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This paper presents the results of a research conducted in order to investigate the relationship between the use of mobile information and communication technologies (MICTs) by service providers and service innovation capabilities of their firms. We empirically tested a theoretical model which supposed that MICTs would positively influence market and procedures innovation capabilities, directly, and also through the development of internal and market capabilities. The theoretical background was mainly based on absorptive capacity (ACAP) theory, examining dynamic knowledge capabilities and social integration capabilities. The empirical phase is based on a survey, answered by 51 top managers of business service firms. The data collected were analyzed using the Partial Least Square method. Our main findings suggest that, although MICTs do not affect directly innovation capacities, they can influence this variable trough the development of internal and market capabilities. This will vary according to what type of mobile device is used.

1. Introduction

In order to achieve flexibility, many companies adopt information and communication technologies that support mobility, context and location-awareness as well as networking. Mobile information and communication technology (MICT) includes technological infrastructure for connectivity such as Wireless Application Protocol (WAP), Bluetooth, 3G and General Packet Radio Service (GPRS), as well as mobile information appliances such as agendas, smartphones, mobile telephones, notebooks and tablet PC (Nah *et al.*, 2005).

By extending the use of computers and the Internet into the wireless medium, mobile technology allows users to have at anytime and anywhere access to information and applications. This provides greater flexibility in communication, collaboration and information sharing (Sheng *et al.*, 2005; Chen; Nath, 2006; Chen; Nath, 2008). These environments facilitate access to enterprise resource planning systems and to productivity tools, such as email and scheduling (Cousins; Robey, 2005).

The organizations that operate in these environment not only provide their employees with nomadic computing capabilities, but they also design their business processes, operational procedures, organizational structure, and reward systems around the needs of nomads (Chen; Nath, 2008).

This can result in the gradual improvement of existing working practices, enabling, for example, efficiency gains and flexibility. However, mobile IT also has the potential of being a disruptive technology, supporting a transformation of the way decisions are made, innovations carried out or services delivered (Sørensena *et al.*, 2008). This disruptive technology may offer changes in the organizational process for many tasks (Boutary *et al.,* 2008).

In other words, mobile information technology in general will play a significant role in organizational efforts to innovate current practices. Enterprise mobility signals new ways of managing how people work together using mobile information technology and will form an integral part of the efforts to improve the efficiency and effectiveness of information work (Sørensena *et al.*, 2008; Alonso *et al.*, 2010; Zhang, 2011). The rapid pace of adoption and advancement of mobile technology also creates opportunities for new and innovative services provided through mobile devices (Sheng *et al.*, 2005).

Considering the strategic importance of innovation for services competitiveness, organizations need to establish how mobile technology use can lead to improvements in the way work is done. Since mobile technology is a fairly new phenomenon, its organizational and strategic implications have not been systematically studied (Sheng *et al.*, 2005) and this new phenomenon needs to be better understood. In this context, the aim of this paper is to investigate the relationship between the adoption of MICTs and service innovation capabilities.

This research is motivated by two main factors. First, some researches have been done to examine theoretically and empirically the link between IT capabilities and firm innovation (e.g., Holsapple; Singh, 2003; Tippins; Sohi, 2003; Sabherwal; Sabherwal, 2005; Joshi *et al.*, 2010; Zhang, 2010). However, they are not focused on mobile technologies, which seem to have particularities associated to the nomadic computing capabilities. Furthermore, previous researches have focused on information technology impact on product innovation (Henard; Szymanski, 2001; MacCormack *et al.*, 2001; Nambisan, 2003; Pavlou; El Sawy, 2006; Alonso *et al.*, 2010). MICTs relations with services innovations remain scarcely studied. It is yet worth to recognize that service firms may be more deeply affected by introduction of MICTs owing to some differences between goods and services. De Bandt and Gadrey (1994, 14) have pointed out how far they differ in their operational process, as well as in the co-production relationship they have to tie between client and producer.

To bridge the gap in the literature, we draw on absorptive capacity (ACAP) theory to examine whether and how the adoption of MICT affects firm innovation. We argue that MICT should enhance firm innovation capabilities by the acquisition of internal and market capabilities.

The remainder of the paper is organized as follows. We begin by discussing the theoretical underpinning of our research model. We present our understandings regarding innovation, services innovations, dynamic knowledge capabilities and social integration capacity. We then describe our research model and the method used. At last, we present the results and we conclude the paper, presenting the managerial implications that may be drawn from this research work.

2. Theoretical Background

Our paper is based on three streams of the literature on economic innovation, service innovation and dynamic knowledge capabilities.

2.1. Innovation

Innovation is the ability to establish relationships, identify opportunities and take advantage of them (Tidd *et al.*, 2008, 23). The innovation process depends primarily on the cognitive abilities of individuals. This means thinking about innovation as a solution to problems, or as a result of a sum of variables (internal and external to the organization), that is responsible for new directions of development paths for a company. The creation of new things is related to the cluster of information relevant and recognized, allowing further development, including dictating market rhythms (Freeman; Soete, 2005, 19).

Schumpeter (1985) relates innovation with the strategic advantages of organizations, arguing that entrepreneurs would use technological innovation to organizational development. The Schumpeter concept of innovation is associated with something that differentiates and creates value for a business. This includes thinking about new products, new markets or new processes, which allow the organization to be perceived as different from other competitors.

