

Representing a Model to Measure Absorbency of Information Technology in Small and Medium Sized Enterprises

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Abstract

With rapid development of information technology (IT) and further deepening of informationization construction, more and more enterprises have realized the strategic value of IT and made great investments in it. However, during the IT implementation process, decision-making, adaptation degree, and IT performance are often inferior to the anticipation. The assimilation of technology can be defined by the extent to which the use of Information technology spreads across organizational processes and becomes routinized in activities. Capabilities of information technology play crucial role in an ever-changing environment and are considered as one of the most important sources for enterprises while enterprises should acquire some effective capabilities so that they can effectively deploy and utilize information technology. But companies need to increase their Absorbency of IT to accept it for effective use of IT, since the acquisition and use of information technology is simply not feasible and any information technology does not create value. The purpose of this investigation is to represent a model to measure absorbency of information technology in small and medium-sized enterprises. To do so, dimensions of the "absorbency of information technology" was determined through exploratory factor analysis in a survey research and confirmatory factor analysis was used to confirm model validity. Findings show that three dimensions are related to absorbency of information technology including the capability for innovative technology, Inside-Out IT capability and IT management capability, among which the capability for innovative technology has the highest correlation with the concept of absorbency of information technology.

Keywords: Absorbency of Information Technology; Capability for Innovative Technology; Small and Medium-Sized Enterprises; Inside-Out IT Capability; IT Management Capability.

1. Introduction

Nowadays many of small and medium sized enterprises (SMEs) are faced with difficulties in market situation. For example: increasing globalization, increasing competition, improvements of information and communication technology (ICT) and changes in organizational structure [1-2]. Therefore, in order to keep the competition in a messy market, required resources for the enterprise should constantly be evolved and improved [3]. Information technology (IT) has been recently found as a key resource input to firms' innovation activity [4] and due to its potential and actual effects as well as saving, processing and producing knowledge and information in SMEs, is an attractive realm for investment [5]. In a global conditions for business and due to improvements in IT, SMEs are forced to use novel technologies to preserve their competitive ability. In recent years, many firms have accepted technologies like electronic business, social

networks and virtual society [6] and believe that in order to survive in globalization era, it is necessary to absorb these technologies [7]. In addition, by the support of IT enterprises can obtain some abilities to create superior value to fulfil customers' demands [8] and to improve their financial operation [9]. But some researchers, with regard to the strategic role of IT in an enterprise, have stated that IT is not suitable for any SMEs [10-11]. Information technologies in the organization may cause problems related to their management and use, problems that may be not only technological but also managerial in nature [12-13] and it may cause some management problem for them [14]. [15], in their study concluded that to absorb IT, it is required to create extensive adaption between technology and enterprise and a considerable number of enterprises can't afford such adaption and therefore, they lose most of the benefits that re resulted by IT. Although there are some studies suggested to absorb IT [16-15], still it is not clear which method and structure is suitable to facilitate this

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absorption [17]. [18] emphasis that to create value, it is necessary to understand different aspects of absorption of IT. Therefore, with respect to the properties of SMEs compared to other organizations, these enterprises are suitable ground for studying about IT assimilation [19]. This article is trying to suggest the concept of "absorbency of IT" based on the concept on IT assimilation. To do so, after considering previous researches about IT, this article introduces absorbency of IT and then, represent a model to measure it. In order to represent the model, first, based on the concept of absorbency of IT, this question should be answered that what are the dimensions of absorbency of IT? What are the elements of each dimension?

2. Research Background

In this section and in the form of theoretical background, first the important concepts of the study like absorption and Capability of IT are discussed. Then, in the part about experimental background, some performed studies will be introduced and at the last part, the model of this investigation will be represented.

2.1 Theoretical Background

IT assimilation is about its applicability depth and vastness in the Firm procedure [20] and organization activities [21]. The assimilation of IT can be defined under a multidimensional perspective that involves the following: [22]

- Acceptance or rejection by the user;
- The institutionalization and diffusion of the system in the company's business processes; and
- Support for operational control and management and monitoring of business strategies.

[23-24] stated that IT adoption and assimilation in an organization are determined by numerous factors that can be placed into one of three categories of TOE (Technology, Organization and Environment) proposed by [25]. The TOE framework as originally presented and later adapted in studies of IT adoption provides a convenient analytical framework that can be used to study the adoption and assimilation of different types of IT innovation [26]. Technological factors describe the characteristics of the technological environment, which can influence the spread of systems in an organization. These features include various dimensions of technology due to the advantage to the quality of the system's information, which increases the spread of IT in the organization. Organizational factors refer to the scope, resources and size of the organization, and the environment dimension refers to the context in which the company develops its industry, competitors and government relations [25]. [26] describe these factors as suitable framework to assimilation IT in enterprises.

On the other side, the capability of IT is the capacity to control relevant costs of it, delivering systems when it's necessary and effecting on business goals through implementing IT [27]. This capability is considered from different dimensions: how it is related to its design, process

change, power relations and cooperation [28], improvements in IT capabilities leads to achieve a forward looking in enterprises, improvements in production programming, inventory and distribution management [29]. According to a perspective that uses resource-based view, valuable, rare, inimitable and irreplaceable resources, provide competitive advantage for SMEs, therefore IT should be considered as an organizational capability that leads to competitive advantage through guiding enterprise to perform superior performance [30] and since organizational capabilities or merits re-formed through integration of base resources [31] it can be said that IT capability is a combined factor source. Combined resources are measurable through their components and these lower level components can be either tangible or intangible [32]. Therefore, IT capability can have different dimensions equivalent to its distinct information-based resources. However, to develop the total dimensions of IT capability, one should focus on information-based technology resources that lead to this capability. For example, [27] said that IT capability depends on three different kinds of assets including IT human resource, IT technical resources and IT communication resources and it is a strategic capability to manage these three assets to apply IT in order to meet the goals. [33] adjusted this classification and divided the information-based technology resources of the enterprise into three groups of IT infrastructure, IT human resource and IT intangible resources that are more attractive in IT literature. [34] divided IT capabilities into three groups: outside-in, inside-out, and spanning. Outside-in IT capabilities are outward-facing. For example, a virtual community is an outside-in IT capability that allows firms to develop external relationships and collect knowledge from the external environment. Inside-out IT capabilities are inward-focused. For instance, technology platforms and IT skills are inside-out IT capabilities that enhance a firm's ability to seize market opportunities. Finally, spanning IT capabilities integrate a firm's outside-in and inside-out capabilities. For example, knowledge management systems enable storing, archiving, retrieving, and sharing of current knowledge to gain a better understanding of how new external knowledge relates to what organizational members already know. [35] considered value, dynamic and competitive capabilities as three different kinds of IT capabilities. About competitive capability these researchers said that IT business experience and communicative resources of IT can improve competitive advantage of the enterprises. In addition, IT capabilities normally effect on enterprise operation and provide higher levels of business for it [36]. Organizational performance is one of the most important constructions in meeting organizational goals [37] and the most important measure in evaluating commercial enterprises success.

