

# A knowledge management-based conceptual model to improve the level of utilization of ICTs in Mexican SMEs

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**Abstract**— *The current commercial context for the Small and medium-sized enterprises (SMEs) is an ever-changing environment that is strongly influenced by the information and communication technologies (ICTs). This has led enterprises to implement these technologies as supportive tools for their business processes. Nevertheless, a vast number of SMEs have not obtained favorable results in implementing ICTs, since the lack of knowledge about the potential and application of these technologies has made this technological implementation activity prevail as an action oriented to the simple acquisition of equipment and informatic systems with a short-term vision without considering a business strategy. The aim of this paper is to perform a literature review that shows evidence of the low utilization of ICTs in SMEs, particularly in the Mexican environment, which leads to proposing a different approach where enterprises consider Knowledge Management (KM) in the implementation of the informatic technology, leading to a conceptual model to ensure human, organizational and relational capital provide the proper capabilities to complement a strategy that implies carrying out a correct acquisition and application of knowledge that contributes to improving the utilization of ICTs in the business processes.*

**Keywords**— *Knowledge management, SMEs, ICT, business process.*

## I. INTRODUCTION

In the ever-changing environment of the global market, the competitive advantage not only derives from efficient production and delivery systems, but also to take advantage of the knowledge (Pool *et al.*, 2014). Knowledge is the most important strategic resource and its presence is critical in companies in order to compete successfully, allowing them to achieve superior performance and position themselves over their competitors (Martínez *et al.*, 2012). A knowledge-based economy demands that organizations integrate their activities, processes and systems to make use

of their resources in a more efficient way (Majors, 2010). This represents a very important fact in the business environment, since Small and medium-sized enterprises (SMEs) make up 99.8% of the formal economic activity and 78.5% of employment in Mexico (INEGI, 2012). With regard to the adoption of Information and Communication Technologies (ICTs) it is necessary to understand their interrelationships with the characteristics of SMEs, since there are ICTs applications for different industries and business sectors (Sin *et al.*, 2010). On the other hand, the lack of technological skills in the labor force is a major obstacle to the implementation of ICTs, as well as the proliferation of ICT tools and applications, which in recent years has lead SMEs to find it difficult to select the appropriate applications (Evangelista, *et al.*, 2013). Likewise, because SMEs do not have a methodology for Knowledge Management (KM), this implies that decisions are based mainly on tacit knowledge as intuition, experience, attitudes and values. This form of business management, without procedures of knowledge can lead to less success in the implementation of ICTs (Rantapuska and Sore, 2011). They generally take ICTs implementation as any other investment seen only as purchasing tasks, without fully understanding its linkage to the strategy and objectives of the company. In addition, the investment process in ICT is seen as a technical process and little attention is paid to its organizational nature (Rantapuska, 2011; Chinedu *et al.*, 2014). Although several SMEs are implementing ICTs, it has been found that the majority of them are not making the most of their potential (ANIEI *et al.*, 2011; Estavillo *et al.*, 2015). Therefore, a great understanding of how SMEs consider their requirements in ICTs implementations (Consoli, 2012).

Considering the previous scenario, the objective of this work is to propose a KM-based conceptual model to achieve that human capital, organizational and relational capital provide adequate capacities that contribute to

improve the use of ICT in the business processes of the SMEs. The structure of this work begins with a review of the literature on the KM processes, and makes known the environment presented by Mexican SMEs in relation to the use of ICT. The following section presents a conceptual model that integrates a KM approach related to the implementation of ICTs. Subsequently, the arguments of the proposed model to address the problem of the low level of ICT utilization in SMEs are discussed, describing the stages of KM in order to integrate them into the activities carried out by SMEs in the implementation of ICTs. Finally, the conclusions and recommendations are presented to detect areas of opportunity considering KM from its initial phase of implementation of ICTs that contribute to improving the level of utilization of these technologies in business processes.

## II. FRAMEWORK

Currently in the business sector, business processes are increasingly supported by ICT systems to perform certain tasks, such as processes related to purchasing, sales, inventory control, accounts payable, accounts receivable, among others. A business process is usually defined as a set of activities that represent business functions with a certain specific order and are part of the collaborations between different departments within the same organization or between companies that include several participating organizations (Künzle and Reichert, 2013; Weske, 2010; Wetzstein, 2016). However, many of the ICT-centric approaches to business process support have failed because they have been dominated by the complexity of the selected ICT solution, rather than focusing on the true alignment of business processes regarding ICT (Becker *et al.*, 2013). The following are concepts related to KM, as well as an overview of the business sector in relation to ICTs and Mexican SMEs.