For Tidd *et al.* (2008), there are four basic types of innovation. The first is the product innovation - the change in the things that the company offers and sells (products / services). The second type of innovation is the process one, which reflects the change in the way that the products / services are created and delivered. With the third type, innovation produces a change in the context in which the product / services are introduced. These changes occur in the management structure of the company, in the form of articulation of different areas, specialization of workers, relationships with suppliers and customers, among others. The last type of innovation is the paradigmatic one, in which change occurs in the mental models that guide the future paths for the organization.

2.2. Service Innovation

Three main theoretical approaches can be found in the services innovation literature: the technicist stream of thought, the service based perspective and the integrated one (Gallouj, 1994). This paper revisits the first one – the Barras' model (1986), which restricts the analysis of services innovation to the impact of new technologies, especially new ICTs. It also incorporates the integrated perspective from Gallouj (1994), which perceives service innovation as an interactive process, in which the company maintains internal and external connections that lead to innovation. These perspectives are presented bellow.

The origin of the technicist approach, based on the work of Richard Barras (1986), is the attempt to develop a theory of service innovation. As major disruptions or incremental improvements, innovative services would only result from the adoption of new technologies by service firms. The Barras' model maintains the primacy of the tech-

nological processes as determinant of innovation and restricts, therefore, the analysis of innovations in services to the impacts of new technologies, particularly new information technologies and communication.

The reaction to the technical focus of the pioneering studies of Barras has led to a new line of work: the Service Based Perspective. The central idea is that the user-producer relationship, the service relationship as defined by Gadrey (1994), offers huge opportunities for innovation that are more important than any technological innovation, even if we consider that this service relationship may vary in its intensity from an activity to another.

Lastly, the integrated approach aims to reconcile goods and services, integrating them into a single definitive theory of innovation. It believes that innovation involves generic characteristics and that the emphasis will be on some peculiarities for the manufacturing or for the services, according to the intensity of user-producer relationship found in each specific market.

Each product could be interpreted as a system combining the technologies deployed (tangible or intangible) and the skills needed for their production (producer's skills) and use (client's skills). Thus, innovation can be defined as any change affecting one or more terms in one or more characteristics vectors belonging to any domain: technical, service or skills (Gallouj; Weinstein, 1997, 547).

The trajectory of innovation in services may result from the combination of different service operations which, in turn, seek to meet the expectations generated by the type of service (Gallouj, 1999).

2.3. Dynamic Knowledge Capabilities

Considering the relationship between knowledge and innovation, we draw on absorptive capacity (ACAP) theory to examine whether and how the adoption of a MICT will affect firms' dynamic knowledge capabilities and enable innovation.

ACAP is often viewed as a dynamic capability of processing knowledge that enhances firm innovation (Zahra; George, 2002). ACAP literature argues that a set of organizational routines and processes, by which firms acquire, assimilate, transform, and exploit knowledge, can produce dynamic capabilities (e.g., Mowery; Oxley, 1995; Zahra; George, 2002).

ACAP theory is aligned to the vision that among the organizational resources that might differentiate firms' ability to develop and deploy an Information System (IS) for product innovation successfully are the knowledge resources (Zhang, 2011). Information and Communication Technologies enables the creation, dissemination, and use of knowledge, thus greatly augmenting and enabling firms' knowledge capabilities (Alavi; Leidner, 2001). Firms increasingly depend on their knowledge capabilities to continuously innovate (Leonard-Barton, 1995; Alavi; Leidner, 2001; Sabherwal; Sabherwal, 2005).

It is well recognized in the product innovation literature that information and knowledge about the firm's customers, suppliers and internal processes and capabilities play a pivotal role in new product development (Hong *et al.*, 2004; Sørensena *et al.*, 2008). Hong *et al.* (2004) argue that the essence of new product development is

about matching customer needs with the engineering and manufacturing capabilities of a firm and its suppliers.

What is required by customers? In which fields of design and production is the firm able? What are the capacities of the firm's suppliers and partners? What kind of new organizational process can be realized by the firm and its employees? These four questions seem to be therefore critical for the effectiveness and efficiency of the new product development process. Furthermore, the idiosyncrasy of a firm's information and knowledge about its customers, suppliers and internal capabilities may make the firm's information system support for product innovation more valuable. Although many firms may potentially develop and use similar technological devices to pursue product innovation, only firms with unique market information and knowledge are in a better position to acquire and to maintain competitive advantage from IT-based product innovation (Feeny; Ives, 1990).

2.4. The Social Integration Capabilities

Social integration mechanisms are structures that build firms' social capital (Zahra; George, 2002). These structures promote connectedness, interaction, coordination, and communication among members of firms by creating seamless networks of people and knowledge.

ICT can support and cultivate knowledge synergies by creating electronic networks of alliances and collaborations which can facilitate cross-firm socialization, essential for knowledge integration (Tippins; Sohi, 2003). Social processes are important for the workers' learning and understanding (Lundin; Magnusson, 2003). As a social integration mechanism, MICT can provide a capability to enhance firms' social capital and to support direct interactions among members of the firms.

If organizations aim at softening the boundaries to customers and associates in order to better understand and involve these stakeholders, then one of the primary means may just be a MICT. If Internet users are keen to helping companies supporting customers with deep questions about its products through posting their knowledge on discussion forums, some of this energy may in different forms be harnessed and adopted to the context of mobile technology use (Sørensena *et al.*, 2008).