Therefore, enterprises to create value through using IT, should reach to a specific penetration level. [38] believe that penetration of technology introduction into the business and education procedures, can lead to innovative application of IT. In order to make IT advantages and

benefits available to enterprises, they should be at the suitable level of absorbency. Lack or deficiency of absorbency in an enterprise, directly influences on steps in evolutionary path of IT assimilation and impede the progress of IT assimilation, even causing IT project to cease and leading to “assimilation gap”. So, while implementing complicated informational systems, it is necessary for managers to pay attention to IT absorbency in order to successfully implement the system and guarantee its ongoing application [39].

2.2 Experimental Background

In considering enterprises abilities and capabilities to absorb and use IT, there are several studies in the literature. Primary reviews show that there are differences between IT absorbency, its application and identifying its fundamental capabilities. For example there is difference between tools to reduce the cost [40], communication and customers and suppliers relationship tools [33]. The second wave of studies in technology investigations is about the effect of IT on the individuals' potential power and its effect inside the organization that has been performed by [41] and is mostly concerned about some properties like resource allocation, network focus, expertise and discretion. Next wave of studies were in 1990s and studied about the effect of IT on business redesigning process in which totally 9 basic capability were identified that lead to strong relationship between IT and business redesigning process [42].

On the other hand, [43] found that IT capabilities has positive and direct effect on organizational performance and this lead to important consequences for managers in evaluating investment on IT. [44] stated that IT enables organizations to continuously and gradually, change the knowledge achieved through cumulative experience into a practical knowledge, tangible efficiency and improvement of quality.

[45] suggested that IT capabilities are dependent on external environment properties which the enterprise in competing. [46] discussed about the role of technical capabilities in adjusting competitive strategies relation in enterprises operation. His results showed that technical capabilities have positive effect on organizational performance. [47] classified the IT capabilities into two groups of technical skills (education, experience and vision) and management capability (using technical skills to predict the technology). [48] discussed about the effect of IT based capabilities on enterprises operation with respect to the processes and operations that are supported cloud computations. Their result showed that communicational capability of IT, compared to technical and managerial abilities, has the most influential factor in facilitating success.

Findings of [49] showed that ERP implementation strategies don't directly effect on organizational performance, rather IT hybrid capabilities play as a tool to facilitate the relation between efforts to implement ERP system and the results of competitive performances in

enterprises. In this article, it has been tried to use a hybrid perspective about the dimensions of IT capabilities.

Reviewing literature shows that researchers discussed about IT capabilities from different perspectives, but there is no consensus about element for IT capability and how to measure it. Since there is no model or scale to measure the IT capability, it is necessary to define a new concept to evaluate IT assimilation in SMEs, which will be discussed as follow.

2.3 Conceptual Model

In order to review and evaluate enterprises ability in different fields, investigators have introduced different capabilities in literature all of which are gathered under the title of organizational capability. IT can be one of these organizational capabilities [30] so in this study, hybrid perspective about dimensions of IT capability is used. This study, through reviewing literature and focusing on basic resources, has integrated the theory of resource advantage and has represented a wider perspective about IT capability called “IT absorbency”.

IT absorbency is defined as “organization capability in a way that it can apply its IT resources in an effective way and in relation to other resources so that it can manage information inside the organization, improve the performance and create competitive advantage”. According to this definition, literature review and basics of theory to measure the IT absorbency it is necessary to consider three capabilities. In other words, an organization has a high level of IT absorbency that has a proper performance in three dimensions of IT resources, management and improving the performance and also in turn uses basic concepts of Inside-Out IT Capability [34], IT management Capability [33-47] and Technological Innovation Capability [50-51].

Inside-Out IT Capability

Inside-out IT capability are inward-focused. For instance, technology platforms and IT skills are inside-out IT capability that enhance a firm's ability to seize market opportunities Integrated information systems provide immediate access to standardized data across organizational units, which in turn allow the organization to more readily apply new knowledge to create products and services [52]. At inter-organizational level, Inside-out IT capabilities, like electronic commerce interactions will increase company's ability to recognize the valuable knowledge and exchange it with other co-operators or other companies. This leads to another form of side relation that supports knowledge stream in organizational limits [53]. Predetermined formats, will enforce applying and exchanging information and helps the enterprise to recognize the valuable knowledge. Enterprises that use shared decision-making mechanisms, contribute in richer knowledge about customers, technologies and markets through participating in collective decision making about effective factors in their processes of electronic exchanges. In addition, combining exchanged information with shared

decision-making processes through standard electronic commerce, leads to a deeper understanding about needs of each side and this will in turn increase their environmental self-awareness [54]. Therefore, Inside-out IT capabilities, reinforces enterprise' ability in recognizing and developing IT.

