

Influencing Factors to adoption SME of ICT in the knowledge economy

العوامل المؤثرة على اعتماد المؤسسات الصغيرة و المتوسطة لتكنولوجيا المعلومات و الاتصال في ظل الاقتصاد المعرفي

Doctoral **Kherroubi sofiane**,

University Blida 2

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Abstract: The purpose of this article is to provide an explanation of the method of ICT adoption in SMEs and their benefit according to Porter's model. In a knowledge-based economy, and after a comprehensive survey of previous studies in this area, it has been concluded that the influencing factors are divided into internal factors and external factors, each of which has its own effect to varying degrees, so they should be taken into account when adopting this technology.

Keywords: ICT, SME, knowledge economy.

Résumé: Le but de cet article est de fournir une explication sur la méthode d'adoption des TIC dans les PME et leur bénéfice selon le modèle de Porter. Dans une économie fondée sur la connaissance, et après l'enquête complète sur les études précédentes dans ce domaine, on a conclu que les facteurs d'influence sont divisés en facteurs internes et en facteurs externes, dont chacun a son propre effet à divers degrés, donc, ils devraient être pris en compte lors de l'adoption de cette technologie

Mots clés: TIC, PME, économie de la connaissance.

المخلص: هدف هذا البحث إلى تقديم شرح مبسط لأسلوب تبني تكنولوجيا المعلومات والاتصال في المؤسسات الصغيرة والمتوسطة و كيفية الاستفادة منها وفق نموذج سلسلة القيمة لي"بورتر"، مع التركيز على العوامل المؤثرة على اعتماد المؤسسات الصغيرة و المتوسطة لتكنولوجيا المعلومات و الاتصال في ظل اقتصاد مبني على المعرفة و ذلك بإجراء مسح شامل للدراسات في هذا المجال، بالتالي تم استخلاص ان العوامل المؤثرة تنقسم الى عوامل داخلية و عوامل خارجية، كل منها له تأثيره الخاص بدرجات متفاوتة، لذا يجب اخذها بعين الاعتبار عند القيام بعملية اعتماد هذه التكنولوجيا.

الكلمات المفتاحية: ، تكنولوجيا المعلومات و الاتصال، المؤسسات الصغيرة و المتوسطة، الاقتصاد المعرفي.

Introduction: Currently, knowledge economy, enterprise's ability to create knowledge and disseminate, ICT may serve as a catalyst for effectively performing this function, as it enables firms to codify knowledge into a digital form and easily transmit it anywhere around the world. enterprises with access to ICT are able to use this for transmitting and/or processing information, which includes wide array of technology, ranging from database programs to local area networks. ICT has also speeded up the pace of globalization and increased complexity of business practices, because enterprises today not only need to be familiar with their local context but also with global developments. Thus, to compete in the knowledge economy, SMEs need a strong ICT-literate skills base that can innovate and adapt quickly to change.

However, despite all the importance of ICT, we find a small number of SMEs that adopt and use this technology after a comprehensive survey of all the studies that were previously discussed in this subject, there must be factors affecting them, and from this perspective This study aims at highlighting the factors affecting to adoption ICT in SMEs. In the midst of these ideas we raise the following problem:

1. Literature review:

1.1 What are Small and Medium Enterprises?: SME, is a term used to describe companies with the number of employees below a certain threshold, the definition of SME was different amongst various European countries. For example, in Germany any company with a total headcount of less than 255 people was considered as an SME while this limit was 100 in Belgium or Greece for example .In 2011, the European Commission decided to adopt a unified definition for SMEs. Within this perspective, SMEs are classified to three categories of 1) micro-entities that are companies with less than 10 employees, 2) small companies with up to 50 headcounts and finally 3) medium-sized companies are considered those which less than 250 permanent employees. From the financial perspective, an SME can be defined as an enterprise with the revenue of €10-50 million. The definition is not very straightforward in US as it depends on different criteria, such as, the industry, ownership structure and revenue¹

¹Rimal Ronchi, Zowghi Qian, *Entrepreneurship in Small and Medium Enterprises*, Electronic Journal of Information Systems Evaluation, vol 04, 2013,pp(03-04).