### 2.1. Intellectual capital and KM in enterprises

Intellectual capital consists of three factors: human capital, structural capital and relational capital (Bontis, 2002). Human capital can be defined as the knowledge, skills and abilities of employees (Bhartesh and Bandyopadhyay, 2005). It considers the know-how, experience and talent of employees and managers in the organization (St-Pierre and Audet 2011). Structural capital is defined based on the internal structure of the organization. It includes patents, structure, policies, culture, processes, as well as the technology used in the company (El and Tollington 2012). As for relational capital, it is represented by the external environment of the company, that is, all the relationships

that an organization establishes with suppliers, customers, competitors, government and the community (Cohen and Kaimenakis, 2007). Intellectual capital has become a key factor for the success of SMEs, as it is one of the main business assets that helps to promote competitive advantage for value creation (Daou and Su, 2014). Figure 1 graphically shows the factors that constitute the intellectual capital, as well as the elements that make up each one of these factors.

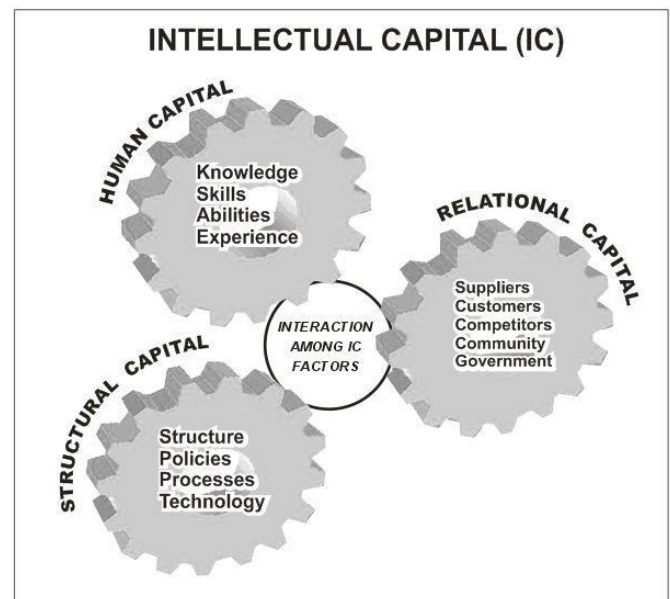


Fig.1: Intellectual capital consists of human capital, structural capital and relational capital.

KM is essentially focused on people, how to create, and share and use knowledge. It is not about creating a new department or acquiring a new computer system, it is about making changes in the way all members of the organization work and providing people with access to relevant information resources (Shannak and Ali, 2012). There are many KM definitions from different authors in different contexts and times, such as Nonaka and Takeuchi (1995), who define KM as the company's capabilities to create new knowledge, spread it in the organization and incorporate it to all of its processes. Another definition given by Wiig (1997), mentions that it is the function that plans, coordinates and controls the flows of knowledge that occur in the organization in relation to its activities and its environment in order to create essential competencies. For Davenport and Klahr (1998), KM is the systematic process of searching, organizing, filtering and presenting information with the aim of improving the understanding of people in a specific area of interest. Due to the wide variety of concepts in the literature related to KM and its processes,

it is appropriate to use the results obtained from Galvis and Sánchez (2014), who carried out a systematic review of the literature on KM processes, obtaining a synthesis of scientific documents published between 2001 and 2011, where they analyzed a total of 1,341 bibliographic records that explicitly mentioned a process or group of KM processes. After a more exhaustive analysis, we reached a set of 65 documents that served as primary source of data for the systematic review of literature. The result of this analysis was a set of eight processes considered of great importance to KM. These processes are identification, acquisition, creation, codification, transferring, application, protection and knowledge assessment. As a result of the aforementioned statements, and once the KM concept and constituting processes have been understood, it can be observed that KM is a discipline that can be applied in diverse areas of interest. KM has the potential to provide several benefits to companies, such as better communication, better customer service, shorter response times, greater innovation capacity and greater efficiency in their processes and procedures (Zieba *et al.*, 2016).