The social integration capacity is especially relevant for services firms: the client's participation is an essential element of the production process for many business services specially consultancy services. The building of service relationship involves direct interactions which may be facilitated by mobile ICT.

3. Model and Hypotheses

We started the development of the theoretical model considering the perspective from Gallouj (1994), where each product or service is a system that results from the combination of technologies applied (material and non-material) and the competences needed to its production or use. As MICT has at start a technological dimension, we focused on this aspect and on the capabilities that could influence the service development and innovation.

In order to assess the possible existence of a specific attitude towards mobile technology that could have been developed by the top interviewed managers, we asked how they perceived the utility for the organization of four types of technologies: (i) Smartphone; (ii) Mobile phone; (iii) Notebook; (iv) Tablet PC. A negative attitude certainly will hinder the adoption of mobile technologies, when a positive one will speed it up.

We have to identify elements associated to the producer capabilities. We considered Gallouj's perspective, which perceives service innovation as an interactive process, where the company maintains internal and external connections that lead to innovation. There are two different types of elements associated to the producer capabilities: internal ones and market capabilities. We selected the following items to measure internal capabilities: (i) Better organize the work of travelling employees; (ii) Better develop employees' information and competences; (iii) React faster when facing problems or opportunities; (iv) Better use of the competences throughout the firm; (v) Better diffuse information inside the enterprise; (vi) Better develop the firm's information systems. Market capabilities were approached through 6 other items: (i) Better develop relationship with clients; (ii) Better inform clients about other services or products the firm offers; (iii) Better develop clients' portfolio; (iv) Better develop relationship with suppliers and partners; (v) Better explore customers needs; (vi) Better knowledge about the competitors offers.

The innovation capabilities were here evaluated by the intensity of the changes having been accomplished during the last three years in seven different dimensions of the service activity: (i) The internal procedures set up to perform the service; (ii) The way the service is made available for clients; (iii) The service business model; (iv) The legal environment of the services (brand, labels, certifications); (v) The targeted market; (vi) The content of main services offered; and (vii) the content of peripheral associated services. These items are based on the classification of the innovation types proposed by Tidd *et al*. (2008). It was also asked what share of the general turnover was obtained by recently developed service activities; the answers were converted into a 5 levels scale (viii). We split these items into Procedures Innovation Capabilities (i, ii, iii, iv) and Market Innovation Capabilities (v, vi, vii and viii).

Having identified the variables, we propose a theoretical model that characterizes the relationships between the adoption of MICT and innovation capabilities.

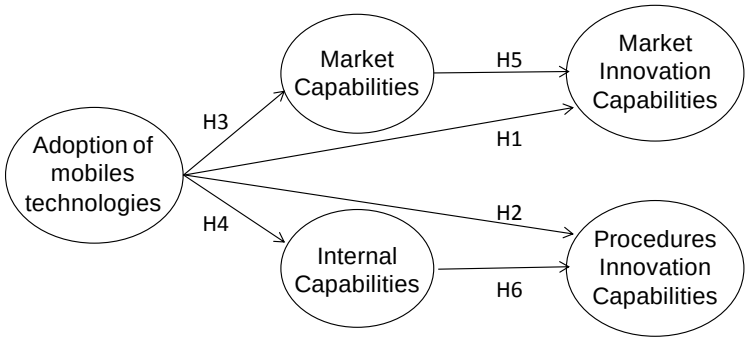

Fig. 1: Theoretical Model

The main hypothesis of the proposed model associate the adoption of MICT directly to firm's innovation capabilities:

H1: The adoption of mobiles technologies positively affects market innovation capabilities.

H2: The adoption of mobiles technologies positively affects procedures innovation capabilities.

It is also supposed that the adoption of MICT influences internal and market capabilities.

H3: The adoption of mobiles technologies positively affects firm's market capabilities.

H4: The adoption of mobiles technologies positively affects firm's internal capabilities.

Finally, these internal and market capabilities should also influence firm's innovation capabilities:

H5: Market capabilities positively affect market innovation capabilities.

H6: Internal Capabilities positively affect procedures innovation capabilities.

4. Method

4.1. Sample and Data Collection

The data were collected from a telephone survey[1]. The target respondents of the survey were senior executives of business service companies in France. Before being applied, the survey instrument was pre-tested and refined by specialists. Out of the 807 companies which were contacted in order to collaborate with the research, 51 usable responses were received. This response rate was found adequate. Among the responding firms, 27 (53%) do belong to the sector of logistics, transports or related activities. There the answering rate climbs up to quite 20% of the contacted firms. 23 other answers (45%) are from engineering, IT, technical assistance or education; The only one left is related to management consulting, but as it sells mostly computer consultancy services it can be considered together with the previous category. Noteworthy, no answer was obtained from the operational services sector. 29 firms (57%) which answered our questionnaire are independent and among the 22 others, which are belonging to larger organizations, only 12 are parts of very large corporations. Thus, most managers interviewed have full authority on their enterprise which remains small or medium sized: 27 having between 10 and 70 employees, 6 between 100 and 200 and 6 others only 6 or seven. All these firms are widely spread over the national territory, 11 being located in the main French region around Paris, the other 40 in most of the 21 French regions, with a maximum of 5 in the Marseille-Nice region.

[1] The survey was done by MARS Marketing, Marseille.