1.2 Characteristics of SMEs: Five specific characteristics can be associated with SMEs which distinguishes them from larger Firms¹:

First, SMEs organizational structure tends to be more organic compared to the normally bureaucratic structure of larger firms.

Second SMEs have the advantage of being highly flexible in their processes, strategic orientation and operations comparing to larger firms. This flexibility enhances their ability to perform in a dynamic environment and adapt to changing needs of market.

Third, SMEs are the drivers for economic growth and innovation.

Profitable market opportunities increase the rate of small firms' creation. This increases the total number of SMEs in a country, which increases job creation and income per capita.

Fourth, risk taking behavior is usually associated with SMEs because they need to compensate for their limitations through creating and exploiting new opportunities.

Finally, liability of smallness and liability of newness are two characteristics which inhibit SMEs from higher growth potential.

2. ICT adoption and its benefits to SMEs:

2.1 ICT adoption: In order to describe the process of ICT adoption, it is essential to define ICT, as well as to scrutinize the adoption concept. For this paper, an inclusive term of ICT is defined to cover the multiplicity of these technologies. Within the diffusion and adoption of ICT literature, there is no generally accepted ICT definition as various definitions of ICT have widely been employed by different researchers, The term 'ICT' refers to a wide range of computerized ICT . These technologies include products and services such as desktop computers laptops, handheld devices, wired or wireless Internet, business productivity software such as text editor and spreadsheets, enterprise software, data storage and security, network security².

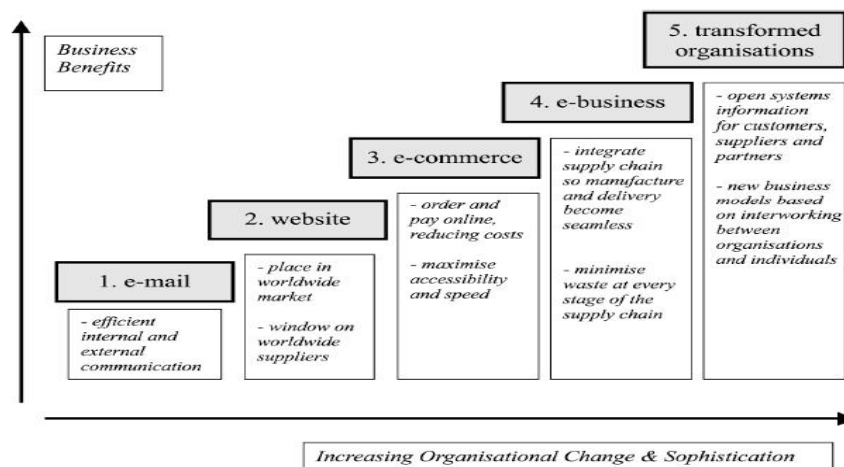
Hence, Rogers (1983) defines adoption as a decision to make full use of an innovation as the best course of action whereas rejection is a

¹ Vinit Parida, Johan Johansson, *Barriers to information and communication technology adoption in small firms*, Working Papers Series from Swedish Entrepreneurship Forum, 2010, p08

² Ankit Garg , *ICT adoption and SME's: a contextual framework* , International Journal of Engineering Technologies and Management Research , vol 03, 2016, p02.

decision not to adopt an available innovation¹. according to research in the field normally a process consisting of different phases or trajectories. There are different views on the adoption process of ICT and we would like to present one of them here. The most easily understandable adoption process is often called the "adoption ladder approach". This adoption ladder approach has been used by the UK government's Department of Trade and Industry (DTI) for better understanding of the adoption of ICT by existing small firms, Figure (01) provides an illustration of this ICT adoption model. The main idea behind this model is that a SMEs approaches ICT adoption through a series of stages, in a well planned and sequential manner. The business benefits associated with ICT drive the adoption process and results in increased organizational change and ICT sophistication at each step. SMEs usage of ICT ranges from basic technology such as emails and fixed lines to more advanced technology such as e-commerce, and information processing systems. Using advanced ICT to improve business processes falls into the category of e-business and finally representing a transformed small firm².

Figure (01): DTI adoption ladder approach



Source: Lynn M. Martin, Harry Matlay, "'Blanket' approaches to promoting ICT in small firms-some lessons from the DTI ladder adoption model in the UK", Internet Research, Vol11, Issue 5, 2001, p402.

