IT based capabilities in SMEs: technological, organizational and environmental influence

IT BASED CAPABILITIES IN SMES: TECHNOLOGICAL, ORGANIZATIONAL AND ENVIRONMENTAL INFLUENCE

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ABSTRACT

Information Systems (IS) provides to Small and Medium Enterprises (SMEs) opportunities for supporting internal operations and their market relationships. Accordingly, this study investigated the industry influence on the patterns of IT use in SMEs. Specifically, using data from a survey on 402 Italian SMEs, we empirically examined the impact of technological, organizational and environmental characteristics on adoption decisions of IT and on the creation of IT capabilities. Specifically, using treatment effects models on a sample of 402 Italian SMEs, the paper shows that IT assimilation is related to the endowment of given managerial capabilities in SMEs and it does no longer depend on divides in the access to infrastructural resources. Moreover, IT planning capabilities positively affects the development of IT-based capabilities and results incisive in IT investments decisions. Finally, complexity in products and supply chain negatively affects the adoption of externally IT capabilities. The implications of these findings are discussed.

KEYWORDS

SMEs, Information Systems, IT capabilities, TOE

1. INTRODUCTION

Small and Medium enterprises' (SMEs) have been found to be different respect to large firms in the context of investments in Information Technology (IT) as they normally face greater risks in Information Systems (IS) implementation due to lack of adequate resources and IS expertise (Thong, 1999). Although many SMEs restrict the use of IT only to administrative tasks, appropriate IS may allow smaller businesses to increase their strategic and operational agility (Sambamurthy, 2003) by allowing innovations in business processes and supply-chain relationships. Past studies have analysed these aspects only in part. There is a lack of research on the study related to capabilities that SMEs develop from IT adoption, as previous studies have focused on aggregate measures of IT investments (Lucchetti and Sterlacchini, 2004).

Various motivations exist, however, to investigate the capabilities that SMEs develop from adoption of IT. First, IS are an enabler of more internal transparency and better coordination practices in the stage of business growth of SMEs, allowing managers to control what is going on within the organization. Second, in SMEs the relative advantage to adopt IT is usually less clear than for large firms since cross-functional coordination can be better guaranteed by flatter organizational structures and close proximity of co-workers. Third, small businesses usually follow different models to select and accumulate IT resources respect to their larger counterparts, as their IT investments tend to produce more business value when they facilitate inter-firm relationships rather than when they are solely focused on the improvement of internal efficiency (Shin, 2006). Fourth, there is a divide in the accessibility to infrastructural resources such as the access to broadband connection or technical skills that may block or delay IT investments. Finally, environmental "pull" factors (such as normative pressure) may influence the IT adoption in the light of SMEs' shortage of technical and managerial skills related to IT use. These motivations highlight that the degree of continuity with which SMEs invest in new IT may depend on technological, organizational and environmental factors.

Motivated by these issues, this paper analyses two research questions: first, what capabilities SMEs are more likely to develop by investing in IT? Second, what is the influence that the technological, organizational and environmental context has on creation of such IT-based capabilities? To give answer to these questions, this paper formulates a set of hypotheses that are validated on a sample of 402 Italian SMEs.

2. IT ASSIMILATION AND ITS ANTECEDENTS

IT assimilation refers to the success that firms achieve in incorporating IT into their business activities to enhance performance (Armstrong et al., 1999). It refers to the development of new organizational capabilities (or the improvement of pre-existing ones) originated by investments in new IT. Our work is inspired on Stoel and Muhanna's (2009) distinction among externally-focused and internally-focused IT capabilities. The former refers to bundles of IT-related resources that help firms respond timely to changes in its markets and shifts in customers and suppliers needs. The latter refers to firms' capacity to offer reliable products and services through efficient internal operations and low general and administrative overhead costs.

According to the innovation diffusion literature, adoption of an innovation does not always result in effective usage by a firm. Specifically, technologies often exhibit an "assimilation gap" (Fichman, 1999) since after a new technology is adopted, it needs to be routinized and institutionalized within the firm.