IT Management Capability

[55] have defined IT management capability as "a distinct set of human, motivational and behavioural skills that have different potentials to achieve special activities which are effective in business performance". They have argued that an IT capability is a capability to facilitate supporting and utilizing IT in order to improve business performance. SMEs keep their close relationship with their employees and have informal relations between manager and employees, informal structure and also informal processes. IT management capability performs facilitating mechanisms for entrance of valuable IT in to the enterprise so that it can obtain ore value. Human resources of IT represent intangible assets that are an important introduction for IT capabilities in enterprises [56]. Generally, human resource in IT represent education, experience and vision [57] that develop technical and managerial skills and capabilities. IT management capability is the extent to which managers should possess technical skills and business intelligence to predict emerging technology and its effective lever in balancing commercial processes with organizational goals [48]. The effective factor for successfully implementing new system in the enterprise is the ability of IT managers in coordinating multilateral activities that are relevant to implementation [58]. Studies have shown that managerial abilities have positive effect on competitive advantage or enterprise performance. In addition resource-based theories believe that enterprise capabilities represent resources that may be used for increasing efficiency and competitive advantage [48]. Therefore, managers should provide a situation under which employees are able to identify and exchange new information technologies. To create such a situation, there is no specific and standard instruction. So, managers can actively create an atmosphere in which employees have the motive to exchange IT and this exchange is easily done through informal relationships. According to [59], informal relationships are good source for small enterprises, since knowledge and IT will be achieved

Technological Innovation Capability

Innovation, as an intangible asset, is the foundation for any organization's survival [60] and those enterprises that use it successfully, can create competitive advantage in the market [61]. Responding to competitive environment, organization and countering possible internal and external threats are some factors contribute to applying innovation [62]. Therefore, innovation capability is an organization's asset and obtaining IT dependent on enterprises innovation capability [63]. Results from a study by [64] showed that the speed of innovation has positive and significant effect on performance. Faster innovation leads to better performance.

The speed of innovation makes it possible to react to the environment faster and represent a new product in a minimum possible time and cost and finally will lead to improvement in organization performance [65]. The concept of technological innovation capability first was raised at the beginning of 1980. This concept discusses about level of technology changes in order to achieve technological capability [66]. [67] define technological innovation as "a procedure by which the enterprise is dominant in designing and producing new product, regardless of whether or not these products are new to their local and foreign competitors". Technological innovation, is the process of developing new products or technologies, has important effect on enterprise operation [68]. [50] defined the technological innovation capability as "organization's required knowledge and skill to choose, install and maintain, adaption, improving and developing technologies inside the organization". Furthermore, technological innovation capability is defined as a set of tools, skills, knowledge, talent and intentions of the enterprise that lead to the ability to produce, understand, change and create procedures and products [51]. [69-70] considered the technological innovation capability as an important factor in company's development and emphasized on the importance of evaluating it. [71] Believe that developing technological innovation capabilities can be useful for the enterprise and leads to its competitiveness. [72] discussed about the effects of using innovations of technology in improving competitiveness and assuring companies stability. In addition, [73] argued that technological innovation capability is measurable through dimensions like technology infrastructure, production, knowledge, experiences and organization.

3. Methodology

In order to know different aspects of IT absorbcency and representing a model to measure this capability in SMEs, first according to the literature review and previous studies, effective indices in IT absorbcency in SMEs were extracted. Then, through filtering these indices by the experts, a questionnaire was extracted through forming special panels and by using experts' opinions that involved 25 questions among which 13 questions were dedicated to measuring technological innovation capability, 6 questions dedicated to measuring internal capability of IT and 6 questions dedicated to evaluate IT management capability. Population of this investigation involved all employees with bachelor or higher education, managers of production, sale, marketing and service units, ad senior managers of production SMEs in Iran. With respect to the identified population, the required sample number to test the model based on Cochran Formula was 650 people. After distributing 680 questionnaire, finally 587 questionnaires were received (86 percent) and analysed. Since the population was specific and there were some lists of individuals and enterprises, random sampling method was

performed. Among 587 respondents, 321 people had bachelor, 213 people had master and 53 people had Ph.D.

With respect to the purpose, this is an applied investigation and with respect to data gathering method, is descriptive with correlation, in a way that by reviewing relevant theories, first dimensions of the investigation are identified from theoretical perspective. Then, these identified dimensions are tested through a survey (production SMEs). Tool for data gathering and measuring variables of the study is a questionnaire which is prepared in the form of Likert scale. To consider the correctness of validity, before distributing the designed questionnaire, that was judged by some experts and necessary corrections were applied to it. Furthermore, divergent validity (exploratory factor analysis) and convergent validity (first order confirmatory factor analysis) were used to confirm the

validity of the questions in the questionnaire. After first order confirmatory factor analysis, three questions (question B1 in Inside-Out IT capability aspect, questions C5 and C6 in IT management capability aspect) were omitted because of little correlation. In exploratory factor analysis KMO value of questions was 92% that represents sampling adequacy. In addition, since Bartlett test is significant in error level of 0.05% (sig equals to zero and less than 0.05), the factor analysis was suitable to identify and discover the structure. Furthermore, to calculate questionnaire reliability, Cronbach's Alpha was used with the help of SPSS software and its result was calculated to 0.90 that shows high reliability of the questionnaire. Its dimensions' reliability were 0.71, 0.75 and 0.83 respectively. Designed questions are represented in three suggestive dimensions in table 1.