## 2.2. ICTs and the Business Environment

It is undeniable that organizations can obtain major performance improvements through the implementation of ICTs, but it is important to mention that these potential results are not automatically generated, since the utilization of ICTs has to do with the sector organizations belong to, and each sector perceives ICTs in a different way, affecting the use as well as the sophistication of the adopted ICTs (Rovira *et al.*, 2013). Ignoring these technologies and their potential benefits can represent a significant obstacle that derives in a bigger uncertainty, which results in a limited implementation of new technologies from the organizations (Scupola, 2009; Huaroto, 2012). It has been observed that ICTs have allowed the participation of small enterprises in global markets thanks to the utilization of websites for the marketing of their products, which contributes to the growth and profitability of enterprises and provide a basis for the transformation from a micro to medium-sized company (Taylor, 2015). This generates differentiation and specialization processes that allow the improvement of its business development structure, as well as the creation of new business processes, increasing the competitiveness level of the enterprise (Olló and Aramendía, 2012). As a result of the investment in ICTs, which in turn entails investment in the human factor, companies are in need of introducing consulting, supervision, design and implementation programs that guide them in the correct use

of these technological tools (Builes, 2015). For example, there are positive results in some SMEs in the manufacturing sector where the influence of ICTs is important for the relationship with suppliers to be effective and collaborative, since supply chain management helps to improve logistics control. However, it is important to mention that the use of ICTs in the operational activities does not guarantee the adequate performance of these companies, since this depends not only on the type of technology used, but also on the degree of adaptation of the technology to the business needs (Colin *et al.*, 2016). Research theories and models should address the implementation of ICTs as a dynamic, interactive and evolving process, rather than a static one-time action (Chinedu and Chen, 2014). This dynamic capacity is related to the ability to absorb, create, store and apply knowledge resources to respond to the changing environment (Shih-Yi and Ching-Han, 2012), it is then important to consider that the success of ICTs use should not only be measured by the number of computers companies acquire, nor by having an internet connection, nor by many other merely tangible factors. What really matters is that companies improve competitiveness by taking advantage of the opportunities offered by ICTs (Greenan, 2003). This means reinforcing the idea that a rigorous analysis of the business as well as the identification of the needs and the monitoring of the results are important precursors of the initiatives of ICTs implementation (Bhaskaran, 2013).

## 2.3. The environment of Mexican SMEs in relation to ICTs and KM

Most of SMEs have had limited economic and material resources since their creation. The most serious effect is the lack of business management knowledge from the main partner and close associates, which limits the growth of a business and destines SMEs towards failure, or even to bankruptcy by the lack of specific objectives (Romualdo *et al.*, 2015). Another of the characteristics presented by Mexican companies according to ANIEI *et al.*, (2011), is a low capacity in ICT, understood not in terms of the implication of ICT but in terms of its use to articulate processes and business data in seven areas: sales and distribution, supply, development, finance and administration, production and operations, marketing, planning and collaboration. This is related to what has been stated by Angeles (2007) who indicates that the majority of SMEs in Mexico lack a formal organizational structure and do not even have personnel trained in the implementation of information technologies, so they must hire or advise

external consultants. Another research done in 2014 in relation to electronic invoicing and the use of ICTs in their business processes, only 45% consider it necessary for the operation of their business and only 41% carry out their own operations of the company using the informatic equipment (Estavillo *et al.*, 2015). SMEs, according to several studies, have a low level of survival and face serious problems such as access to finance, poor management capacity, poor information on market opportunities, modern technologies and methods of work organization and limited information on access to innovation and research funding. However, these companies have areas of opportunity in the integration of their business processes in relation to ICTs (Menchaca *et al.* 2014). Other studies about the use of ICTs in Mexico was carried out by Esparza *et al.*, (2012), where the results showed that companies more aware of the importance of ICT implementation tend to be better organized, with better trained human resources and with a clear vision of the benefits of the application of ICTs as tools of competitiveness and greater productivity.

In relation to KM, Calderón (2014) carried out a study in manufacturing SMEs in the city of Morelia, Mexico, indicated that most SMEs do not know what KM is, what benefits they could obtain and what elements would favor their use. It was observed that in this type of companies the practice of KM is performed partially and occasionally. This also agrees with what Avila *et al.*, (2014) stated when pointing out that Mexican SMEs generally face a problem related to low investment or no implementation in KM systems, ignorance of the advantages of KM, poor implementation of technology, as well as the lack of support from government and/or chambers of commerce. However, contrary to this unfavorable scenario in relation to KM, there are positive aspects when applying a system in terms of improving KM processes mainly in the identification, documentation and utilization of knowledge (Perez-Soltero *et al.*, 2015). Another study carried out by Vazquez-Avila *et al.*, (2012) in 418 Mexican manufacturing SMEs in the states of Jalisco, Colima, Queretaro and Aguascalientes regarding the benefits of KM found that the level of competitiveness of these companies rose by 59.2%, in terms of intellectual capital. They also found favorable results with a contribution of 40.8% in the level of competitiveness. This was evident when favorable aspects were shown; such as better use and development of information technology, improving the competitiveness of the organization, seeking external consulting as support, better coordination in the development of different areas, improvement to acquire knowledge about new products as well as the relationship with sources of knowledge to face

problems and challenges. Evidently, there are SMEs where there is evidence of positive results in relation to KM and how it influences the best use of company resources, which provides the guideline to propose a conceptual model aimed at improving the level of utilization of ICTs in business processes, where this model integrates the processes related to the implementation of ICTs and the KM processes.