¹ Khong Sin Tan, Uchenna Cyril Eze, *Effects of Industry Type on ICT Adoption among Malaysian SMEs*, Journal of Supply Chain and Customer Relationship Management, vol 02, 2012, p03.

² Vinit Parida, Johan Johansson, Op cit, pp(09-10).

The advantage of adoption ladder approach is highlights the transformation aspects of technology and the key social needs from which it emerges. However, it remains a profoundly deterministic view of change and builds on the understanding that SMEs have the need and opportunity to follow one prescribed course. If they are not able to climb the top of the model, this is often understood as representing some kind of failure or unused potential¹.

We note that not every SMEs that does not rely on ICT is considered a failure because each organization has its own needs and requirements according to its type of activity and other factors are due to the difference in the percentage of its dependence on information technology and communication.

2.2 ICT adoption benefits for SMEs: Bringing ICT into the SMEs activity has multiple benefits in all the layers of the activity. It has developed a visual representation of those benefits grouped under Porter's Value Chain as shown in Figure (02)

Figure (02): Benefits of ICT Tools under Porter's Value Chain

Inbound Logistics <ul style="list-style-type: none"> • Cheaper and faster communication with suppliers through Supply Chain Management 	Operations/ Manufacturing <ul style="list-style-type: none"> • Improve Inventory Management systems • Enterprise Resource Planning software • Rapid Prototyping and Manufacturing programmes 	Outbound Logistics <ul style="list-style-type: none"> • Easier to link to global supply chains and outsourcing opportunities 	Marketing and Sales <ul style="list-style-type: none"> • e-Commerce • e-Marketing through websites 	After-sale Service <ul style="list-style-type: none"> • Customer Relationship Management software 	Margins
Firm Infrastructure (Finance, Planning) <ul style="list-style-type: none"> • Better accounting and financial management practices • Improved communication between different departments through the intranet • Better grasp of business trends and market prices through easier access to information • Use models to enhance business planning capabilities 					
Human Resource Management <ul style="list-style-type: none"> • e-Learning for employee training 					
Technology Development <ul style="list-style-type: none"> • Better Knowledge Management within the firm • Integrate different software platforms through Enterprise Application Integration 					
Procurement <ul style="list-style-type: none"> • Use e-procurement for cheaper and faster communication with suppliers 					

Source: Kotelnikov Vadim, SME and ICT: Asia-Pacific Development Information Programme e-Primers for the Information Economy, Society and Polity, published by Keen Media, Thailand, 2007, p 12.

ICT adoption means better communications with the company reach out its clients and suppliers, permitting improved inbound and

¹ Lynn M. Martin, Harry Matlay, "“Blanket” approaches to promoting ICT in small firms: some lessons from the DTI ladder adoption model in the UK", Internet Research, Vol 11, Issue 5, 2001, p402

outbound logistic flows. A wide array of suppliers opens itself to the SME increasing outsourcing opportunities and access to purchasing virtual markets. By adopting ICT artifacts as E-commerce applications and online marketing the SME can extend its activities to new market segments and increase revenues and market-share. Artifacts like Enterprise Resource Planning (ERP) software, Warehouse Management Systems (WMH) improve the Operational performance of the company. In the manufacturing industry, ICT permits rapid prototyping, and special manufacturing applications. The whole infrastructure of the SME benefits from Better accounting and financial management practices, improved internal communication and better Organizational learning processes¹.

3.influencing factors to adoption of ICT in SMEs.

3.1 internal factors

Individual Factors: there are two factors under individual factor in the research framework, Attitude and Innovativeness. Attitude can be powerful enable or a barrier towards the adoption of the new technology in the SMEs, Bruque and Moyano describes an attitude as a general concept, reflecting views about wider, often complex issues. In SMEs, ICT adoption process is directly affected by top management/ where all decisions from daily functions to future investments are made by them Positive attitude of top management towards using ICT as the users of ICT in SMEs will result in ICT acceptance and subsequently success in SMEs ², According to (Dess and Lumpkin), innovativeness as a willingness to introduce newness and novelty through experimentation and creative process aimed at developing new products and services, as well as new process³.