In this study we use the technology-organization-environment (TOE) framework (Tornatzky et al., 1990) to analyse factors that influence adoption and assimilation of internal IT resources – such as ERP systems – and of external resources (e.g. CRM and Product Lifecycle Management systems). Three reasons motivate the use of TOE framework to study the degree of assimilation of IT resources in SMEs. First, in the light of the greater influence that external "pull" factors (Powell and Dimaggio, 1992) may have on IT adoption in SMEs, environmental uncertainty and market munificence may shape the IT adoption and affect the duration of assimilation by affecting learning-by-doing on IT use. Second, by considering the influence of firms' organizational context over adoption decisions, TOE framework can be draw on Resource Based View (Barney, 1991) to assess the effects of managerial capabilities on learning-by-doing processes of IT adoption. Third, TOE allows to consider SMEs' technology readiness, which may have a significant importance given the difficulties that SMEs often encounter using reliable IT infrastructure and hiring IT professionals with adequate technical skills. Grounding on IT assimilation context, identified with internally and externally-focused IT capabilities, and TOE framework, we developed the following conceptual model (figure 1).

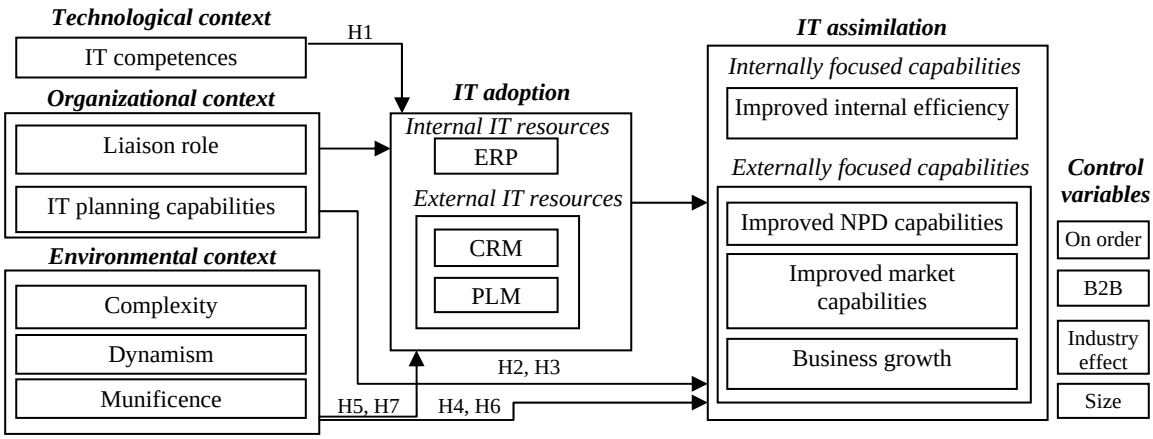

Figure 1. The conceptual model

2.1 Technological context

IT competences. The technological context refers to the firm readiness (Zhu et al., 2003) to invest into new features provided by emerging technologies. Such readiness depends on the technological infrastructure and the technical competencies required for allowing the correct running of IT. Whereas in large enterprises technical skills and infrastructure resources play a marginal role in IT investments dynamics in the light of their broader diffusion, in SMEs they may delay adoption decisions of information systems (Cragg et al., 1993). Because of obstacles with the development of appropriate skills and IT knowledge, many SMEs tend to postpone the adoption of IS. Based on these considerations we hypothesize what follows.

H1: The endowment of IT competences in SMEs is positively correlated with the adoption of internal (H1a) and external IT resources (H1b).

2.2 Organizational context

The organizational context refers to characteristics and resources of firms, including size and managerial capabilities in technology adoption decisions. By drawing on past studies on IT management, we expect that in SMEs assimilation of IT resources may mainly depend on the capabilities of undertaking IT decisions following with a mindful attitude and by considering carefully the requirements that stem from business improvement programs (Bharadwaj, 2000). Thus, two conditions may favour assimilation processes of IT.

