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ICT Ádoption: A Case Study of SMEs in Tehran (Iran)

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Abstract

In this paper, factors that effect on ICT adoption by SMEs in Tehran (Iran) are investigated. To do so, after reviewing the literature, we identified the factors affecting ICT adoption by SMEs in Tehran and, based on this review, we proposed our hypotheses.

Factors include internal factors, external factors and ICT specifications that influence on IT adoption by SMEs. All hypotheses are confirmed except the one that articulates the relationship between perceived ease of use and ICT adoption by SMEs.

Weak managerial support, lack of available skills, weak strategic vision regarding the ICT, weak innovative environment and insufficient financial resources are among the internal barriers. External barriers include weak governmental supports, legal environment, low cultural acceptance and weak pressures from customers, suppliers and competitors. Finally, low perceived usefulness and compatibility are among the ICT specifications that limit ICT adoption by SMEs.

Keywords: ICT Adoption; SME; Tehran; Iran.

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1. Introduction

For much of the late 1990s, the diffusion and development of IT were the main concerns of social scientists. They were to highlight and explain gaps in adoption of technologies between different groups of firms in the face of common technological assumptions about the ubiquity of technologies (Orlikowski and Barley, 2001). The emphasis in empirical research, at both a survey level and through case studies was very much on the barriers to the adoption of ICTs by SMEs (Eurostat, 2002).

Today information and communication technologies are generally recognized as one of the central forces in the transition toward a new economic system. (Fathian, et al. 2008)

The potential contribution of ICT for small-medium sized enterprises (SMEs) has long been recognized (Bayo and Lera, 2007). Morgan et al., (2006) emphasize the potential contribution of ICT to improve the competitiveness of SMEs.

The use of ICTs can be considered as the key factors for innovation and entrepreneurship. ICTs are necessary for SMEs to innovate. (Judith, R., et al., 2008)

We see a stream of works have done to distinguish IT adoption by SMEs; Chitura T., et al. (2008) reports some of them, comparing early studies (1990-1999) and the recent researches (2000 and beyond).

A range of points has been raised in this context; different studies show different factors enabling or hindering SMEs' adoption of ICTs. The paper aims to identify the factors and then show their situations in the case of SMEs in Tehran For this purpose, after reviewing the literature and proposing the conceptual framework of our study, the research methods and the results will be presented. At the end, the conclusion and some recommendations will be delivered.

2. Literature Review

2.1. ICT and its Application in Firms

According to Carolina L.N. and Pedro S.A. (2010), firms can use ICT for different, but compatible, uses. These are related to offering information, communications and exchange of information, and the automation of internal business processes. For the particular case of Internet applications (Soto-Acosta & Merono-Cerdan, 2006), in general terms, three ICT use orientations are identified: ICT informative orientation, ICT communicative

orientation, and ICT workflow orientation. In ICT, informative orientation, technologies in a company are mainly employed to provide and distribute corporate or commercial information to diverse stakeholders (Huzingh, 2000). In this sense, ICT can be used as a corporate channel for information dissemination and data access across functional boundaries and organizational levels (Bafoutsou & Mentzas, 2002). Therefore, ICT informative orientation is defined as the use of ICT to provide one-way company electronic information directed to one or more stakeholders. ICT communicative orientation, besides allowing cost reduction in comparison to traditional communication tools, offers a unique and integrated opportunity for interacting with several business agents (both internal and external to the organization). In this regard, all these ICTs facilitate the exchange of information, collaboration and the possibility of establishing close relationships (Kalakota & Robinson, 2000). Thus, ICT communicative orientation is defined as the use of ICT for two way information exchange. In the new economy, work has shifted from the creation of tangible goods to the flow of information through the value chain (Basu & Kumar, 2002). The establishment and development of workflow technologies has played a fundamental role in this transition. ICTs, and especially Web technologies, provide great opportunities for the automation of processes (Fischer, 2004). Thus, ICT workflow orientation involves the establishment of predefined electronic processes through corporate technologies.

2.2 SMEs in Economies

According to Tapscott (1996), growth in the innovation economy is coming from SMEs rather than from large corporations or government. Meanwhile, they have great impact in economies and people' life, as well. About 80% of all firms in most countries have less than 10 employees: ranges from 95% in UK, 94% in Spain and Finland, 79% in US. SME employment shares in under-10 employee firm-size category vary considerably across countries. Irish firms with less than 10 employees account for 85% of businesses.

SMEs play different roles in economies, beside their participation in employment (Robertson & James, 2004); they prepare a bed for entrepreneurs (Wong & Aspinwall, 2004), they are sources for innovation in goods and services, processes and new

adventures (Robertson, 2004). SMEs influence in the specific markets that large companies do not enter (Storey, 1994), especially as the subcontractors of large companies in providing them with spare parts (Whittaker, 1997). One of the other important roles of SMEs in the economies is their anti-monopoly role (Cross, 1983)

2.3 SMEs and Information Technology

IT is long believed to have a critical role in new economies. Binding SMEs and ICTs together, may make an issue with double fold of importance in our era.

Although many researches are done to distinguish the different aspects and dimensions of information technology and information systems in organizations but most of them are centered on large enterprises (Bruque & Moyano, 2007) and what is shown in previous studies is that information system theories and practices developed for large firms cannot be applied for SMEs fully. (Farhoomand, Hrycyk, 1985; Premkumar, 2003)

SMEs are different from large firms in several ways. In SMEs, decision-making is centralized in a reduced number of persons, standard procedures are not well laid out, there is limited long-term planning, and there is greater dependence on external expertise and services for information systems (Premkumar, 2003). Furthermore, SMEs face substantially greater risks in information system implementation than large businesses, since they have inadequate resources and limited education about information systems (Cragg & King, 1993). They have difficulties in recruiting and retaining internal information system experts due to the scarcity of qualified information system experts and the limited career advancement prospects in SMEs (Kuan & Chau, 2001).