Size firm's: The ICT adoption processes in SMEs differ from the ones in larger enterprises. The difference lies in the infrastructure each of them relies on. To build their firm-wide infrastructure the larger companies have the power to invest in software, hardware equipment and ICT while SMEs rely more on external relations and on the public

¹ Kotelnikov Vadim, Op Cit, p 12.

² Sebastian Bruque, J Moyano, *Organisational determinants of information technology adoption and implementations in SMEs: The case of family and cooperative firms*. Technovation Jornal, Volume 27, Issue5,2007, p247.

³ Dess G,Lumpkin G,*The role of entrepreneurial orientation in stimulating effective corporate entrepreneurship*. Academy of Management Executive, Vol. 19 No 1,2005, p73.

infrastructure, In Sweden, 99.4% of the firms are SMEs but their total expenditure on ICT is low compared to the expenditure in bigger enterprises. Between 2009 and 2013 larger firms have increased their ICT use by 25%, mostly in regard to software products. The use of ICT services from companies in the same holding has increased about 7%. SMEs kept approximately the same ICT expenditure trend as in the previous years but with a tendency to spend more on hiring equipment and access services from specialized companies¹.

COST: The majority of the SMEs surveyed identified costs as the single biggest factor threatening future investment in ICT. This perception can be explained with reference to the funding sources open to the SMEs in our survey. We found that most SMEs sourced their ICT capital expenditure through retained profits. In very few cases were alternative sources of funding such as venture capital and commercial loans used by SMEs. This can be explained by the very cautious approach that SME owner/managers often adopt with respect to ICT investments, particularly when they have difficulty quantifying or envisaging the business benefits that might arise from such investments², so high cost of computer equipment, which constitute the core ICT infrastructure for example internet facilities and other ICT equipment affect the adoption of ICT by SMEs³, According to the results of the study by Harindranah and others about 377 SMEs in Britain, the cost factor is the biggest obstacle for these institutions in adopting of ICT⁴.

According to Duncombe and Heeks in 2001 survey on US SMEs found that 90 % of the survey SMEs lack of finance and skills are the main constraints for organization to utilize ICT. Some of them cannot

¹ Ana-Maria Onicescu, Karolina Gurbin, *Actors influencing sense-making of ICT adoption in SMEs*, Master Thesis in Business Administration, Jonkoping university, 2015,p08.

² Harindranath, G. Dyerson, R. and Barnes, D. “*ICT Adoption and Use in UK SMEs: a Failure of Initiatives?*.” The Electronic Journal Information Systems Evaluation, Volume 11 Issue 2,2008, p94.

³ Nduati, N. L., Ombui, K, & Kagiri, A, *Factors Affecting ICT Adoption in Small and Medium Enterprises in Thika Town, Kenya*. European Journal of Business Management, Vol. 2, Issue 3, , 2015 , p401.

⁴ Harindranath G, Dyerson R, and Barnes, D, “*ICT in Small Firms: Factors Affecting the Adoption and Use of ICT in Southeast England SMEs*”, European Conference on Information Systems, Proceedings by an authorized administrator of AIS Electronic Library, 2008, p176.

afford to buy a computer or make efficient use of it in the short or even medium period of time¹.

Owner/managers: Generally the same person undertakes the role of owner and manager. The owner is the major investor who provides the enterprise with capital. The manager is the person who is responsible for carrying out managerial functions such as planning, organizing, executing and controlling. Owners and managers of SMEs play a vital role in IT adoption processes. ICT adoption in SMEs is highly dependent on owners' and managers' perceptions of past investments, while SMEs' specific characteristics such as size and status are less important. Organizational culture consists of the motivations, values, attitudes and abilities of owners and managers. The owners and managers therefore need to be aware of information technologies that could shape the future of SMEs and have the courage to create changes in the organizational culture where ICT functions and support are required. Management and operational styles have an impact on ICT adoption and implementation, therefore a positive attitude of the owner/manager increases the effectiveness of adoption and implementation of IT².