Table 1. Proposed benchmark for measuring absorbency of information technology

Technological Innovation Capability	
A1	By utilizing information technology in our company, products and services are offered with better quality.
A2	Since employment of information technology in our company the customers' demands are met with high speed and quality.
A3	Applying information technology in our company has caused human errors and release of defective products to decrease.
A4	Using information technology in our company has enhanced instant access to standard information for different units of the company
A5	Utilizing information technology in our company has increased new products and services.
A6	Utilizing information technology in our company has increased the use of appropriate software and hardware equipment in administrative procedure.
A7	Exploitation of information technology in our company has accelerated the purchase and service rendering process.
A8	Utilizing information technology in our company has caused newer and better procedures for meeting the market's demands to develop.
A9	Information technology have promoted the improvement of our personnel (in receiving information appropriately making decision independently and better).
A10	The use of software and hardware tools in coordination between different sections of company has increased.
A11	Employment of information technology has encouraged the personnel to exchange and update the information on knowledge base.
A12	By the arrival of information technology at our company, work procedures have been simplified.
A13	Exploiting the information technology has facilitated the introduction of products and services to the customers.
Inside-Out IT Capability	
B2	Information technology development in our company has caused the price of our products and services to be suitable and competitive.
B3	Exploitation of information technology has caused development of e-commerce in our company.
B4	Information technology has caused our products and services to go beyond frontiers.
B5	Since employment of information technology, the customers use our products and services more than that of rival companies.
B6	Using e-commerce has accelerated achieving the company's goals.
IT management Capability	
C1	In our company, the information technology applied by the company has resulted in delegating some authority to the staff.
C2	By accepting information technology, some positions have been integrated or removed.
C3	Information technology has given our manager the chance to manage in a simpler way by quickly processing the information.
C4	Information technology has extended the range of marketing for our company.
Three deleted questions after factor analysis	
B1	In our company, using information technology has reduce production or service rendering expenditure.
C5	In our company, informal communication between the manager, personnel and customers has been enhanced owing to information technology.
C6	Our company uses social networks, SMS, email and remote conference to communicate with people.

Findings

In this investigation, in order to identify latent variables, exploratory factor analysis (EFA) was used. EFA should be used when the researcher has no a priori hypothesis about factors or patterns of measured variables or for Reclassification of component. 25 questions are designed to measure IT absorbency among which 3 questions were omitted due to their unsuitable factor structure. Then, with the help of exploratory factor analysis and first order

Varimax rotation, three factors were identified as it is represented in table 2. According to theoretical grounds of the investigation and experts' opinions, the first factor (A) is called technological innovation capability, second factor (B) is called Inside-Out IT capability and third factor (C) is called IT management capability. Furthermore, questions' validity was approved.

Table 2. Rotated Component Matrix
Component

	Technological Innovation Capability	Inside-Out IT Capability	IT Management Capability
A1	.722	.288	-.014
A2	.692	.307	.059
A3	.684	.194	.010
A4	.717	.139	.151
A5	.643	.248	.121
A6	.687	.105	.174
A7	.610	.212	.133
A8	.624	.240	.120
A9	.639	.117	.286
A10	.623	.190	.168
A11	.580	.318	.084
A12	.565	.017	.356
A13	.420	.307	.409
B2	.222	.801	.043
B3	.236	.774	.099
B4	.147	.757	.135
B5	.218	.691	.158
B6	.330	.657	.131
C1	.101	.063	.752
C2	.007	.065	.720
C3	.378	.217	.593
C4	.302	.397	.478

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative%
technological innovation capability	8.378	38.083	38.083
Inside-Out IT capability	1.749	7.951	46.035
IT management capability	1.498	6.811	52.845

First and second order confirmatory analysis are used in this study. In the first order confirmatory analysis, we reached to the latent variable through indices and this latent variable is used to validate questions in the questionnaire and second order confirmatory analysis is also used to consider correlation between first order latent variables and the variable for IT absorbency.

As it is shown in table 2, model practice is calculated. If the reported values of the indices is in a desired level, the structural model will be confirmed. If the ration of Chi-squared to the degree of freedom (df) is less than 3, RMSEA is less than 0.08 and NFI,RFI and IFI higher are than 0.9 and Parsimonious indices (PCFI,PNFI) are higher than 0.5, it can be concluded that this model has a suitable practice [74]. Findings from table 3 show that all practice indices are at desired level and hence, structural model will be confirmed.

Table 3. Fit indices for structural equation modeling

indices	favourable	achieved score
X2/df	Between 1 and 5	4.60
GFI	0.9 and higher	0.93
NFI	0.9 and higher	0.93
RFI	0.9 and higher	0.92
IFI	0.9 and higher	0.94
CFI	0.9 and higher	0.94
PNFI	0.5 and higher	0.83
PCFI	0.5 and higher	0.89
RMSEA	Smaller than 0.08	0.078

After confirming fitness of pattern in a logical form, significance of model components and relations between variables are evaluated. In figures 1 and 2 estimation of Lisrel parameters in a tested pattern are represented. These parameters all show the simultaneous effectiveness of each

observer and latent variable in a general framework. By standard coefficient we mean values of binary correlations (between two variables) and it is used to compare the effects of model components and is totally used to confirm or reject the hypotheses of the study. How much the significance value is higher than 1/96 or lower than -1/96, represents that the independent variable has strong effect on dependent variable. Is it is clear in figure 3, all three main hypotheses of the investigation are significant and have high standard coefficient. In the fitted model there is the effect of each dimension on absorbency. More coefficients in the dimensions means they have more effect on absorbency. Among considered dimensions in this study, technological innovation capability (A) with the impact coefficient of 0.89 has the highest effect on IT absorbency. Next IT management capability with the impact coefficient of 0.80 and then Inside-Out IT Capability with the impact coefficient of 0.75 have the highest effects.