Hashem, and Ismail (1998), Walczuch et al (2000), Stuart Locke (2001), Walker et al (2003), Allan et al. (2003), Panagiotis and Theodoros (2003), Kendall et al. (2004), Chalermsak and Nitaya (2004), Simmer and Mohamed (2005), Chitura et al. (2008), Jouni et al. (2009), MacGregor, et al (2009), Dub T. et al. (2010) and many other scientists have studied different factors enabling SMEs adopting information technology. On the other side of the coin, they have studied problems and difficulties to which SMEs face throughout ICT adoption.

Rovere (1998) argues that although firms are encouraged to adopt IT due to the positive impacts on competitiveness, in

practice there are obstacles to IT diffusion, especially in the case of SMEs. Most SMEs innovate only when they clearly perceive business opportunities involved with the organization, or because they are under pressure from suppliers and clients. This is because the search and selection of information for SMEs are important but extremely focused due to time and human resources constraints. Besides, SMEs have fewer resources than large firms, which lead to weaknesses in planning, training, finance and organization of internal information.

Panagiotis and Theodoros (2003), in studying the key drivers of e-business practices adoption by SMEs in Eastern Europe, present a framework that is comprised of three interrelated levels of analysis: the level of the firm, the level of the market, and the regulatory environment level. In each level they have presented some factors as the drivers of e-business adoption by SMEs.

Chitura et al. (2008) in a critical analysis of the literature summarize the barriers effecting e-commerce adoption by SMEs in early e-commerce barriers (1990-1999) and recent e-commerce barriers (2000 and beyond). Finally, they show there are few changes in the factors. We should notice that each of these authors has been emphasized ICT adoption from different approaches. For example Chitura et al. has been focused on the barriers of EC adoption and Kaynak et al. has been focused on ICT adoption factors from viewpoint of sales and market, So Kuan et al. without considering the structure, concept and element of technology, organization and environment factors, has been emphasized on perceived benefits, cost and pressure. His research framework is lacking factors as a wholesome and his research variables are not persuasive. But in our research, with a broader viewpoint, has attempted to distinguish these factors.

In recent studies about ICT adoption, Angelina Totolo (2011) and so Fengyi Lin et al. (2010) in another article used the Technology Acceptance Model (TAM) constructs including Perceived usefulness, External variables, Perceived ease of use, External variables, Perceived usefulness, Behavioral intention, and Actual usage.

David M. Weber and Robert J. Kauffman offer a set of factors and levels of impact for analyzing the adoption of ICT in the global. The adoption factors that these studies recognize can be classified as

follows. Economic factors include all income and cost-related factors, including financial, risk, wealth, trade and competition and are often relevant in explaining firm performance in different national. Social factors often are identified by the levels of access to technology and education observed for different groups of people and societies .Other factors consist of aspects of a country that also affect technology adoption including legal factors (laws, regulations, court cases), environmental factors (family, religion, way of life), and cognitive factors (innovativeness of the people, openness to foreign ideas). These three areas of factors reflect a superset of the variables.

Shin-Yuan Hung et al. (2010) categorized the adoption of CRM systems in two dimensions: characteristics of organization and characteristics of CRM systems. Characteristics of organization factors include Size of organization, The IS capabilities of staff, Knowledge management capabilities, Innovation of senior executives and characteristics of CRM systems include relative advantage and complexity. The research results reveal constructive suggestions to researchers and the government to increase the likelihood of adopting CRMs.

Mahmud Akhter Shareef et al. (2010) examine the critical factors that enable citizens to adopt e-Government (e-Gov) at different stages of service maturity. The research findings declare 5 principal factors include Attitude to Use, Ability to Use, Assurance to Use, Adherence to Use and Adaptability to Use.

Irefin et al. (2012) collected survey data from 20 industrial Small and Medium enterprises located in different part of Nigeria to analyze the vital influential factors affecting their adoption of Information and Communication Technology from adopter and non-adopter perspectives .The results indicate that Cost is a major barrier for Small and Medium enterprises in adopting ICT. Other critical determinants also include availability of ICT infrastructure; government support; Management support and business size in that order.

3. Theoretical Framework

We suppose that the enablers of ICT adoption by SMEs can be categorized in these three main dimensions; external

enablers, internal enablers and the ICT specification (see Fig. 1).

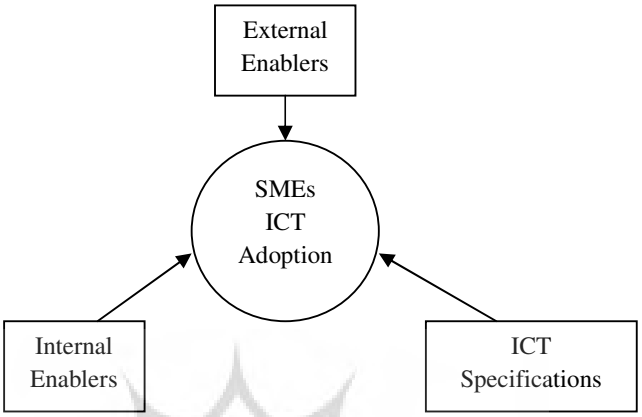

Fig 1. SMEs' ICT Adoption

As shown in Table 1, the internal enablers are management support of ICT, skills available, ICT strategy, the cultural context in the enterprise supporting innovation and the financial resources necessary to support ICT activities (budget). External factors can be explained by governmental supports, legal and regulation environment, cultural acceptance of ICT and the pressures from customers, suppliers and competitors. ICT specifications refer to perceived ease of use, perceived usefulness and compatibility of ICTs.