ICT knowledge and skill: Recent research on ICT adoption is emphasized on SMEs and examined the factors influencing SMEs adopting ICT. According to MacGregor et al SMEs tends to avoid ICT into their business, if it is seen as complex to use. This is not surprising because SMEs always lack of skills amongst workforce to use ICT³, To lower the knowledge barrier, many organizations have been formed with the objective of simplifying technology adoption for small firms. As an example of such entities, mention can be made to Service Bureaus Consultancy firms. In line with this vision, Utomo and Dodgson, have shown that the SMEs are more eager to adopt new ICT solutions when government assistance or voluntary consultancy from higher education institutions, is available⁴. the small business

¹ Syed Shah Alam, Kamal Mohammad Noor, *ICT Adoption in Small and Medium Enterprises an Empirical Evidence of Service Sectors in Malaysia*, international journal of business and management, vol 4,no 02, 2009, p 114.

² Sinem Dilver, *The Adoption of New Technology: A Case of Small, Medium and Micro-sized Enterprises in South Africa and Turkey*, Entrepreneurship and Innovation Management Journal , V3, Issue 3, 2015 ,p132.

³ Syed Shah Alam, Kamal Mohammad Noor, Op Cit, p115.

⁴ Utomo, H. and Dodgson, M, Contributing , *Factors to The Diffusion of IT Within Small and Medium-sized Firms in Indonesia*, Journal of Global Information Technology Management, Vol 4, No 2, 2001, p27.

owner/managers are unlikely to adopt more sophisticated technologies if they are not familiar with the basic ones. This is because of the limited number of employees with lack of technical knowledge. This lack of knowledge based employees might hinder or prevent technology adoption if the owner believes that this technology can only be employed using specialist staff¹.

Government: Both industry and government bodies have a role to play in promoting and supporting small business networking and ICT, According to Doig (2000), Australian governments are committed to accessible e-commerce for SMEs, and have decided that some intervention was necessary to make participation affordable, particularly for small and remote businesses², Another study was conducted by Fernandes and Vieira (2015), who also ranked the external factors in order of their priority. They maintain that Government support has the highest priority, followed by transaction and payment cost, organisational culture, number of suppliers, visibility and trust of supply chain and finally enhanced competitors' and market data³.

External and Competitive Pressure : Prior literature suggests that as small businesses are susceptible to customer pressure, these firms adopted IT as a result of demand from customers to develop the efficiency of their inter-organizational dealings, Hence, it has become an indispensable strategy for firms to have these technologies, while others suggested that the main driving forces to move toward IT tools adoption in SMEs are internal factors., including industry changes and trends, maintaining current market, finding new markets, opportunities for growth and the necessity to keep up with competition, a study by Premkumar and Roberts on rural small businesses suggested that external pressure and competitive pressure are important determinants to the adoption of ICTs. Likewise, it was suggested that client and supplier pressure to adopt IS/IT was an important factor influencing

¹ Syed Shah Alam, Kamal Mohammad Noor, Op Cit, p115

² Syed Shah Alam, Kamal Mohammad Noor, Op Cit, p115.

³ Ahmed Altayyar , John Beaumont, *External Factors Affecting TheAdoption of E-procurement in Saudi Arabian's SMEs*, 5th International Conference On Leadership, Technology, Innovation And Business Management, Procedia - Social and Behavioral Sciences,2016,p366.

the levels of IS/IT adoption and success in Portuguese manufacturing SMEs¹.

External IT vendors or consultants: External IT vendors or consultants are one of the important factors of IT adoption in SMEs. Although their professionalism could have a positive impact on IT adoption, most of the SMMEs suffer from a lack of qualified external vendors or consultants for their businesses. For many SMEs there is pressure to keep up with competition and this pressure forces them to adopt IT in order to enhance survival and growth, manage changes effectively, promote better customer service and stay competitive². Shin found that SMEs are moving toward the adoption of enterprise application software to survive in competitive global markets while consultants often have a greater share in providing EA than vendors³.

Customers: With the development of technology, the new approach to the Internet emerged, whether for research, demand or purchase, but also the emergence of the factor of consumer reluctance as an influential variable in the orientation of SMEs to use ICT. Some studies have tried to explore them. His study of the factors that guide the use of e-commerce for 15 SMEs in Ghanah through an interview with the leaders of these institutions found that the resistance of people and those of the community members who are potential customers plays an important role in the reluctance of institutions to use the tools of trade Electronic in their institutions⁴.