4.1.1. Questionnaire and measurement

The survey was structured in four sections:

- The first one had the purpose to obtain general information on the firm: activity sector, size, ownership.
- The second one aimed to identify the innovation capacity of the firm, asking which kind of changes the organization had introduced in the last three years. As stated before, seven separate domains were proposed. These questions are related to the items of market and procedures innovation; the scale of measure is a five points Likert scale, where 1 means that a small change had been conducted and 5 means that a deep change has been done. The answer that no change has occurred in this domain was also possible.
- In the third part, the uses of four types of MICT were investigated. It questioned the utility of the technology for the enterprise, with a 5 points scale, were 1 means that the utility is limited and 5 means it is extremely useful. It was also possible to choose an option that revealed that this MICT did not have application for that enterprise.
- The last part presented the items associated to internal and market capabilities. It was investigated the utility of MICT to the development of these capabilities, in a scale from 1 to 5, measuring the level of agreement with the positive propositions submitted.

4.2. Data Analysis

Partial least squared (PLS) path modeling is a multivariate technique to test structural relationships and a general method to estimate models with latent variables measured by many items. This tool has as a main objective, the causal predictive analysis where problems are complex and the theoretical support is very limited (Wold, 1982). It is applied by a growing number of researchers from disciplines such as strategic management, information systems, marketing, *etc*. (Henseler *et al.*, 2009).

Basically, the objective of the PLS modeling is to predict dependent variables, latent or manifest, maximizing the Explained Variance (R^2) of the dependent variables.

The differences between the PLS method and models based on Structure Equation Modeling (SEM) lays out on its objectives. The PLS optimization method is more suitable to predictive applications and theory development (Exploratory Analysis) while SEM methods will be more suitable to confirmatory analysis (Lévy-Mangin; Varela-Mallou, 2006). Besides, the PLS does not require any parametric conditions, so this technique is particularly appropriate in the case of small samples with non-normal data (Chin, 1998; Vinzi *et al.*, 2010).

Due to the exploratory condition of this research and to the scope limited to 51 respondents, the PLS was identified as the most appropriate technique to data analysis. In order to take into account the limited number of cases, we launched 1000 bootstrap samples based on the 51 cases.

5. Results

The first research result was to reject the idea that a unique variable could express a possible global attitude of the managers towards the mobile technologies. It shows that a global 'mobile technology' concept does not have any meaning to most of the managers: they evaluate each type of application and equipment as useful or not in their given professional context. Four separate variables had therefore to be kept and we developed one model for each mobile technology, taken separately. We present here these models for: (i) Smartphone; (ii) Mobile Phone; (iii) Notebook; (iv) Tablet PC.

First, we examined the individual reliability for each item, given by loadings or correlations between the items and the construct. The convergent validity of each construct is acceptable for a loading greater than 0.55 (Falk and Miller, 1992). Only the items complying with this prerequisite could be incorporated. This resulted in the exclusion, for all four models, of the eight following items:

- The 'Better use of the competences throughout the firm (iv)', 'Better diffuse information inside the enterprise (v)' and 'Better develop the firm's information systems (vi)' had to be dropped from the internal capabilities, which was measured by the three remaining items.
- The market capabilities could not be measured by the six items, two being dropped: 'Better develop relationship with clients (i)' and 'Better explore customers needs (v)'.
- The Market innovation capability was consistent with only two of the four initial items: The two others, - 'The content of main services offered (vi)'; and 'The content of peripheral associated services (vii)'-, had to be suppressed from the analysis.

Table 5 in Appendix 1 recapitulates the different variables and the items which were used in order to measure them.

5.1. The Smartphone Model

Following the two-step analytical procedures (Hair *et al.*, 1998), we first examine the measurement model and then the structural model. The rationale of this two-step approach is to ensure that our conclusion on structural relationship is drawn from a set of measurement instruments with desirable psychometric properties.

5.1.1. The Measurement Model

The measurement model was evaluated in terms of internal consistency, convergent validity and discriminant validity. Table 6 in Appendix 1 presents the average variance extracted (AVE), the composite reliabilities, the Cronbach's alpha and the discriminant validity for the smartphone model.

In assessing the internal consistency for a given block of indicators, we have calculated the composite reliability, which should be greater than 0.7 (Nunnally, 1978). This condition is met in this study.

Additionally, the Cronbach's alpha coefficients were computed (Cronbach, 1951). Typically, these coefficients should fall within a range of 0.70 to 0.90 for narrow constructs, but it is also accepted coefficients superior to 0.60 in social sciences (Pasquali, 1999). All the coefficients for the variables ranged between 0.69 and 0.78. Thus, the reliability test works out successfully.

Convergent validity indicates the extent to which the items of a scale that are theoretically related should correlate highly. The average variance extracted for each construct should exceed the variance due to measurement error for that construct (i.e. should exceed 0.5). All the measures fulfill the recommended levels.

In order to verify the discriminant validity, all AVE scores were compared to R^2 values. Since the AVE scores are bigger for all cases, this test works out successfully.

5.1.2. The Structural Model

Figure 2 depicts fit statistics, overall explanatory power and estimated path coefficients.