Table 1. Factors Affecting ICT Adoption by SMEs

Factors	Enablers	Sources
Internal Environment	Management support of ICT	Damanpour, (1991), Thong, (1999), Brock, J. K. U., (2000),Culkin, N., & Smith, D., (2000), Panagiotis D. and Theodoros E. (2003), Soliman and Janz, (2004), Raymond, Louis (2005), Stockdale, R., & Standing, C., (2006), Sebastia´n Bruque, Jose´ Moyano, (2007), J. W. J. Weltevreden & R. A. Boschma, (2008),
	Skills available	Van Akkeren and Cavaye (1999) Hadjimanolis (1999) Lawrence (1997) Abell and Lim (1996), Mehrtens J., et al., (2001), Panagiotis D. and Theodoros E. (2003), Kaynak et al (2005), Reardon and Davidson (2007),

Factors	Enablers	Sources
		MacGregor, R. & Vrazalic, L. (2007), Jing et al. (2007), Chon et al. (2008), Lorence (2008)
	ICT Strategy	Mehrtens J., et al., (2001), Brown (2002), Panagiotis D. and Theodoros E. (2003), Carbonara, N., (2005), Sebastia´n Bruque, Jose´ Moyano, (2007), Jing et al. (2007), Judith, et al (2008),
	Innovative Environment	Ibarra, H. (1993), Kimberly, J. R. and Evanisko, M. J., (1981), Sanchez, R., (1995), Powell, T. C., Dent-Micallef, A., (1997), C. Allan, J. Annear and Eric Beck, (2003), Raymond, Louis (2005), Sebastia´n Bruque, Jose´ Moyano, (2007),
	Financial Resources (Budget)	Van Akkeren and Cavaye (1999), Jing et al. (2007), Chitura T. et al, (2008),
External Environment	Governmental Supports	El Nawawy and Ismail (1999), Ling (1999), Panagiotis D. and Theodoros E. (2003), C. Allan, J. Annear and Eric Beck, (2003), (Azumah et al., 2005), Chitura T. et al, (2008),
	Legal and Regulatory Environment	Hashem and Ismail (1998), Walczuch et al (2000), Panagiotis D. and Theodoros E. (2003), Fathian et al. (2008),
	Cultural Acceptance	Hepworth, M and Ryan, J. (2000), Panagiotis D. and Theodoros E. (2003), Jing Tan et al (2007), A. Molla et al (2005), J. Gibbs et al (2003)
	Pressures from Customers	Porter (2001), T. McCollum, (1997), Jing et al. (2007), Walczuch et al (2000), Looi (2003)
	Pressures from Suppliers	Porter (2001), T. McCollum, (1997), Jing et al. (2007), Walczuch et al (2000), Looi (2003)
	Pressures from Competitors	Allan, Annear and Beck, (2003), Chalermsak L. and Nitaya W. (2004),
ICT Specifications	Perceived Ease of Use	Davis, F. D. (1989), Mehrtens J., et al., (2001), Straub, D. et al. (1995), Raymond, Louis (2005), Ka-Young et al. (2009),
	Perceived Usefulness	Davis, F. D. (1989), Straub, D. et al. (1995), Mehrtens J., et al., (2001), Raymond, Louis (2005), Ka-Young et al. (2009),
	Compatibility	Tornatzky, L. G. and Fleischer, M., (1990), Walczuch et al (2000), Khan (2004), Mehrtens J., et al., (2001), Chalermsak L. and Nitaya W. (2004), Robert C. Macgregor and Lejla Vrazalic, (2005), Dube T. et al. (2010)

As shown in Table 1, the internal enablers are management support of ICT, skills available, ICT strategy, the cultural context in the enterprise supporting innovation and the financial resources necessary to support ICT activities

(budget). External factors can be explained by governmental supports, legal and regulation environment, cultural acceptance of ICT and the pressures from customers, suppliers and competitors. ICT specifications refer to perceived ease of use, perceived usefulness and compatibility of ICTs.

Management support of ICT refers to the degree that the managers pay attention to ICT activities, based on their ICT knowledge and their perception of ICT benefits.

To uptake ICT and nurture it in organizations skills are very important; what we mean in this research, is the available skills inside the firm not relying on the outsourced resources.

ICT strategy depicts if the corporate has a roadmap for its ICT activities or not, does it know its SWOT to formulate a reasonable way to coordinate related activities or not?

When a firm encourages new ideas, new products, services and processes between its staffs and tries to deploy them in an efficient approach, it poses an innovative environment.

Governments may support SMEs to adopt ICT through different policies, like encouraging policies (e.g. loans and taxing), infrastructural policies (e.g. informative activities and providing needed infrastructures) and push policies (e.g. pushing SMEs by law and running flagship projects like using B2G / G2B applications that force government partners to use ICT applications).

ICTs challenge traditional rules and regulations by defining new concepts, so a new and complementary legal environment is needed to encourage and control ICT activities simultaneously.

What people think about ICT and working with this technology is called cultural acceptance.