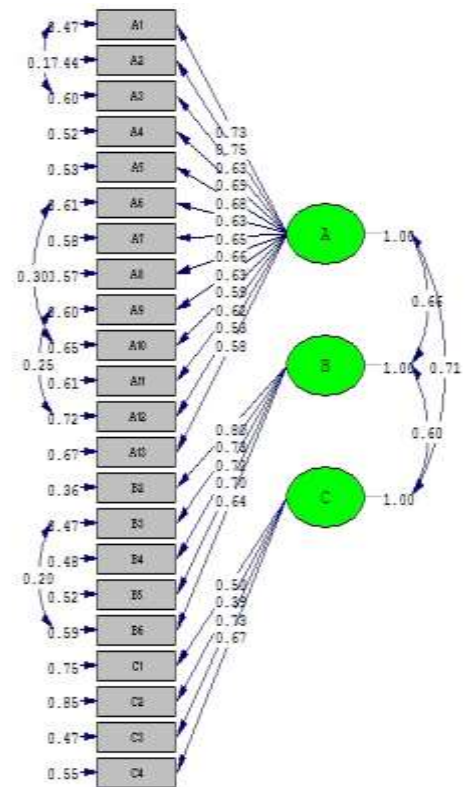


Fig. 1. First order factor analysis in standard mode

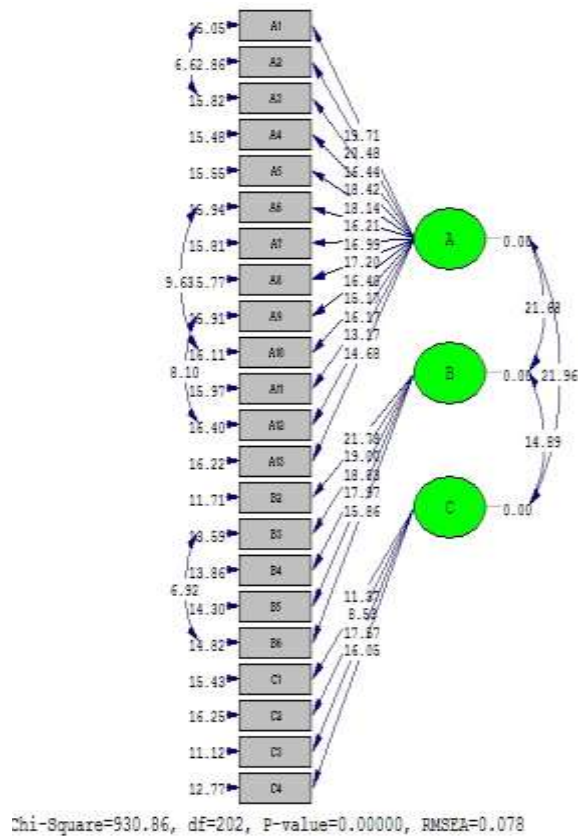


Fig. 2. First order factor analysis in standard mode coefficient

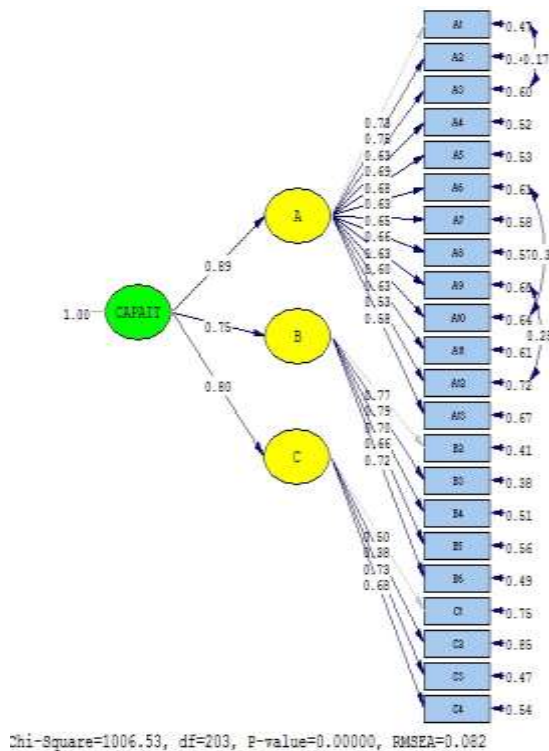


Fig. 3. Second order factor analysis in standard mode

4. Conclusion and Suggestions

In order to investment in development and IT assimilation of IT and its effectiveness, some capabilities should be considered in SMEs. IT, to be successful in enterprises, needs to identify some capabilities and determine their significance. IT is the most important way to improve the performance in long term and just an organization can achieve to superiority in short term that is able to utilizing IT absorbencies in all organizational levels. The purpose of this study is to represent a model to measure IT absorbency in SMEs upon which managers can evaluate their own enterprise capability in absorbing IT. Findings show that three suggested dimensions have correlation with the concept of IT absorbency and factor analysis, confirms components' classification in three dimensions. In addition, findings show that among suggested dimensions, technological innovation capability has the highest correlation with IT absorbency that emphasizes on continuous innovation in products and procedures so that the enterprise can respond to the environmental changes including customers' increasing demands. Technological innovation is crucial for economic development and ignoring it has guided several enterprises into the destruction. This concept helps managers to provide a ground for their economic growth by choosing the most suitable technology as well as maximum use of available technology. These findings confirm studies of [69-70-72-62] but in the first dimension, that is technological innovation capability, question A2 has the most correlation and confirms that through applying IT in the enterprise, customers' demands are met with high speed and quality. Companies should try their best to serve services to their customers [75-76-8]. Applying IT can make the customers satisfied and companies can exchange their knowledge with their customers and this in turn will lead to producing new products in accordance to market demand and rings financial profitability and improves the enterprise operation (Similar to results: [77-78-79]). In the second dimension, that is Inside-Out IT Capability, question B2 has the highest correlation with IT absorbency. Developing a technology for internal information leads to supplying products or services with a suitable and competitive price. Those SMEs that actively are concerned about market changes and developing technology and respond to the market demand with new products and services, increase their competitive success. SMEs investment in IT is necessary for survival and competitiveness, especially for international capacities and innovation (Similar to results: [80-81-82]). Furthermore the most relevant correlation is in the third dimension, which is IT management capability that is relevant to C3 questions. These findings show that IT has caused the management to manage the enterprise in a simpler way through fast processing of information. IT based systems provide more flexibility for companies to omit time and space limitations (Similar to results: [83-84]). Hence, following suggestions are useful to improve IT absorbency SMEs.