Existence of a liaison role. The first condition refers to the existence of a manager accountable of IT investment decisions. Whereas large enterprises employ Chief Information Officers (CIO), SMEs – due to their limited size – cannot afford a role entirely deputed to IT management. In large enterprises, Armstrong and Sambamurthy (1999) have found that CIO's knowledge of both the IT and the business-related domains is a key factor for IT assimilation. Based on these considerations, we hypothesize that the existence of liaison role who is able to integrate the business and the IT perspective as a CIO are required and may anticipate effective IT assimilation processes in SMEs.

H2: A liaison role integrating IT and business decisions positively affects SMEs' development of internally (H2a) and externally-focused IT capabilities (H2b).

IT planning capabilities. The second condition refers to SMEs' ability to approach IT planning by using a long-term horizon and a strategic perspective (e.g. Sambamurthy and Zmud, 2000). Such condition is expected to favour SMEs' mindfulness in IT adoption decisions and it may thus decrease significantly the risk of failures in IS implementation. Thus, we hypothesize what follows.

H3: The endowment of IT planning capabilities in SMEs is positively correlated with the creation of internally (H3a) and externally IT capabilities (H3b).

2.3 Environmental context

In considering environment influence, studies on IT diffusion mainly concentrated on competition intensity and uncertainty (Mithas and Tafti, 2009), environmental dynamism, complexity and munificence. We focus on the latter three factors since they have been showed to synthesise various environmental characteristics (Dess and Beard, 1984).

Dynamism. Environmental dynamism refers to the rate of instability in an industry (e.g. changes in customer preference). Dynamic environments are characterized by an high variable demand and by unpredictable actions of competitors. Earlier studies (e.g. Li and Ye, 1999) highlight a positive association between dynamism and innovations in both processes and products. In unstable environments internal IT resources are likely to be in a state of constant flux. This may hinder the use of IT to improve internal efficiency, as most of the enterprise systems packages are "rigid" and not "malleable" in supporting business practices (Merrifield et al., 2008). Moreover, the lack of flexibility may be particularly critical for small businesses in the light of their more idiosyncratic operating practices and the lower endowment of expertise and financial resources to invest in the maintenance of their IS. Thus, we hypothesize what follows.

H4: Size moderates the effect of environmental dynamism on the creation of internal IT capabilities positively.

Complexity. Environmental complexity depends on the number of products offered by the firm and product technical complexity. As complex environments are difficult to monitor and understand (Thompson, 1967), firms facing high environmental complexity have more information processing requirements and are expected to have greater need for both internally and externally focused IT resources.

H5: High environmental complexity is positively associated with the adoption of internal (H5a) and external IT resources (H5b).

Complexity can be however detrimental for the improvement of SMEs' capabilities, in particular for the ones that support their external relationships. Complex products require higher coordination and market transaction costs in product development and sales processes. Moreover, in complex environments, firms cope with higher knowledge barriers in the development of new enterprise systems, leading firms to more likely fall in assimilation gaps in the implementation of new IT systems. Thus, we hypothesize what follows.

H6: Environmental complexity is negatively associated with the development of externally focused capabilities.

Munificence. Environmental munificence refers to the extent to which the environment can support sustained growth. It affects the availability of financial resources that can be invested in IT and the timing of IT adoption. Especially small firms may be less prone to wait the engagement of IT adoption projects which could generate high sunk costs (Lefebvre et al., 1997). Furthermore, under high industry munificence, firms are likely to follow the industry norm in IT strategy and thus will turn out to reinforce broader adoption of IT (Mithas and Tafti, 2009). Contingent studies (Stoel and Muhanna, 2009) argue that industries in low munificent environments perceive stronger competitive pressure on prices that may more likely induce firms to use IT to improve their internal efficiency, whilst in high munificent industries firms will be more likely oriented to use IT to increase their external orientation. Thus, we hypothesize what follows.

H7: Environmental munificence is positively associated with adoption of internal (H7a) and external IT resources (H7b).