Corporate partners including customers and suppliers are of the market potential forces that may push ICT adoption by SMEs.

Competitors through adopting new technologies can challenge the rules of the game in the market.

If a firm feels working through a technology is easy, that technology is called easy to use. The other criteria to examine technologies is usefulness, that refers to how much it performs efficiently what it claims.

One of the factors influence diffusion of every innovation is "compatibility". Compatible ICTs can coordinate themselves

with the current processes, systems and objectives in the firms.

4. Methodology

A pluralistic methodology was adopted, incorporating both qualitative and quantitative approaches, where research bias is minimized by methodological triangulation (Gill & Johnson, 1991). This mixture of ideographic and nomothetic methodologies enables internal cross-checking to be carried out and increases the credibility of the work. Interviews are accomplished in two phases; before distributing the questionnaire, face-to-face interviews with the key informant people in thirty companies were conducted to restructure the initial questionnaire and justify the wordings. As well, some other face-to-face interviews are conducted to distinguish other relevant factors inhibiting IT adoption by SMEs and to understand the reasons behind the statistics. Studied companies were SMEs and most interviewees were CEOs.

4.1 Sample and Data Collection

For sampling method in this research we used simple random sample. In a simple random sample of a given size, all such subsets of the frame are given an equal probability. Each element of the frame thus has an equal probability of selection: the frame is not subdivided or partitioned. Furthermore, any given *pair* of elements has the same chance of selection as any other such pair (and similarly for triples, and so on).

The target survey population consisted of SMEs from Tehran (Iran), with at least 10 and maximum 49 employees. Data is collected for the period of September 2009 to October 2010. The questionnaire distributed throughout active SMEs in Tehran, they are up to 12,000 enterprises. Through random selection, SMEs are chosen and their data are collected. Three hundred and four valid responses were obtained. The study assumed an error of 5 % for p = q = 50 % and a confidence level of 95%. A structured questionnaire consisting of close-ended questions was developed. The validity of the questionnaire is examined by asking the 5 experts in the field of ICT and SMEs to validate our questionnaire. They provided us with some points of view and we corrected the related parts in the questionnaire. For the reliability of questionnaire, Cronbach Alpha technique has been used. For the whole variables

Alpha stands for 0.88 so we can say that the questionnaire is reliable.

Since the main objective of the research is to study factors affecting ICT adoption by SMEs and to investigate these factors in SMEs in Tehran (Iran), we formulated the hypotheses in relation to various enabling factors and ICT use. The following hypotheses are formulated. These hypotheses lead to some sub-hypotheses according to the enablers, which form the related category of factors. Figure 2 summarizes main hypotheses and hypotheses in each category.

H 1: There is a positive relationship between Internal Environment and ICT adoption by SMEs.

H 1a: There is a positive relationship between Management support and ICT adoption by SMEs.

H 1b: There is a positive relationship between Skills available and ICT adoption by SMEs.

H 1c: There is a positive relationship between ICT strategy and ICT adoption by SMEs.

H 1d: There is a positive relationship between Innovative culture and ICT adoption by SMEs.

H 1e: There is a positive relationship between Budget and ICT adoption by SMEs.

H 2: There is a positive relationship between External Environment and ICT adoption by SMEs.

H 2a: There is a positive relationship between Governmental supports and ICT adoption by SMEs.

H 2b: There is a positive relationship between Legal environment and ICT adoption by SMEs.

H 2c: There is a positive relationship between Cultural acceptance and ICT adoption by SMEs.

H 2d: There is a positive relationship between Pressure from customers and ICT adoption by SMEs.

H 2e: There is a positive relationship between Pressure from suppliers and ICT adoption by SMEs.

H 2f: There is a positive relationship between Pressure from competitors and ICT adoption by SMEs.

H 3: There is a positive relationship between ICT specifications and ICT adoption by SMEs.

H 3a: There is a positive relationship Perceived ease of use and ICT adoption by SMEs.

H 3b: There is a positive relationship Perceived usefulness and ICT adoption by SMEs.

H 3a: There is a positive relationship Compatibility and ICT adoption by SMEs.