1. Identification and absorption of IT in SMEs should be more efficient and its being fitted with available capabilities should be considered.
 2. SMEs don't have a correct definition of IT absorbcency. So it can be said that they haven't considered all tools and factors of each capability and even they apply them, they can't establish necessary and sufficient integration between them, therefore, it is suggested that after identifying capabilities, their dimensions' integration must be reviewed.
 3. Some capabilities must be considered in SMEs so that they provide a ground for identification, deliverance and application and distribution of IT all over the enterprise.
 4. Since time passes by and because of applying IT and its rapid change, it is suggested that the conceptual model of the study will be retested in a three years period, and its results will be compared to the results of this study.
 5. This investigation has been reviewed in SMEs while the presented model could be tested in big or private industrial companies.
 6. Results from this investigation, doubtlessly are derived from experts opinions and time and space conditions in this territory are considered. So, it is suggested that identified dimensions are tested in other places and their importance is measured.
 7. Considering how to apply the right approach in order to achieve all dimensions of IT absorbcency in the companies can be another issue for future investigations.
 8. It is suggested that other models of IT absorbcency are tested for SMEs.
- This study faced some limitations. To generalize the results of this study for other small, medium or large enterprises, should be done prudently and also inherent limitation of the questionnaire in data gathering should be noticed.

References

- [1] N. Ale Ebrahim, S. Ahmed, & Z. Taha, "SMEs; Virtual research and development (R&D) teams and new product development: A literature review [Review]", *International Journal of the Physical Sciences*, 5(7), 916–930, 2010.
- [2] M. Mohsin, M. Bashir, and A. Latif, "The effect of information technology support on innovation concepts: A study of textile sector in Pakistan", *International Journal of Academic Research and SocialSciences*, 3(3), 105-112, 2013.
- [3] V. Ambrosini, C. Bowman, "What are dynamic capabilities and are they a useful construct in strategic management?", *Int. J. Manag. Rev.* 11 (1), 29–49, 2009.
- [4] J.Q. Dong, W. Wu, "Business value of social media technologies: evidence from online user innovation communities", *J. Strateg. Inf. Syst.* 24 (2), 113–127, 2015.
- [5] K. A. Pflughoeft, K. Ramamurthy, E. S. Soofi, M. Yasai-Ardekani, and F. Zahedi, "Multiple Conceptualizations of Small Business Web Use and Benefit, *Decision Sciences*3", 4(3), 467–512, 2003.
- [6] j. Jalali, E. Mahizadeh, "The Investigation of E-Business Trends by Using Social Network Analysis Technique during 1980 to 2015", *journal of IT Management*, 8(3), 499-518, 2015.
- [7] R. Southwood, "The impact of ICT on SMEs- a motor for future economic growth in hard-pressed items", *Balancing Act News Update*, available at: www.Balancingactafrica.com/news/current.html, 2006.
- [8] S. Boulesnane, L. Bouzidi, "The mediating role of information technology in the decision-making context", *Logistics Inform. Manage.* 26 (4), 387–399, 2013.
- [9] P. Theodorou, G. Florou, "Manufacturing strategies and financial performance—the effect of advanced information technology: CAD/CAM systems", *Omega: Int. J. Manage. Sci.* 36, 107–121, 2008.
- [10] A. Macpherson, O. Jones, M. Zhang, and A. Wilson, "Re-Conceptualising Learning Spaces: Developing Capabilities in A High-Tech Small Firm", *Journal of Workplace Learning* 15(6), 259–270, 2003.
- [11] A. Morgan, D. Colebourne, and B. Thomas, "The Development of ICT Advisors for SME Businesses: An Innovative Approach", *Technovation* 26(8), 80–987, (2006).
- [12] M. M. Caldeira, and J. M. Ward, "Using Resource-Based Theory to Interpret the Successful Adoption and Use of Information Systems and Technology in Manufacturing Small and Medium-Sized Enterprises," *European Journal of Information Systems* 12, 127–141, 2003.
- [13] P. B. Cragg, A. Mills, and T. Suraweera "The Influence of IT Management Sophistication and IT Support on IT Success in Small and Medium-Sized Enterprises," *Journal of Small Business Management* 51, 617–636, 2013.
- [14] C. Bull, "Strategic Issues in Customer Relationship Management (CRM) Implementation", *Business Process Management Journal* 9(5), 592–602, 2003.
- [15] P. B. Cragg, A. Mills and T. Suraweera, "The Influence of IT Management Sophistication and IT Support on IT Success in Small and Medium-Sized Enterprises", *Journal of Small Business Management* 51, 617–636, 2013.
- [16] E. Mu, L.J. Kirsch, and B.S. Butler, "The assimilation of enterprise information system: an interpretation systems perspective", *Inf. Manage.* 52 (3), 359–370, doi:<http://dx.doi.org/10.1016/j.im.2015.01.004>, 2015.
- [17] N.G. Carr, "IT doesn't matter", *Harv. Bus. Rev.* 81 (5), 41–49, 2005.
- [18] C. Aparecida de Mattosa, F.J. Barbin Laurindob, "Information technology adoption and assimilation: Focus on the suppliers portal", *journal of Computers in Industry*, 85, 48–57, 2017.
- [19] N., Saraf, H. Liang, Y. Xue, Q. Hu, "How does organisational absorptive capacity matter in the assimilation of enterprise information systems?", *Inform. Syst. J.* 23, 245–267, 2013.
- [20] T. H. Nguyen, M. Newby, and M. J. Macaulay, "Information Technology Adoption in Small Business: Confirmation of a Proposed Framework", *Journal of Small Business Management* 53, 207–227. doi: 10.1111/jsbm.12058, 2015.
- [21] M.J. Gallivan, "Organizational adoption and assimilation of complex technological innovations: development and application of a new framework", *ACM Sigmis Database*, 32 (3), 51–85, 2001.