3. RESEARCH METHODOLOGY

3.1 Sample and data collection

The data used are the output of a survey carried out on a population of 6,059 SMEs between February 2010 and April 2010 in Piedmont, a North-West Italian region. The survey is commissioned by the regional government to assess the diffusion of ICT in local firms. Data collection was organized in three steps. 2,022 companies in the population were randomly selected. We asked for the existence of a role appointed to management of information systems. A questionnaire was then delivered to the companies in the sample. A total of 473 questionnaires were returned but only 402 were usable for the purpose of this research (table 1).

Table 1. Sample composition (number of firms)

Industry	Small (10-49 employees)	Medium (50-250 employees)	Total
Manufacturing	87	117	204
Retail and wholesale trade	18	80	98
Transportation and logistics	11	14	25
Business services	24	51	75
Total	140	262	402

3.2 Measures

Some measures used in this study were based on composite scales adopted from earlier studies. For multidimensional scale, we used a five-point Likert scale, with responses ranging from “strongly disagree” (-2) to “strongly agree” (+2). The 0 value indicated a neutral position in the scale. Validity and reliability of these scales were tested. Exploratory and Confirmatory Factor Analysis were applied to data.

3.2.1 Variables

Concerning the adoption of IT resources, to measure internally-focused IT resources, we controlled for the adoption of ERP systems. Externally-focused IT resources were measured controlling for the adoption of CRM and PLM. Principal Component Analysis and reliability analysis did not support for considering a unique factor for adoption of external IT resources. For this reason, we kept each of these variables separated.

Regarding the IT capabilities, using a five-point Likert scale, CIOs were invited to evaluate whether IT leads to a significant impact on a series of items related to the firm’s internal and the external orientation, basing their assessment on impacts observed over the previous 4 years (between 2006 and 2009). The first factor we found in the analysis refers to the improvement of internal efficiency (internally focused IT capability). The analyses revealed other three externally-focused capabilities: improvement of new product development capabilities, improvement of market capabilities and business growth (appendix shows results).

The IT competencies, referred to the firm's technological context, were operationalized considering both end-users' IT skills, IT professionals' technical skills required for running information systems and infrastructure resources and the competencies to scan and identify emergent technologies.

Concerning the organizational context, IT planning capabilities were measured asking companies for the existence of routines for planning IT investments. The existence of a liaison role was instead taken into account by considering the presence of a managerial role whose duties included IT management decisions.

To operationalize environmental factors we followed the approach used by Dale Stoel and Muhanna (2009). Dynamism and munificence of each industry were thus assessed using national accounting data from Istat. For each industry segment, the industry-level total sales for 5 years (from 2004 to 2008) were regressed on the year variable. Dynamism was operationalized as the variability in annual industry sales and was measured as the standard error of the regression slope coefficient of annual industry sales divided by the industry mean for the 5 year period. Munificence was measured as the growth rate in annual industry sales for 5 years, measured as the regression slope coefficient divided by the average industry sales. We framed industry complexity as homogeneity-heterogeneity of inputs and outputs (Dess and Beard, 1984). We used the Istat input/output tables to calculate the complement to 1 of the concentration of each industry's inputs. For each of the three industry characteristics, we split the industries into two sets (1 for high and o for low).

We controlled for size, industry effect, the existence of business-to-business (B2B) and job-based operational models. Size was operationalized with the number of employees in logarithmic form. Three dummies were used for discriminating manufacturing companies (TMAN) and material and information services sectors (MSERV and ISERV), which aim to capture industry' technology features that environmental variables could capture only in part. B2B and job-based operational models were considered since the opportunities to improve market-based IT capabilities are limited by the firms' characteristics.

3.2.2 Instrument validation

Cronbach's alphas (CA) range from 0.707 to 0.943, thus pointing out adequate reliability. Moreover, all items have significant loadings on their corresponding factors, indicating evidence of good convergent validity (average loading = 0.793 and average p-value = 0.001). Discriminant validity is supported as the average variance extracted is greater than the squared correlation between constructs (Fornell and Lacker, 1981). Finally, Harman one-factor test points out that common method bias is unlikely to be a problem in the data (Podsakoff and Organ, 1986), as a principal factor analysis on the items used yields six factors.