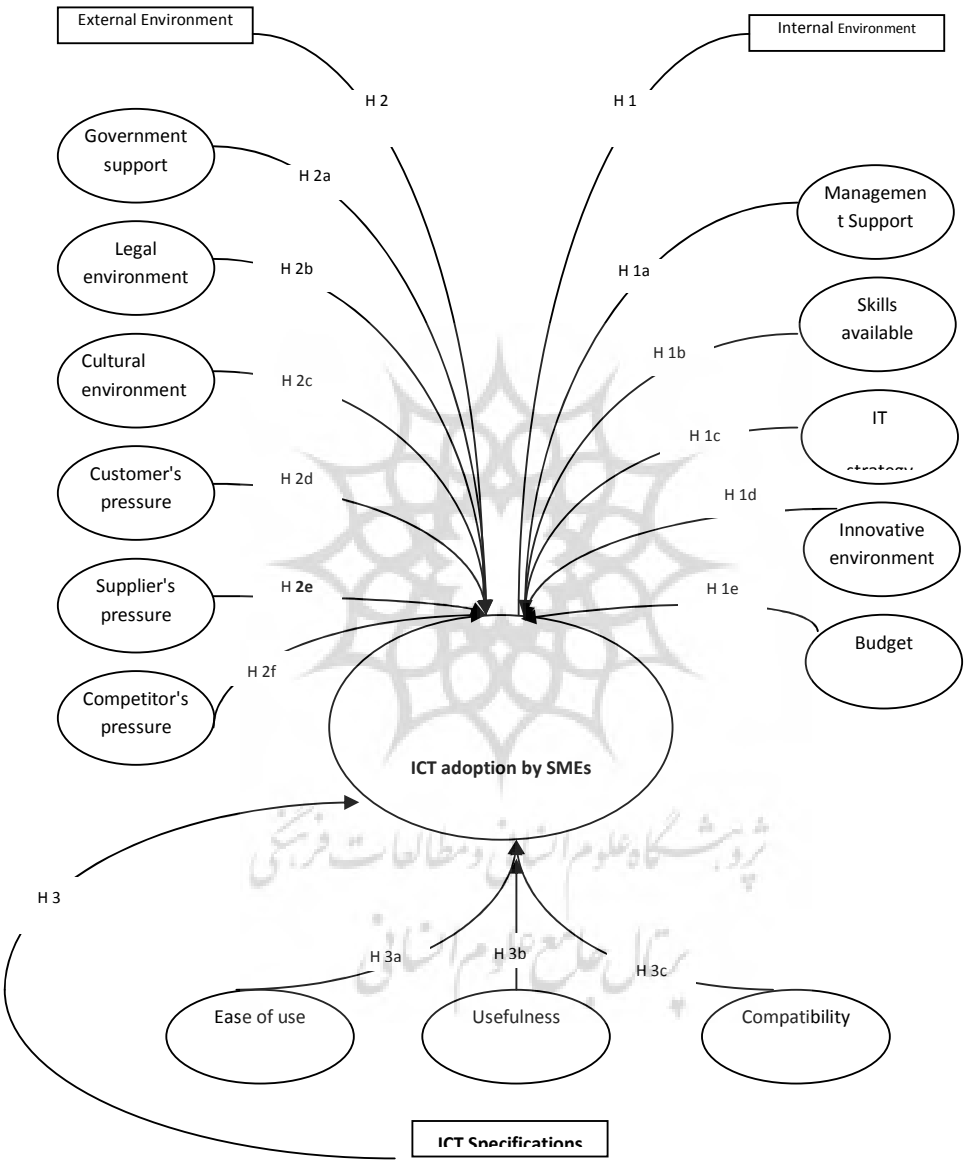

Fig 2. Hypotheses

4.2 Measures of Variables

This section describes the variables used for measuring the ICT adoption and the factors effecting this process.

ICT adoption was measured by 1 item (table 2). In order to measure the ICT adoption, firms were requested to value their use of ICT applications. Questions were designed to measure managers' perceptions of the relative frequency of ICT applications or tools using five-point scales, i.e. 5= Often use, 4= frequent use, 3 = sometimes use, 2=seldom use, 1 = never use. In this item we used the measure used by Veysel K. and Ekrem T. (2003).

As well, fourteen items measured factors influencing ICT adoption. In order to measure these factors, firms were asked to value the current state of external factors, internal factors and ICT specifications. In this section, a five-point Likert-type scale ranging from very weak (1) to very strong (5) was used in the questionnaire.

Table 2. Factors' Measures

Factor	Five Point Scales				
	5	4	3	2	1
ICT Adoption	Often use	Frequent use	Sometimes use	Seldom use	Never use
Factors Affecting ICT Adoption	Very strong	Strong	Medium	Weak	Very weak

As mentioned above, before distributing the questionnaire to the sample, we interviewed with 30 SMEs, and asked them to fill the initial questionnaire in. After collecting data, questionnaires were analyzed for the reliability of the tool. To do so, we used Cronbach Alpha, that counts with all Cronbach alphas well over for 0.85 (the accepted cut-off for reliability).

4.3 Correlation

The main objective of using the questionnaire is to study the correlation and implication of influencing factors on ICT adoption (i.e. internal factors, external factors and ICT specifications) and ICT uptake. The method that is applied in this research is the coefficient of correlation using SPSS. The coefficient of correlation describes the strength of the relationship between two sets of interval–scaled or ratio–scaled variables. It can assume any value of –1.00 or +1.00 inclusive. The coefficient correlation of –1.00 or +1.00 indicates perfect correlation (see Figure 3).

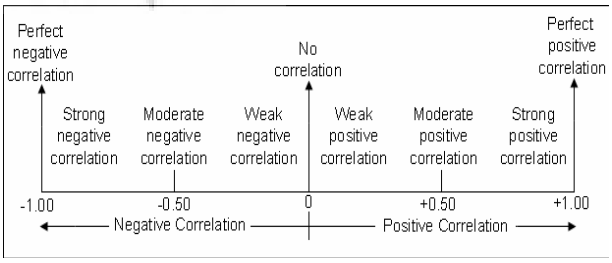

Fig 3. The Coefficient of Correlation Source: Mason et al. (1999)

Findings

Table 3 shows contextual information of the sample. As it is shown, about 52 % of the irms belong to services sector and 48 % are in production section.

Table 3 Contextual Information of Sample

Section	Numbers	Percent	ICT Use
Production	146	48	2.16
Services	158	52	2.09
Total	304	100	2.12

ICT usage in SMEs reaches 2.12 (of five point scales) reflecting the reality that SMEs in Tehran seldom use ICT in their operations. For SMEs in production sector (Mean = 2.16), it is a bit higher than of SMEs in service industry (Mean = 2.09).

