in this study should be tested on other types of technologies and in more countries in order to reinforce the external validity of the study. Our goal is to extend this research to other developing countries. In addition, it is important to mention that although some of the determination coefficients (R^2) obtained during the test of hypotheses are weak, they still are significant, according to Fisher's test. Moreover, it might be possible that the variables included in the research model are not the only ones

that could explain the users' attitudes towards cellular phones and the use of this technology. In the future, it would therefore be interesting to include additional explanatory factors to the research model. Furthermore, because the respondents in the current study are among the 2% of cellular phones users in Guinea, it may be reasonable to think that the sample is not representative of the whole Guinean population. Therefore, the conclusion of this study with regard to cellular phones adoption and use behavior in Guinea should be taken with caution. Another limit of the study deals with the measurements of the use variable (see methodology section) which are limited to the vocal usage of cell phones. We adopted these measurements because the cellular phone services in Guinea are less developed. Sophisticated uses of mobile phones such as accessing the Internet are still lacking in Guinea. Furthermore, familiarity variable needs more attention in subsequent studies because we believe that the influence of this variable would be stronger in personal relationships than in business exchanges. It will be also useful to study more in depth the role of resources in cellular phone adoption in developing countries. Finally, because this study is a survey research, we have not been able to collect data on non-respondents who could have expressed a different opinion. Also, the use of a questionnaire can raise the threat of a common method variance.

8. Conclusion

In this research, we studied the influence of mobility, characteristic group and social influence, as well as the effect of facilitating conditions on the users' attitude and the use of cellular phones. A research model was built and five research hypotheses were stated after a review of the literature on the adoption and use of cellular phones. We collected usable data from 463 respondents using a questionnaire survey of cellular phone users in Guinea.

The analysis of the results have shown that among the independent variables of the research model, only the group characteristics, the possession of resources, and the social influence have a direct influence on the user's attitude toward and the use of cellular phone. Surprisingly, the results have shown that the subscription conditions have no impact on the adopters' attitude toward cellular phones, whereas they negatively influence the average time spent on calls per day. These results present numerous advantages because they are among the first to bring out micro-level factors which directly take into account the opinions and characteristics of cellular phones end users. This research can serve as basis for other studies.

The results of the current study can also help telephone operators to better target the real needs of end users, which would in turn have positive effects on their market penetration strategy. They could also help governments and international organizations involved in ICTs growth in developing countries to elaborate and refine their policies in promoting the telecommunication sector.

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