4. FINDINGS

The empirical analysis followed a two stage process. First, descriptive statistics were computed to analyze the diffusion of the IT and the development of internal and external capabilities. Second, we searched for the determinants of IT assimilation using treatment-effects model with a two-step consistent estimation. Specifically, four types of capabilities from IT use were regressed on the firm's technological, environmental and organizational context. In this way, we counted for endogeneity due to selectivity bias.

4.1 Descriptive statistics

Table 2 reports descriptive statistics and highlights three facts. First, internally-focused IT resources are more diffused than technologies supporting firms' external orientation. Specifically, 36% of the firms adopted ERP, whereas CRM and PLM exhibited diffusion rates equal to 12% and 3%, respectively. These data thus suggest that these three technologies are positioned in three different parts of the diffusion curve (Rogers, 1992), thereby identifying three different types of adopters (early majority, early adopters and innovators, respectively). Concerning the endowment of infrastructural resources, almost all companies had broadband connection (87%). Second, the impact of IT on internal efficiency has been more broadly experienced than the benefits produced in customer relationships management, product development activities and business growth. Finally, few firms have developed IT planning capabilities, despite around 50% of the firms surveyed have a managerial role who is apparently deputed to IT management decisions. Indeed, the presence of such liaison role is not positively correlated to IT planning capabilities, suggesting that part of the companies that have "CIO-like" roles do not use formal routines for taking their IT decisions.

Table 2. Descriptive statistics

Construct	Variable	Acronym	Min	Max	Mean	S.D.
Technological context	IT competences	IT_comp	-2.00	2.00	0.38	0.76
Organizational context	Size	Size	1.00	2.40	1.55	0.36
	IT planning capabilities	IT_PC	-2.00	1.50	-0.27	0.77
	Presence of a liaison role	PLR	0.00	1.00	0.46	0.50
Environmental context	Munificence	Mun	0.00	1.00	0.64	0.48
	Dynamism	Dyn	0.00	1.00	0.36	0.48
	Complexity	Compl	0.00	1.00	0.42	0.49
IT capabilities	Improved internal efficiency	IE	-2.00	2.00	0.17	0.84
	Improved NPD capabilities	NPD_C	-2.00	1.50	-0.29	0.83
	Improved market capabilities	MKT_C	-2.00	2.00	-0.01	0.92
	Business Growth	BG	-2.00	2.00	-0.54	0.96
IT resources	ERP	ERP	0.00	1.00	0.36	0.48
	CRM	CRM	0.00	1.00	0.12	0.32
	PLM	PLM	0.00	1.00	0.03	0.16
Control variables	On order production	On_ord	0.00	1.00	0.28	0.44
	Business to business	B2B	0.00	1.00	0.52	0.50

4.2 Influence on IT adoption and IT assimilation

Ordinary Least Square (OLS) regression models reported that PLM had an impact on product development, whilst CRM on market-based capabilities and business growth. Whilst, ERP impact on the improvement of internal efficiency resulted positive but not significant. Therefore, we use adoption of ERP and PLM technologies as treatment effects for analyzing the determinants of internal efficiency and product development capabilities, respectively, while CRM for market based capabilities and business growth.

Concerning results on IT adoption, IT competencies had a positive effect on adoption of ERP and PLM, but not on CRM systems. Hypothesis H1a was thus supported, whereas hypothesis H1b was supported only in part. Munificence had a positive impact only on adoption of CRM systems (hypothesis H7b was thus supported in part, whereas hypothesis H7a was confuted). Complexity positively affected only PLM adoption (hypotheses H5a and H5b were not supported and partially supported, respectively).