Table 4 shows the mean of all factors. Budget with mean of 2.4 has the highest mean and the cultural acceptance goes to the second place with mean of 2.38. Compatibility and Perceived ease of use with means of 1.85 and 2.01 have taken lowest mean.

Table 4 Mean Factors

Factors		Mean
Management Support	X1	2.16
Available Skills	X2	2.13
ICT Strategy	X3	2.12
Innovative Environment	X4	2.17
Budget	X5	2.40
Governmental Support	X6	2.21
Legal Environment	X7	2.07
Cultural Acceptance	X8	2.38
Pressures of Customers	X9	2.32
Pressures of Suppliers	X10	2.16
Pressures of Competitors	X11	2.03
Perceived Ease of Use	X12	2.01
Perceived Usefulness	X13	2.18
Compatibility	X14	1.85

In order to test the hypotheses of the study, in this section we present a correlation test investigating the possible relations between the factors, which are claimed to influence adoption of ICT by SMEs. Correlation test using Pearson test, based on the overall samples (304), shows that all the factors except "ease of use" are correlated to ICT use (Table 5).

Table 5 Correlation between Factors and ICT Use

		X1	X2	X3	X4	X5	X6	X7
ICT Use	Pearson Correlation	.710 (**)	.687 (**)	.870 (**)	.575 (**)	.731 (**)	.653 (**)	.356 (**)
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000
	N	294	304	304	304	304	304	304
		X8	X9	X10	X11	X12	X13	X14
		.410 (**)	.752 (**)	.530 (**)	.658 (**)	.067	.816 (**)	.541 (**)
		.000	.000	.000	.000	.241	.000	.000
		304	304	304	303	304	304	294

Note: Pearson Correlation; Sig. (2-tailed);

**Correlation is significant at the 0.01 level (2-tailed);

According to the results depicted in table 4,

the following results can be concluded, which help us verify our hypotheses:

- The Management support and ICT adoption has a positive correlation (0.710), which is between Moderate positive correlation and Strong positive correlation.
- The skills available and ICT adoption has a positive correlation (0.687), which is between Moderate positive correlation and Strong positive correlation.
- The ICT strategy and ICT adoption has a positive correlation (0.870), which is between Strong positive correlation and Perfect positive correlation.
- The Innovative environment and ICT adoption has a positive correlation (0.575), which is between Moderate positive correlation and Strong positive correlation.
- The Budget and ICT adoption has a positive correlation (0.731), which is between Moderate positive correlation and Strong positive correlation.
- The Governmental support and ICT adoption has a positive correlation (0.653), which is between Moderate positive correlation and Strong positive correlation.
- The Regulatory environment and ICT adoption has a positive correlation (0.356), which is between Weak positive correlation and Moderate positive correlation.
- The Cultural acceptance and ICT adoption has a positive correlation (0.410), which is between Weak positive correlation and Moderate positive correlation.
- The Pressures from customers and ICT adoption has a positive correlation (0.752), which is between Strong positive correlation and Perfect positive correlation.
- The Pressures from suppliers and ICT adoption has a positive correlation (0.530), which is between Moderate positive correlation and Strong positive correlation.
- The Pressures from competitors and ICT adoption has a positive correlation (0.658), which is between Moderate positive correlation and Strong positive correlation.
- The correlation between the Ease of use and ICT adoption is not statistically significant.
- The Usefulness and ICT adoption has a positive correlation (0.816), which is between Strong positive correlation and Perfect positive correlation.
- The Compatibility and ICT adoption has

a positive correlation (0.541), which is between Moderate positive correlation and Strong positive correlation.

The results confirm our hypothesis namely that there is a positive relationship between internal environment and ICT adoption by SMEs (H 1). As well, this hypothesis that external environment and ICT adoption by SMEs have a positive relationship (H2) is supported by our findings. However, the hypothesis that states that there is a positive relationship between ICT specifications and ICT adoption by SMEs (H3), cannot be confirmed.

Moreover, about the hypotheses driven from H1, H2 and H3 (sub hypotheses), we should say that all these hypotheses are confirmed except the one which states that, there is a positive relationship perceived ease of use and ICT adoption by SMEs (H 3a).

Discussion and Conclusion

The present research examines the effect of internal environment, external environment and ICT specifications on ICT adoption by SMEs in Tehran (Iran). The results show that both internal and external environments have a positive relationship with ICT adoption by SMEs. About the ICT specification, we cannot judge that precisely because there is not statistically significant correlation between all sub factors of this category and ICT adoption.

Management support as indicated by a stream of researches, here as well has its role in ICT adoption. Sebastian and Moyano (2007) indicate that there are some internal elements, such as … the support of the managers (especially the technology leaders)… that influence the success of the SMEs' ICT adoption decision, on the one hand, and the implementation process, on the other hand. Elaine and Frances (2006) in order to integrate business and information technology innovation in SMEs, suggest that SME managers need to be fully aware of and exploit the resources available to them. In order to do this, they need to achieve a level of technical understanding and they need to nurture an organizational culture that supports their staff in the utilization of their current and potential skill sets.

Mean of management support is 2.16, which is between weak and medium. It shows that a weak support from the management is a reason for low ICT uptake by SMEs. In interviews we found that most CEOs have a dizzy idea regarding ICTs; they see it somehow like black box. Our

findings confirm the conclusion of Fathian et al (2008) that weak management perspectives is one of the barriers to adopt ICT by SMEs.