Infrastructure factors: Many developing countries still lack the infrastructure of communication and provided equipment and non-conformity to the technological development and monopoly of the state of the sector leads to the result of increasing costs and limited coverage of all areas, especially remote areas and thus limited access to this technology and this leads to SMEs do not even have the simplest basic technologies such as fixed or fax. According to Idris, the level of national infrastructure and government participation in promoting the adoption of electronic commerce, which is an important factor needs to be reviewed from The political decision makers in the

¹ Morteza Ghobakhloo, Tang Sai Hong, *Strategies for Successful Information Technology Adoption in Small and Medium-sized Enterprises*, Information, vol03 ,2012, p50.

² Sinem Dilver, Op Cit, p131.

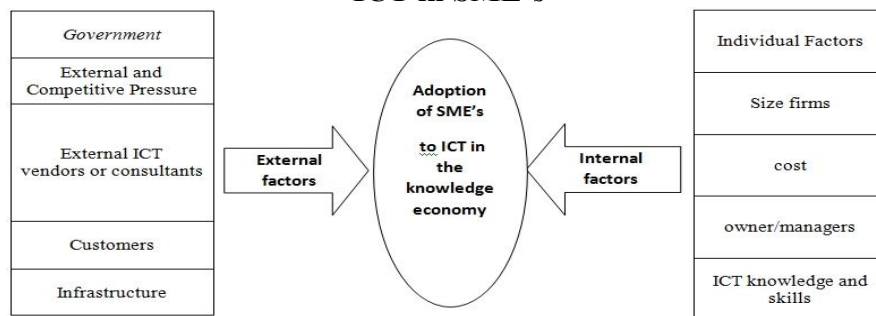
³ Morteza Ghobakhloo, Tang Sai Hong, Op Cit, p 53.

⁴ Faisal Iddris, *Adoption of E-Commerce Solutions in Small and Medium-Sized Enterprises in Ghana*, European Journal of Business and Management, Vol 4, 2012, p55.

state¹, According to Kotelnikov Vadim, SMEs may still be reluctant to adopt ICT to engage in electronic commerce because of the underdeveloped legal policy of electronic payment and information security. Many Asian banks have not linked their electronic business with online banking Through their own systems².

After presenting these affecting factors to adoption of ICT in SME's, which were the studies and experimental research by the several researchers, we will present a form summarizing and explaining all these factors divided into two categories as follows.

Figure(03): internal and external factors influence to adoption of ICT in SME's



Source: Prepared by researcher

Conclusion: There have been a large number of studies dealing with SMEs because of the pivotal role it plays in most economies of the world. In this context, we find the emergence of a knowledge economy in which ICT is also greatly increased due to the rapid development of various. Therefore, this study is concerned with the combination of these two important variables, and through the above presented in the paper we have discovered the concept of SMEs, which is defined by size with no more than 250 workers. Institutions that we believe he could have to adopt ICT depending on their size and special requirements.

And in the same context a number of prior studies have attempted to gain a clear understanding of numerous pitfalls and challenges associated with ICT adoption awaiting SMEs, as well as evaluate those factors affecting of ICT. The authors categorized influencing factors into two main groups:

Furthermore, internal factors include Individual Factors, Size firms, cost, owner/managers, ICT knowledge and skills, External factors

¹ Faisal Iddris, Op Cit, pp(49-50).

² Kotelnikov Vadim, Op Cit, p 11.

include External and Competitive Pressure. However, External ICT vendors or consultants, Customers, Infrastructure, Government, The authors believe that the categorization of ICT adoption issues and SME-related factors through a developed, integrated framework and suggested model of effective ICT adoption process can help organizations, managers and ICT consultants to achieve clearer understanding of ICT adoption influencing factors, and also add further knowledge to the literature. Finally, this study propose a set of recommendations to owners of SMs's:

- Learn all you can know about the advantage and convenient of ICT.
- An attempt to study the impact of investment ICT in line with financial resources, while trying to develop a plan to enable the establishment of a special budget in this area.
- Identify the government incentives in the field of ICT and try to avoid obstacles through accurate knowledge of all legal and financial procedures.

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