Concerning results on IT assimilation, treatment effects model confirmed all the estimates generated by OLS regression models regarding the determinants of IT-based capabilities. With regard to the role of the organizational context, IT planning capabilities had a positive effect on the creation of both external and internally focused IT capabilities. Thus, hypotheses H3a and H3b were supported. Moreover, H2a and H2b were not supported, since the presence of a liaison presence did not impact on any type of capabilities. Furthermore, the interaction between size and dynamism had a positive effect on the improvement of internal efficiency, suggesting that capabilities to use IT to improve internal efficiency decreases as firm size decreases. This fully supported hypothesis H4. In addition, complexity was negatively associated with the improvement of NPD and new marked based capabilities, but it had no effect on the use of IT for supporting business growth. Accordingly, H6 was partially supported.

To sum up, table 3 reports hypotheses summary and table 4 shows models results.

Table 3. Hypotheses summary

Hypotheses	Supported a?	Supported b?
H1: The endowment of IT competences in SMEs is positively correlated with the adoption of internal (H1a) and external IT resources (H1b).	Supported	Partially supported
H2: A liaison role integrating IT and business decisions positively affects SMEs' development of internally (H2a) and externally-focused IT capabilities (H2b).	Not Supported	Not Supported
H3: The endowment of IT planning capabilities in SMEs is positively correlated with the creation of internally (H3a) and externally IT capabilities (H3b).	Supported	Supported
H4: Size moderates the effect of environmental dynamism on the creation of internal IT capabilities positively.	Supported	
H5: High environmental complexity is positively associated with the adoption of internal (H5a) and external IT resources (H5b).	Not Supported	Partially supported
H6: Environmental complexity is negatively associated with the development of externally focused capabilities.	Partially supported	
H7: Environmental munificence is positively associated with adoption of internal (H7a) and external IT resources (H7b).	Not Supported	Partially supported

Table 4. Estimates from OLS Regression Model and Treatment Effects Models.

	Internally-focused IT capabilities			Externally-focused IT capabilities								
	(1)	(2)		(3)	(4)		(5)	(6)		(7)	(8)	
	(OLS)	ME[1]	TE[2]	(OLS)	ME	TE	(OLS)	ME	TE	(OLS)	ME	TE
Dep. Var.	IE	IE	ERP	NPD_C	NPD_C	PLM	MKT_C	MKT_C	CRM	BG	BG	CRM
Dyn	0.06	0.05				1.19*	-0.38**	-0.40**				
Compl					-1.73"	1.13**		-0.11"				
Mun									0.31"			
Size[3]	-0.10	-0.64"	1.31***	0.05	0.03	0.63	0.11	0.12	0.33	-0.01	-0.03	0.31
IT_PC	0.04***	0.56***		0.46***	0.46***		0.39***	0.43***		0.42***	0.42***	
IT_comp	0.20**		0.15**			0.46"	0.15*					
SizeXDyn[3]	0.69"	0.72*										
ERP	0.20	1.41**										
CRM							0.32*	0.75		0.29"	0.82	
PLM				0.49"	0.95*							
On_ord	0.08	0.10		0.07	0.05		-0.18	-0.17		-0.03	-0.03	
TMAN	0.02	0.01		-0.35**	-0.35**		-0.17	-0.23"		-0.11	-0.12	
MSERV	-0.20	-0.23		-0.31*	-0.25*		-0.24"	-0.26"		-0.15	-0.15	
B2B	0.30*	0.28*		0.03	0.04		-0.05	-0.04		0.02	0.01	
Const	-0.42*	-0.77**	-2.40***	-0.06	0.10	-4.67***	0.03	0.32	-2.29***	-0.37**	-0.38	-1.60***
Rho	n.a	-0.50		n.a.	-0.30		n.a.	-0.29		n.a.	-0.32	
Adj R-Square	33.24%	n.a		25.38%	n.a.		21.53%	n.a.		13.58%	n.a.	
Observations	278			265			278			288		

*** p-value < 0.1%, ** p-value < 1%, * p-value<5%; "p-value<10%

4. CONCLUSION

This paper shows how technological competences, managerial features and competitive environment influence the dynamics of adoption and assimilation of IT in SMEs, generated three key findings.