- [22] R.L. Purvis, V. Sambamurthy, R.W. Zmud, "The assimilation of knowledge platforms in organizations: an empirical investigation", *Organ. Sci.* 12 (2), 117–135, 2001.
- [23] R. Kouki, D. Poulin, R. Pellerin, "The impact of contextual factors on ERP assimilation: exploratory findings from a developed and a developing country", *J. Global Inf. Technol. Manage.* 13 (1), 28–55, 2010.
- [24] L. Raymond, S. Uwizeyemungu, F. Bergeron, S. Gauvin, "E-Learning adoption and assimilation in SMEs: a research framework. computing and communication technologies, research, innovation, and vision for the future (RIVF)", *IEEE RIVF International Conference, IEEE*, 1–4, 2012.
- [25] W. Xu, P. Ou, and W. Fan, "Antecedents of ERP assimilation and its impact on ERP value: a TOE-based model and empirical test," *Inf. Syst. Front.*, 2015.
- [26] L. Tornatzky, M. Fleischer, "The Process of Technology Innovation," Lexington Books, Lexington, MA, 1990.
- [27] T. Oliveira, M.F. Martins, "Literature review of information technology adoption models at firm level," *Electron. J. Inf. Syst. Eval.* 14 (1), 110–121, 2011.
- [28] J.W. Ross, C.M. Beath, D.L. Goodhue, "Develop Long-Term Competitiveness through Information Technology Assets. *Sloan Management Review*," 38, 31–42, 1996.
- [29] p. Mulligan, "Specification of a capability-based IT classification framework," *Information & Management*, 39(8), 647–658, 2002.
- [30] N. R. Sanders, R. Premus, "Modeling the relationship between firm IT capability, collaboration, and performance. *Journal of Business Logistics*," 26(1), 1–23, 2005.
- [31] M. J. Zhang, "Information systems, strategic flexibility and firm performance: An empirical investigation," *Journal of Engineering & Technology Management*, 22, 163–184, 2005.
- [32] S.D. Hunt, "A General Theory of Competition: Resources, Competences, Productivity, Economic Growth. Thousand Oaks, CA: sage Publication, 2000.
- [33] S. Madhavaram, S.D. Hunt, "The service-dominant logic and a hierarchy of operant resources: developing masterful operant resources and implications for marketing strategy," *Journal of the Academy of Marketing Science*, 36(1), 67–82, 2008.
- [34] A. S. Bharadwaj, "A resource-based perspective on information technology capability and firm performance: an empirical investigation," *MIS quarterly*, 24 (1), 169–196, 2000.
- [35] M. Wade, J. Hulland, "Review: The Resource-Based View and Information Systems Research: Review, Extension, and Suggestions for Future Research," *MIS Quarterly*, (28:1), 107–142, 2004.
- [36] G. D. Bhatt, V. Grover, V. GROVER, "Types of information technology capabilities and their role in competitive advantage: An empirical study," *Journal of Management Information Systems*, 22 (2), 253–277, 2005.
- [37] C. Abecassis-Moedas, S. B. Mahmoud-Join, "Absorptive Capacity and Source-Recipient Complementarity in Designing New Products: An Empirically Derived Framework," *Journal of Product Innovation Management*, 25(5), 473–490, 2008.
- [38] P. J. Richard, T. M. Devinney, G. S. Yip, G. Johnson, "Measuring organizational performance: Towards methodological best practice," *Journal of management*, 2009.
- [39] J.P.-A. Hsieh, R.W. Zmud "Understanding post-Adoptive usage behaviors: a two-Dimensional view", *International Conference on Information Systems*, Milwaukee, Wisconsin, USA, 2006.
- [40] M. Mayeh, T. Ramayah, S. Popa, "The role of absorptive capacity in the usage of a complex information system: the case of the enterprise information system," *J. Univ. Comput. Sci.* 20 (6), 826–841, 2014.
- [41] J. Ross, W. George "Preparing for utility computing: The role of IT architecture and relationship management," *IBM Systems Journal*, 43(1): 5–19, 2004.
- [42] G.L. Lee, D.C. Robertson, "Information technology impacts on potential power and influence", *Boston University Working Paper Series*, September, 1989.
- [43] T.H. Davenport, E. S. James, "The new industrial engineering: information technology and business process redesign", *Sloan Management Review*, 31(4): 11–28, 1990.
- [44] R. S. Nada, R. Premus, "Modeling The Relationship Between Firm IT Capability, Collaboration, And Performance", *Journal of Business Logistics*, 26(1), 1–23, 2005.
- [45] M. A. Ashworth, T. Mukhopadhyay, "The effect of information technology on organizational learning and knowledge transfer: a natural experiment. In Pittsburgh", PA: Carnegie Mellon University. Paper presented to Tipper School of Business Monthly Faculty Seminar (11 February 2005).
- [46] M. D. Stoel, W. A. Muhanna, "IT capabilities and firm performance: A contingency analysis of the role of industry and IT capability type", *Information & Management*, 46(3), 181–189, 2009.
- [47] M. J. R. Ortega, "Competitive strategies and firm performance: Technological capabilities' moderating roles", *Journal of Business Research*, 63(12), 1273–1281, 2010.
- [48] L. Vijayasarathy, D. Turk, "Drivers of Agile Software Development Use: Dialectic Interplay Between Benefits & Hindrances", *Information & Software Technology*; 54: 137–148, 2012.
- [49] G. Garrison, R. L. Wakefield, S. Kim, "The effects of IT capabilities and delivery model on cloud computing success and firm performance for cloud supported processes and operations", *International Journal of Information Management*, 35(4), 377–393, 2015.
- [50] D. Hwang, M. G. M. Yang, P. Hong, "Mediating effect of IT-enabled capabilities on competitive performance outcomes: An empirical investigation of ERP implementation", *Journal of Engineering and Technology Management*, 2015.
- [51] H. Romijn, M. Albaladejo, "Determinants Of Innovation Capability in Small Electronics and Software Firms in Southeast England, *Research Policy*", 31(7), pp.1053–1067, 2002.
- [52] G. Marcelle, "How Do Telecom Firms Build Capabilities? Lessons from Africa", *Telecommunication Policy*, 29(7), 549–572, 2005.
- [53] N. Roberts, P. S. Galluch, M. Dinger, V. Grover, "Absorptive Capacity and Information Systems Research: Review, Synthesis, and Directions for Future Research," *MIS Quarterly* 36(2), 625–648, 2012.
- [54] Malhotra, S. Gosain, O. A. El Sawy, "Absorptive Capacity Configurations in Supply Chains: Gearing for Partner-Enabled Market Knowledge Creation", *MIS Quarterly* (29:1), 145–187, 2005.
- [55] A. Van de Ven, "On the Nature, Formation, and Maintenance of Relations among Organizations", *Academy of Management Review*, 1(4), 24–36, 1976.
- [56] L.P. Willcocks, D. Feeny, "IT outsourcing and core IS capabilities: challenges and lessons at Dupont", *Information Systems Management* 23 (1), 49–56, 2006.
- [57] T. Ravichandran, L. Chalermsak "Effect of information systems resources and capabilities on firm performance: A