Adoption of ICT by SMEs according to our findings is correlated with skills available to run the ICTs, that is confirmed by many researches; (e.g. look at: Davidson (2007), MacGregor, R. & Vrazalic, L. (2007), Jing et al. (2007), Chon et al. (2008), Lorence (2008). Since the mean of skills is 2.13 (between weak and medium), we understand that lack of skilled ICT people in SMEs is another reason of their low ICT adoption. Some CEOs told us that many ICT men look at SMEs as a dive for their career and they do not stay in SMEs for a long time.

Businesses without strategy are in a way that they do not know where they are, where they want to go, when go, and how to go. Similarly, about ICT strategy; the business needs to identify factors, which will determine successful transformation, and then direct strategy and resources towards those factors (Jing et al. 2007). It is a must for a successful adoption of ICT, to have ICT strategy.

Lack of strategic vision is a barrier to e-commerce adoption according a research conducted by Brown (2002). Sebastian and Moyano (2007) conclude that the technology strategy (a proactive strategy will favor the adoption) influence the success of the SMEs' ICT adoption decision, on the one hand, and the implementation process, on the other hand.

Our statistics show that SMEs in Tehran (Iran), with a mean of 2.12 have a low strategic vision to adopt ICT. Normally ICT strategies are so interrelated with business strategies, in our interviews we found most of the CEOs are technical people and they are too poor in having strategic approaches.

According to Clayton (2000) more than 60% of the micro companies do not have a plan for their business strategy.

SMEs that encourage innovation and entrepreneurship are more likely to adopt ICT faster than the ones do not have an innovative environment inside the corporate. Sebastian and Jose (2007), based on other researches argue that some dimensions of culture, such as, flexibility, communication, absence of conflict and orientation towards innovation have been identified as information technology adoption facilitators.

Lack of innovative environment (mean of 2.17), shows a barrier in ICT adoption by our studied SMEs. In fact, what we watched in the interviews depicts that this weakness

in the SMEs is mostly rooted by their worry about the economic fluctuations.

Referring to the interviews, which are accomplished with some CEOs, most of them view at ICT as an expenditure rather than an investment, therefore they usually do not think they have enough money to expend for ICTs rather than to invest in. This item is repeated in different studies by various wordings, likewise cost of implementation (Van Akkeren and Cavaye 1999), cost of startups (Lawrence 1997), lack of sufficient financial resources (Manian, A. 2001) and technology deems too expensive (Dube T. et al. 2010). Although, mean of budget (2.40) is the highest one between all the factors that we examined, but still it places between weak and medium and we consider it as a barrier to SMEs' ICT adoption.

Governmental supports, especially in developing and planned economies, are very important for SMEs to adopt innovations and use it continuously. About ICT innovations, studies show many countries, even developed ones, have articulated direct and indirect policies encouraging ICT adoption by SMEs. For example, European Commission benchmarks national and regional e-business policies, that explores different governments' support toward promotion of ICTs between SMEs (European Commission, 2002). General data gathered by the questionnaire shows a mean of 2.20 for governmental supports that is a bit higher than weak. However, what we found during interviews is that many CEOs are afraid of bureaucracy and the time they have to spend to grasp such supports.

One of early documented barriers to ICT adoption by SMEs has been legal barriers. SMEs have been skeptical about ICT adoption since they have always had an eye to the regulations supporting such activities. Fathian et al. (2008) have concluded that the lack of a suitable legal environment is prevalent in Iran. Our result with the mean of 2.07 for legal environment confirms this. Through the interviews we found that most of CEOs are reluctant about ICTs document to be accepted in courts and judiciary system. Even some noted that most of banks accept only hard copies.

Cultural acceptance is a key indicator of ICT adoption by SMEs. Based on the study done by Poon and Swatman (1999) one of the issues that impede the uptake of e-commerce in SMEs in Australia could be cultural barriers. The problem in developing countries is more complicated; according to Jing Tan et al. (2007) - based on other researches - conclude that developing

countries often have different cultures and business philosophies, which limit the applicability and transferability of the eCommerce models designed by Western countries. Although, this item in our results gets the second place by mean of 2.37, still insufficient to accelerate ICT uptake by SMEs.

Some CEOs claimed that most of people in our city like to see and touch tangible things.

When we analyze firms' reaction to the innovations and new technology, pressures from the outside, which are rooted from their bargaining power against the firm, can change the equations of adopting new technologies. According to the studies, ICTs give customers, suppliers and competitors more bargaining power against the firms (Porter, 2001). The archetypal image of an SME is of an organization that it is often short of cash, operating within a focused marketplace and reliant on a small number of customers. Considering these facts and the reality that SMEs are much more dependant to other firms in case of ICT (Premkumar, 2003), it may clear for us how much the partner companies can push SMEs to uptake ICT. Based on our statistics, pressure from both suppliers and customers to impose ICT on SMEs is weak. Suppliers' pressures with mean of 2.16 and customers' pressures with the mean of 2.32 are of the factors hindering ICT uptake by SMEs.

The hidden factor we watched during the interviews is that since most of the studied SMEs work locally, and the local presence of ICTs is weak, therefore they feel lower need to use ICTs.

Referring to the interviews, another point about the suppliers is that since most of them are SMEs, while they themselves have low level of ICT adoption, they cannot push others to use ICTs.

Low pressure from partner companies on SMEs refers to low collaboration between the firms. This fact is extracted from the interviews that low level of collaboration between the firms results in low pressure from partner companies and consequently low synergy in ICT adoption.