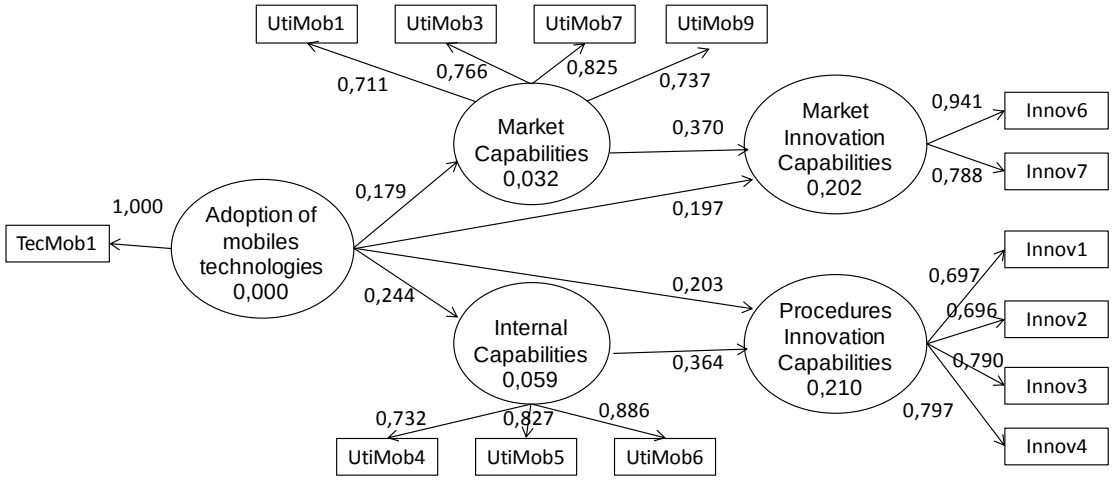

Fig. 2: The Structural Model for adoption of Smartphone

To assess the statistical significance of the path coefficients, which are standardized betas, a bootstrap analysis was performed. The use of bootstrapping, as opposed to traditional T-tests, allows the testing of the significance of parameter estimates from data that are not assumed to be multivariate normal. In this case, 1000 sub-samples were created by removing cases from the total dataset. PLS estimates the parameters of each sub-sample and 'pseudo values' are calculated by applying the bootstrap formula.

To be significant the Student T measure should be greater (in absolute terms) to 2.58 (the null hypothesis probability is then lower or equal to 0.01); With an absolute value of the T measure between 1.96 and 2.58, the null hypothesis will have a probability of about 0.05, which is still acceptable according to Cheung and Lau (2008) who recommend to chose a 95% confidence interval. With a T measure (in absolute terms) between 1.64 and 1.96 the probability of the null hypothesis will climb up to 0.10, which could only be accepted, if need be. Student T's have been calculated after computing a bootstrap in order to validate all model's relationships. Table 1 shows that two paths prove to be significant, supporting the hypotheses 5 and 6:

- Internal Capabilities impact Procedures innovation capabilities (at a 0.01 level)
- Market Capabilities impact Market innovation capabilities (at a 0.05 level)

	ADOPS	CAMARK	CAINT	INNOVM	INNOVP
ADOPS		1,162799	1,601295	1,389678	1,258589
CAMARK				2,320784	
CAINT					2,711326

Table 1: Student T for Smartphone Model

Finally, the results from the analysis show the explanatory power of the research model. It reveals that the proposed model accounts for 20 percent of the variance in Market Innovation Capabilities and 21 percent of the variance in Procedures Innovation Capabilities. The internal capabilities exhibit direct effect on Procedures Innovation Capabilities and market capabilities exert direct effect on Market Innovation Capabilities. The other effects investigated are not significant. Thus, the adoption of smartphones exerts no significant influence on the studied variables.

5.2. The Mobile Phone Model

5.2.1. The Measurement Model

The main tests of the measurement model – the internal consistency, including the reliability, the convergent validity and the discriminant validity tests, work out successfully, according to the same criteria used in the measurement model described for Smartphone model. The syntheses of the average variance extracted, the composite reliabilities, the R square and the Cronbach's alpha for the mobile phone model is presented in Table 7, from the appendix.

5.2.2. The structural model

Figure 3 depicts fit statistics, overall explanatory power and estimated path coefficients.

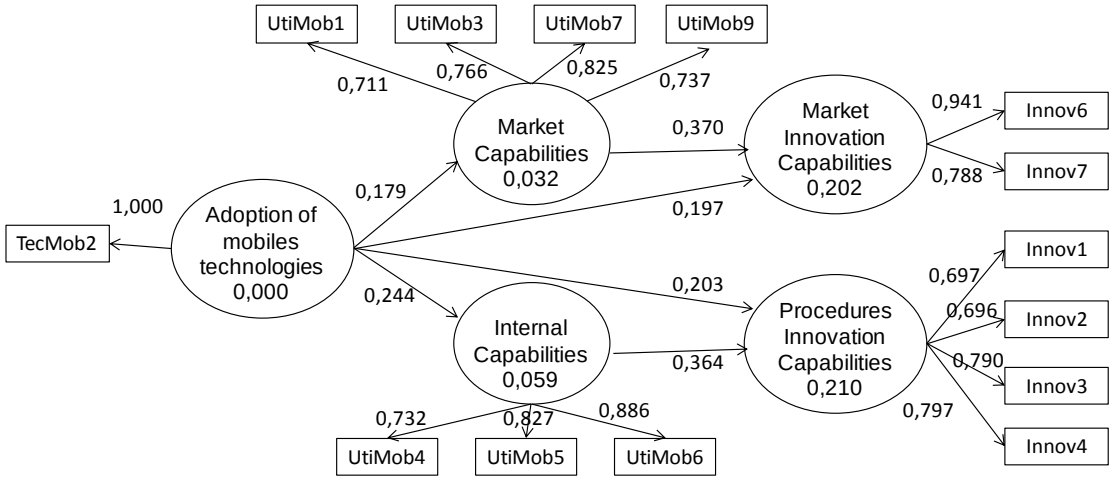

Fig. 3: The Structural Model for the adoption of Mobile Phone

To assess the statistical significance of the path coefficients, we also performed a bootstrap analysis with 1000 sub-samples. Table 2 shows that three paths prove to be significant, supporting the hypotheses 4, 5 and 6:

- Internal Capabilities impact Procedures innovation capabilities (at a 0.01 level)
- Market Capabilities impact Market innovation capabilities (at a 0.05 level)
- Adoption of mobile phone impacts Internal Capabilities (at a 0.10 level)

	ADOPS	CAMARK	CAINT	INNOVM	INNOVP
ADOPS		1,165591	1,653967	1,419197	1,193931
CAMARK				2,112432	
CAINT					3,026748

Table 2: Student T for Mobile Phone Model

The results from the analysis reveal that the proposed model accounts for 20 percent of the variance in Market Innovation and 21 percent of the variance in Procedures Innovation. The adoption of cell phone exhibits direct effect on market capabilities, the internal capabilities has a direct effect on Procedures Innovation and market capabilities exhibits direct effect on Market Innovation. The other effects investigated are not significant. Thus, the adoption of mobile phone exerts an indirect influence on the market innovation capabilities, by the mediation of market capabilities. However it has no significant influence on the procedures innovations.

5.3. The Notebook Model

5.3.1. The Measurement Model

All tests developed – the internal consistency, including the reliability, the convergent validity and the discriminant validity tests, have the necessary conditions satisfied, according to the criteria presented in the measurement model for Smartphone. Table 8 from the Appendix summarizes the average variance extracted, the composite reliabilities, the R square and the Cronbach's alpha for the notebook model.

5.3.2. The Structural Model

Figure 4 depicts fit statistics, overall explanatory power and estimated path coefficients.

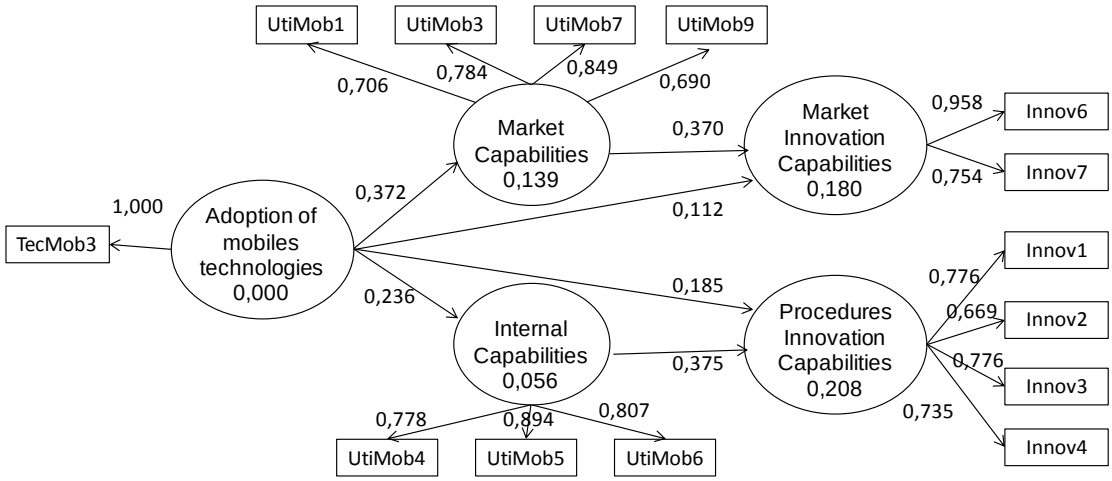

Fig. 4: The Structural Model for the adoption of Notebook

Student T's have been calculated after computing the same bootstrap in order to validate all the model's items. Table 3 shows that four paths prove to be significant, supporting the hypotheses 3, 4, 5 and 6:

- Adoption of notebook impacts Market Capabilities (at a 0.01 level)
- Market Capabilities impact Market innovation capabilities (at a 0.01 level)
- Internal Capabilities impact Procedures innovation capabilities (at a 0.01 level)
- Adoption of notebook impacts Internal Capabilities (at a 0.10 level)

	ADOPS	CAMARK	CAINT	INNOVM	INNOVP
ADOPS		3,123968	1,807235	0,938597	1,396917
CAMARK				2,620550	
CAINT					3,129646

Table 3: Student T for Notebook

The results from the analysis reveal that the proposed model accounts for 18 percent of the variance in Market Innovation and 20.8 percent of the variance in Procedures Innovation. The adoption of notebooks has direct effects on market and procedures capabilities. The internal capabilities exhibits direct effect on Procedures Innovation and market capabilities exert direct effect on Market Innovation. Thus, the notebook adoption exerts significant indirect effects on both innovative capabilities even if the direct relationships are not significant.

5.4. The Tablet PC Model

5.4.1. The Measurement Model

Once more, the internal consistency, including the reliability, the convergent validity and the discriminant validity tests work out successfully, according to criteria exposed. Table 9 from the Appendix summarizes the average variance extracted, the composite reliabilities, the R square and the Cronbach's alpha for the Tablet PC model.

5.4.2. The structural model

Figure 5 depicts fit statistics, overall explanatory power and estimated path coefficients.