First, this study highlights a distinction between different types of externally-focused and internally-focused IT capabilities, going beyond aggregate operationalization of IT investments results that were used in previous studies (e.g. Stoel and Muhanna, 2009; Lucchetti and Sterlacchini, 2004). With this regard the study highlights that SMEs are more likely to have used IT to improve their internal efficiency. The potentialities of using IT for improving external orientation seem under-exploited, even though earlier studies found that investments in IT supporting inter-firm relationships have greater impact on productivity (Shin, 2006).

Second, we have found that – similarly to what happens in large enterprises - IT assimilation is related to the endowment of given managerial capabilities in SMEs and does no longer depend on divides in the access to infrastructural issues (the broadband adoption is equal to the 87%). IT adoption and assimilation process are thus a matter of accumulation of technical competences and managerial capabilities.

Third, with regard to the environmental effects on SMEs' IT investments dynamics, complexity negatively affects new product development and market-based capabilities. Similarly, dynamism have a negative effect on the creation of market-based capabilities, despite it favors IT adoption in NPD processes. This finding is in line with the fact that turbulent and uncertain environments delay learning-by-doing processes and technology routinization (Zhou et al., 2006). Furthermore, considering the distinction between the small and the medium enterprises, we have found that the larger the size of SMEs the less negative is the effect of environmental dynamism on the creation of internally IT capabilities. This result highlights the fact

[1] ME stands for Main Equation.
[2] TE stands for Treatment Equation.
[3] Size is mean centered, since included in interaction with dummy variables.

that in turbulent industries the rigidity of standardized information systems (ERP in particular) is detrimental for internal efficiency especially in small enterprises, as such firms – because of their lower IS expertise and financial resources – may not upgrade their information systems to respond to environmental changes. For such organizations, IT is thus more a rigid asset as illustrated by some studies (e.g. Sambamurthy et al., 2003).

These results have important policy implications for designing public programs aimed at supporting IT adoption in SMEs. Since the IT adoption is no longer an infrastructural issue but a problem of accumulation of competences, policy makers have to focus on providing incentives to SMEs in order to increase the awareness of these phenomena and the development of adequate managerial capabilities.

Overall, this study contains several limitations. The main limitation is that we did not control for the time of adoption of key technologies for IT assimilation such as ERP, CRM and PLM systems. This may have a significant impact on the development of IT-based capabilities.

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APPENDIX

Table A1. Factor Analysis results.

Construct	Items	Loading	CA[4]
Improved internal efficiency	Administrative activities cost reduction	0.714	
	Efficiency enhancement of production	0.807	
	Examination of product and business costs	0.852	
	Examination of inventory levels	0.766	
	Efficiency improvement of production cycles	0.819	
	Quality examination of goods/services	0.754	0.876
Improved NPD capabilities	Quality improvements of goods/services developed	0.756	
	Failure reduction in new product development	0.820	
	Time-to-market reduction	0.849	
	Improvements in the document management	0.758	
	Coordination with suppliers for the design of components	0.716	
	Expansion of the partner network	0.763	0.868
Improved market capabilities	Knowledge enhancement of customers' needs	0.836	
	Improvements in the sales monitoring	0.890	
	Support provided to sellers	0.898	
	Improvement of the after sales services capabilities	0.626	0.832
Business growth	Turnover enhancement due to market share growth	0.886	
	Turnover enhancement due to the entry in new markets	0.943	
	Expansion in foreign markets	0.857	0.875
IT competences	Technological skills owned by ICT specialized employees	0.822	
	High technological skills in the use of IT technologies	0.785	
	Competences in the suppliers identification	0.797	0.720
IT planning capabilities	ICT investments follow a medium-long term strategic plan	0.766	
	Benefits and costs analysis due to ICT investments	0.845	
	Involvement of all functions in ICT investments planning	0.742	
	Regular monitoring of ICT investments carried out by competitors	0.550	0.707

[4] CA stands for Cronbach's alpha.