In a research conducted by Sebastian and Jose (2007), the respondents, in many of the firms analyzed, mentioned that the decision to adopt information technology was made in response to the tensions provoked by the growth of the firm. Sebastian and Jose add that this growth was promoted because the firm had developed proactive change strategies based on diversification and/or internationalization due to pressure exerted

by competitors, suppliers or customers.

In this study, mean of pressures from competitors is 2.03 that on the edge of weak situation. It was obvious during the interviews that most of CEOs appraise the competitors' ICT maturity in the same level they stand. One more hint that we found that the international competitors are not that active; therefore, SMEs do not feel some threats, pushing them to use ICTs.

In our study, perceived ease of use is not correlated with SMEs' ICT uptake, but perceived usefulness has a correlation with ICT uptake by SMEs. Although some researchers have argued different conclusions (e.g. both Igbaria, M., et al., (1997) and Riemenschneider et al. (2003) concluded that ease of use is a determining factor in ICT uptake), what can be explained is that it may refer to the level of ICT use of the studied SMEs. We observed in our interviews that most of them use simple applications and systems, so ease of use is not so important for them. Another reason is that the market does not offer that advanced ICTs, therefore SMEs do not face problems in ease of use.

Usefulness and its correlation with ICT uptake might back to SMEs' characteristics; as mentioned SME is often short of cash, therefore money matters for SMEs, consequently they put the money where the result is positive financially. Since SMEs have limited access to resources (e.g. financial resources, human resources, etc), they do care about spending their vital resources in where they can get back a reasonable ROI. According to Van Akkeren and Cavaye (1999) organizational resistance to change (accepting new ICTs) is rooted by the concern about return on investment (ROI), reluctance of SMEs to make substantial investments when short term returns are not guaranteed.

What our data clears is that perceived usefulness is among the impediments of ICT uptake by SMEs, with the mean of 2.18. our interviews reveal that the more obvious the usefulness is, the more eager SME is toward ICTs investments.

Rogers (1995) postulated that innovation was more likely to succeed and be more readily adopted if the relative advantage as a consequence of its introduction was evident; if it was compatible with the organization, its operations and its view of the world. SMEs prefer ICT applications, which are more compatible with their current systems.

Chalermsak L. and Nitaya W. (2003) note that perceived compatibility is one of the factors influencing e-commerce

adoption by Thai SMEs.

Based on a more recent research conducted by Dube T. et al. (2010), one of the barriers to adopt e-commerce by SMEs in Gweru (Zimbabwe), is that the technology is incompatible with the way SMEs/customers do business. This item in our research received the lowest mean; therefore, it is certainly one of the impediments of ICT adoption.

An interesting point mentioned by most of CEOs regarding compatibility of ICTs is that many of available applications and systems are designed for large firms, so ICTs in the market are too expensive for them and not compatible with SMEs operations. Another cue we observed is that the ICT industry does not invest on SMEs friendly applications and systems because of the diversity of SMEs and their low financial resources to spend on ICTs.

Recommendation

What SMEs need to do to accelerate ICT uptake is to foster the enabling factors inside their firms; it might be started by learning more about ICTs, encouraging innovation and rewarding ICT innovations. Then they can go far more by linking their ICT strategy to their business strategy to achieve higher ICT-business alignment.

The administrative body can do a lot to persuade SMEs to uptake ICTs faster. Comprehensive public policies are required by high priority. These policies should concentrate the infrastructures, competition, cultural changes and regulatory space.

Since self filled questionnaires may make some bias toward ICT use, we suggest that the future researches use some computer data regarding this variable measurement (ICT use). In addition, we suggest the exploration of interrelationships between the variables.

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مطالعه جامعی در بکارگیری فناوری اطلاعات: مطالعه موردی بنگاه‌های کوچک و متوسط تهران

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تاریخ دریافت:۹۱/۱/۳۱ تاریخ پذیرش: ۹۲/٤/۳۱

این مقاله به بررسی موانع توسعه فناوری اطلاعات در بنگاههای کوچک و متوسط در شهر تهران پرداخته است. بعد از بررسی ادبیات موضوعی، مدل مفهمومی تحقیق ارائه شده و فرضیات تحقیق شکل گرفته است.

مدل مفهمومی تحقیق شامل سه دسته عوامل داخلی، عوامل خارجی و عوامل مربوط به فناوری اطلاعات و ارتباطات می شود.

تمام فرضیات تحقیق به غیر از فرضیه مربوط به ارتباط بین «سهولت اسفتاده درک شده» و کاربردد فناوری اطلاعات و ارتباط پذیرفته شده اند.

حمایت ضعیف مدیران، کمبود مهارت‌ها، نبود چشم انداز استراتژیک فناوری اطلاعات، ضعف نوآوری در محیط بنگاه، و منابع مالی ناکافی از جمله عوامل درونی بنگاه بوده اند که پذیرش فناوری اطلاعات را با مانع مواجه کرده اند. موانع بیرونی شامل حمایت‌های ضعیف دولتی، موانع قانونی، عدم پذیرش عموم جامعه و فشار پائین از سوی مشتریان، عرضه کنندگان و رقبا بوده است. و نهایتا اینکه سازگاری پائین فناوری اطلاعات و ادراک پائین از منافع آن از جمله مشخصات فناوری اطلاعات بوده اند که به عنوان موانع پذیرش فناوری اطلاعات در نظر گرفته شده اند.

واژگان کلیدی: بنگاه‌های کوچک و متوسط، فناوری اطلاعات و ارتباطات، پذیرش فناوری اطلاعات و ارتباطات، موانع پذیرش فناوری اطلاعات و ارتباطات

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