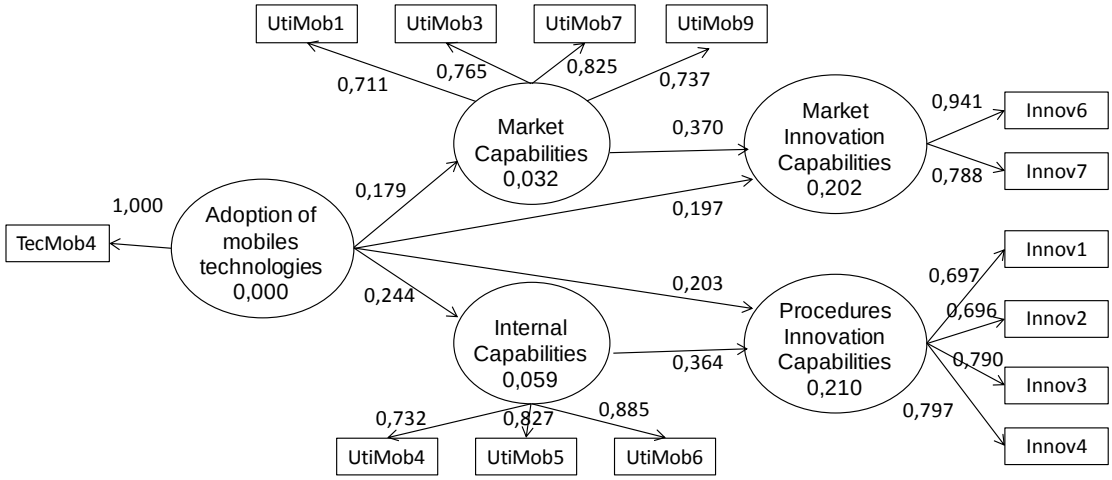

Fig. 5: The Structural Model for the adoption of Tablet PC

Table 4 presents the Student T's calculated after computing the same bootstrap. They show that only two paths prove to be significant, supporting the hypotheses 5 and 6:

- Internal Capabilities impact Procedures innovation capabilities (at a 0.01 level)
- Market Capabilities impact Market innovation capabilities (at a 0.05 level)

	ADOPS	CAMARK	CAINT	INNOVM	INNOVP
ADOPS		1,174059	1,552015	1,427076	1,259769
CAMARK				2,371580	
CAINT					2,769496

Table 4: Student T for Tablet PC

The results from the analysis reveal that the proposed model accounts for 20 percent of the variance in Market Innovation and 21 percent of the variance in Procedures Innovation. The internal capabilities exhibit direct effect on Procedures Innovation and market capabilities exert direct effect on Market Innovation. The other effects are not significant. Thus, the adoption of tablet PC exerts no significant influence on the studied variables.

6. Findings and Managerial Implications

This research was conducted in order to investigate the relationship between the adoption of MICTs and service innovation capabilities. It was based on the perspective that innovation is a result of a sum of variables internal and external to the organization, which is responsible for new directions of development of the firm (Freeman; Soete, 2005, 19). It departs from the idea that MICT would positively influence mar-

ket and procedures innovation capabilities, directly, and also through the development of internal and market capabilities.

Our findings did not support all the hypotheses appointed by our theoretical model. The direct effect of MICT adoption on the innovation capacities is not significant in any of the four models. Some reasons can explain these results:

- Previous researches had pointed out that employees can be reluctant to the use of MICT, fearing that changes in the organizational processes may increase their work pressure (Orlikowsky, 2000; Boutary; Monnoyer, 2008).

- Managers are sometimes more impressed by the "magic effect" of MICT than their employees (Markus *et al.,* 1997), but there is a large gap between MICT adoption and MICT appropriation (Isaac *et al.,* 2006). It seems that the first step of MICT appropriation increases the quality of the relationship between the firm and its partners, and not the innovation procedures (Ben Chehida, 2011). The gap between MICT adoption and its appropriation is probably larger when MICT is used for an innovation process than it is in a casual situation.

- As–innovation capabilities are determined by numerous other variables not taken in account in our model. The effect of MICT on these variables is still to be evaluated.

However, the relationships between internal capabilities and procedures innovation capabilities and between market capabilities and market innovation capabilities are clear. For all types of MICT investigated, the hypotheses 5 and 6 are confirmed. As pointed out by Feeny and Ives (1990), internal and market capabilities, associated for example to knowing customers needs, internal competences and suppliers capacities, are directly associated to innovation capabilities.

The first managerial implication of this research results from these findings: organizations should develop internal and market capabilities, if they intend to be innovative. Therefore, using MICT could be an interesting tool, though our analyses show that it shouldn't be recommended as a panacea: its efficiency probably depends on various contextual situations. It is relevant to observe that the innovation capabilities are explained around 20 percent by the models. This percentage seems to be significant, since innovation is a complex construct, which is explained by numerous other variables. So, the investment in MICT to develop internal and market capabilities represents an opportunity to develop innovation, but a realistic strategy has to sustain this technological investment. It is quite significant to observe that 30 years after the first ICT implementations in the firms, the question of strategic alignment still remains a matter of interest (Venkatraman, 1995; Tallon; Kraemer, 2003).

The results for each specific technology are also worth to be analyzed. Internal and market capabilities are positively affected by the use of notebook, although they are not influenced by the use of Smartphone or Tablet PC. The use of mobile phone exhibits direct effect on market capabilities, although it does not have any significant effect on internal capabilities.