- resource-based perspective”, *Journal of management information systems*, 21(4), 237-276, 2005.
- [58] J. Barney, "Firm resources and sustained competitive advantage", *Journal of management*, 17(1), 99-120, 1991.
- [59] K. Ramamurthy, Y. Lu, "Understanding The Link Between IT Capability & Organizational Agility: An Empirical examination", *MIS Quarterly*, 35(4), 2011.
- [60] P. Dubini, H. Aldrich, "Personal and Extended Networks are Central to the Entrepreneurial Process", *Journal of Business Venturing*, Vol. 6, 305-13, 1991.
- [61] Hurley, R., T. Hult, "Innovation, market orientation, and organizational learning: an integration and empirical examination", *Journal of Marketing*, 42- 54, 1998.
- [62] J. Bruderl, P. Preisendorfer, R.Ziegler, "Survival Changes of Newly Founded Business Organizations", *American Sociological Review*, 57(2), 227-42, 1992.
- [63] R. M. Walker, J. Chen, D. Aravind, "Management innovation and firm performance: An integration of research findings", *European Management Journal*, 33(5), 407-422, 2015.
- [64] C. Liao, H. Y. Wang, S. H. Chuang, M. L. Shih, C. C. Liu, "Enhancing knowledge management for R&D innovation and firm performance: An integrative view", *African journal of business management*, 4(14), 26-30, 2010.
- [65] P. Shan, M. Song, X. Ju, "Entrepreneurial orientation and performance: Is innovation speed a missing link? ", *Journal of Business Research*, 69(2), 683-690, 2016.
- [66] A. D. Smith, "Competitive approaches to new product development: A comparison of successful organizations in an unstable economic environment", *Team Performance Management: An International Journal*, 17(3/4), 124-145, 2011.
- [67] N. Marigo, T. J. Foxon, P.J.G. Pearson, "Chinese Low-Carbon Innovation: Developing Technological Capabilities in the Solar Photovoltaic Manufacturing Industry", *Journal of Knowledge-based Innovation in China*, 2(3), 253 - 268, 2010.
- [68] D. Ernst, T. Ganiatsos, L. Mytelka, "Technological Capabilities and Export Success: Lessons from East Asia", *Routledge*, London, 1988.
- [69] M. D. Mumford, S. J. Zaccaro, M. S. Connelly, M.A. Marks, "Leadership Skills: Conclusions and Future Directions", *Leadership Quarterly*, 11(1), pp.155-170, 2000.
- [70] F. Bougrain, B. Haudeville, "Innovation, Collaboration and SMEs Internal Research Capacities", *Research Policy*, 31(5), pp.735- 747, 2002.
- [71] J. Galende, J.M. Fuente, "Internal Factors Determining a Firm's Innovative Behavior", *Research Policy*, 32(5), 715-736, 2003.
- [72] C.M. Yam, J.C. Guan, K.F. Pun, P.Y. Tam, "An Audit of Technological Innovation Capabilities in Chinese Firms: Some Empirical Findings in Beijing, China", *Research Policy*, 33(8), 1123-1250, 2004.
- [73] M.L. Tseng, Sh.H.Lin, T.N. Tuong Vy, "Mediate effect of technology innovation capabilities investment capability and firm performance in Vietnam", *Procedia Social and Behavioral Sciences*, Elsevier, 40, 817- 829, 2012.
- [74] J. Guan,, N. Ma, "Innovative Capability and Export Performance of Chinese Firms", *Technovation* 23(9), 737-747, 2003.
- [75] R. E. Schumacker, R. G. Lomax, "A beginner's guide to structural equation modeling, Second edition". Mahwah, NJ: Lawrence Erlbaum Associates, 2004.
- [76] V. Govindarajan, P. Kopalle, E. Danneels, "The effects of mainstream and emerging customer orientations on radical and disruptive innovations", *J. Prod. Innov.Manag.* 28(1), 121-132, 2011.
- [77] A. O'Casey, L.V. Ngo, "Winning through innovation and marketing: lessons from Australia and Vietnam", *Ind. Mark. Manag.* 40 (8), 1319-1329, 2011.
- [78] D.A. Levinthal, J.G. March, "The myopia of learning", *Strateg. Manag. J.* 14, 95-112, 1993.
- [79] E. Danneels, "The process of technological competence leveraging", *Strateg. Manag. J.* 28 (5), 511-533, 2007.
- [80] N.E. Coviello, R.M. Joseph, "Creating major innovations with customers: insights from small and young technology firms", *J. Mark.* 76 (6), 87-104, 2012.
- [81] S.L. Brown, K.M. Eisenhardt, "Product development: past research, present findings, and future directions", *Acad. Manag. Rev.* 20 (2), 343-378, 1995.
- [82] V. A. Marbert, A. Soni, M. A. Venkataramanan, "The Impact of Size on Enterprise Resource Planning (ERP) Implementation in the US Manufacturing Sector", *Omega* 31, 235-246, 2003.
- [83] C. Ashurst, P. Cragg, P. Herring, "The Role of IT Competences in Gaining Value from E-Business: An SME Case Study", *International Small Business Journal*, 30(6), 640-658, 2011.
- [84] C. Dibrell, P. S. Davis, J. Craig, "Fueling Innovation through Information Technology in SMEs", *Journal of Small Business Management* 46(2), 203-218, 2008.
- [85] G. Simmons, G. Armstrong, M. Durkin, "A Conceptualization of the Determinants of Small Business Website Adoption: Setting the Research Agenda", *International Small Business Journal* 26(3), 351-389, 2008.

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