We believe that the greater number of hypotheses confirmed by the notebook model is associated to the fact that notebook is a technological device more complete, with more well known functionalities. People should use it for different purposes, associated to both types of capabilities. Smartphone and tablet PC, although more limited if

compared to a notebook, do also offer a great number of functionalities, but have been more recently introduced on the market. The access to these functionalities may not yet be so practical or people may have the habit to use them in more restricted ways. Organizations that invest in smartphone and tablet PC can stimulate users to play with more functionalities of these devices by creating information systems simpler to use. Doing this will perhaps help to build the internal and market capabilities that are necessary to develop innovations capabilities.

The fact that the adoption of mobile phones exerts a direct effect on market capabilities can be attributed to the wide use made by employees of this device: to communicate, exchange information or coordinate with clients, suppliers or other partners. This orientation to market capability may be, in part, explained by the relevance of the client in the co-production process. However the business service firms seem to be missing opportunities to use mobile phones to develop internal communication or to better organize work.

The poor results obtained for smartphone and tablet PC, which did not reveal any influence in internal or market capabilities, probably have specific causes. Tablet PC is a relatively new technology and, as such, its use isn't yet consolidated in business processes. The use of smartphones, may be oriented by others productivity objectives, justifying the poor relationships with internal and market capabilities. It is also logical to imagine that these MICTs can be used together, each one for its purposes. Some of them are more oriented to market and internal capabilities when others are to innovative capabilities.

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Appendix 1

ADOPS: Adoption of one mobile technology	1 (low utility) to 5 (very usefull)
CAMARK: Market capabilities	
Mobile technology allows to:	1 totally disagree to 5 totally agree
utimob1: Better explore customers needs	
utimob3: Better inform clients about other services or products the firm offers	
utimob7: Better develop clients' portfolio	
Utimob9: Better knowledge about the competitors offers	
CAINT: Internal capabilities	
Mobile technology allows to:	1 totally disagree to 5 totally agree
Utimob4: Better organize the work of travelling employees	
Utimob5: Better develop employees' information and competences	

Utimob6: React faster when facing problems or opportunities	
INNOVP: Procedures innovation capabilities	
Since last three years:	1 (not changed) to 5 (deeply changed)
Innov1: The internal procedures set up to perform the service	
Innov2: The way the service is made available for clients	
Innov3: The service business model	
Innov4: The legal environment of the services (brand, labels, certifications)	
INNOVM: Market innovation capabilities	
Since last three years:	1 (not changed) to 5 (deeply changed)
Innov6: The targeted market	
Poursn2: Share of the general turnover obtained by recently (since 3 years) developed services	Percentage converted into a 5 levels scale

Table 5: Recapitulation of variables and measuring items

	AVE	Composite Reliability	Cronbachs Alpha	Discriminant validity				
				ADOPS	CAMARK	CAINT	INNOVM	INNOVP
ADOPS	1,000000	1,000000	1,000000	1,000000				
CAMARK	0,578409	0,845460	0,756559	0,179229	0,578409			
CAINT	0,667967	0,857120	0,783836	0,24392	0,421069	0,667967		
INNOVM	0,753163	0,858259	0,695399	0,2631	0,405087	0,249783	0,753163	
INNOVP	0,557547	0,833867	0,734304	0,291773	0,146289	0,413748	0,11723	0,557547

Table 6: Measurement model for Smartphone

	AVE	Composite Reliability	Cronbachs Alpha	Discriminant validity				
				ADOPS	CAMARK	CAINT	INNOVM	INNOVP
ADOPS	1,00000	1,00000	1,00000	1,00000				
CAMARK	0,57841	0,84546	0,75656	0,03212	0,578409			
CAINT	0,66797	0,85712	0,78384	0,05950	0,17730	0,667967		
INNOVM	0,75316	0,85826	0,69539	0,06922	0,16410	0,06239	0,75316	
INNOVP	0,55755	0,83387	0,73430	0,08513	0,02140	0,17119	0,01374	0,55755

Table 7: Measurement model for Mobile Phone

	AVE	Composite Reliability	Cronbachs Alpha	Discriminant validity				
				ADOPS	CAMARK	CAINT	INNOVM	INNOVP
ADOPS	1,000000	1,000000	1,000000	1,000000				
CAMARK	0,577782	0,844608	0,756559	0,138744	0,577782			
CAINT	0,685095	0,866733	0,783836	0,055774	0,17465	0,685095		
INNOVM	0,742760	0,850611	0,695399	0,062255	0,169118	0,052311	0,742760	
INNOVP	0,548113	0,828609	0,734304	0,074861	0,030641	0,175404	0,018274	0,548113

Table 8: Measurement model for Notebook

	AVE	Composite Reliability	Cronbachs Alpha	Discriminant validity				
				ADOPS	CAMARK	CAINT	INNOVM	INNOVP
ADOPS	1,000000	1,000000	1,000000	1,000000				
CAMARK	0,578409	0,845460	0,756559	0,032123	0,578409			
CAINT	0,667967	0,857120	0,783836	0,059497	0,177299	0,667967		
INNOVM	0,753163	0,858259	0,695399	0,069222	0,164095	0,062392	0,753163	
INNOVP	0,557547	0,833867	0,734304	0,085131	0,0214	0,171187	0,013743	0,557547

Table 9: Measurement model of Tablet PC

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