### III. A KM-BASED CONCEPTUAL MODEL FOR IMPLEMENTATION OF ICTS

KM aims to encourage the use of knowledge, contributing to the organizational performance and knowledge flow, directly affecting personnel, products and structures while trying to improve the efficiency and create innovative processes or products. It is important to consider SMEs as an open system, since they are environment-dependent due to the fact that they interchange content, information and knowledge, having in mind that knowledge does not come from a single source, but can emerge from a context of multiple scenarios (Majors, 2010; Wilfredo and Esteves, 2013; Majors, 2013; Abd *et al.*, 2016). It becomes clear then that KM possesses a dynamic quality and a systemic approach. In the same way, these characteristics can also be present in ICTs since they are tools that are constantly evolving. From the previous statement, we can infer that the conceptual model proposed must be oriented toward the application of ICTs according to the characteristics and conditions of the business processes, considering that SMEs are immersed in a dynamic and diverse environment, where KM interacting during the ICTs implementation process shows a favorable frame to obtain a better use of these technologies in business processes.

#### 3.1. Importance of including KM in ICTs use in SMEs

KM is a wide and supportive research field where solutions are formulated and methodologies proposed from different perspectives ranging from business, management, and economics to information technologies (Mustapha, 2012). Some observations focused on the processes and structures of big corporations show a positive relationship between KM and organizational performance. Similarly, there is a significant consensus over ICTs having important effects over productivity, profitability and competitiveness when they are effectively implemented and utilized by SMEs, since this depends not only on the type of technology used, but also on the adaptation degree of the particular technology to the business needs and the capacity to correctly utilize them (Edvardsson and Durst, 2013; Colin *et al.*, 2016). Concepts presented on Table 1 show an existing

relationship between KM and ICTs, since both share common aspects related to competitiveness, organizational performance improvement and knowledge interchange. As it can be observed (figure 1), technology and processes are interrelated and are part of the structural capital, that along

with human and relational capital, are linked by having a proper balance of intellectual capital, which becomes the dynamic agent that puts knowledge to action to contribute to the organizational improvement.

Table.1: Common aspects between ICTs and KM

ICT		KM	
1	In order to <b>enhance enterprise competitiveness</b> , a change in the approach on how ICTs are used as a function of support in business processes is required (Majors, 2010).	1	KM has focused on processes and organizational structures <b>to improve their performance and competitive position.</b> (Edvardson and Durst, 2013).
2	In order for ICTs to give results on productivity, other variables such as <b>human capital quality, innovating capabilities and organizational changes</b> have to be incorporated (Balboni <i>et al.</i> , 2011).	2	KM involves taking advantage of <b>intellectual actives in order to improve organizational performance</b> (Stankosky,2008).
3	In order to take care of the new changing needs the entrepreneurial world offers, an organizational structure where ICTs integration is conceived as a progressive process for the <b>development of competencies in terms of management ability to face new environments</b> of knowledge is required (Orjuela, 2010).	3	KM <b>has as an objective to boost and optimize knowledge transfer within the organization</b> , which is considered as an open system <b>dependant on its environment due to a content interchange, information and knowledge</b> (Wilfredo and Esteves, 2013; Majors, 2013).
4	ICTs play an important role in the structural capital within some enterprises, because they offer the possibility to speed up processes, contribute to the generation of innovation, as well as with the procurement of more truthful, well-timed, and trustable information leading to the creation of value and the generation of knowledge (Demuner <i>et al.</i> , 2014).	4	Knowledge shouldn't be seen as single data or information, since it has its roots in a <b>social context and in human experience and it requires attention to people and culture, as well as organizational structure and information technologies</b> (Wilfredo and Esteves, 2013).

Source: Originally made based on several authors cited in this table.

Figure 2 shows how processes and technology are part of the structural capital, and even though there might be a relationship between both entities, investing in technology not necessarily leads to a better exploitation of these resources since they do not contribute per se to the improvement in the interaction among intellectual capital factors when a KM approach is not present among employees, direction board or any collaborator who is in touch with the company. Then, when a situation where structural capital elements lack an appropriate balance appears, it makes a lot of SMEs to fail in the implementation of ICTs. Under these circumstances, the implementation of technology and its relationship with other elements become important. During this implementation process, little attention is paid depending on the organization's nature without thoroughly understanding

the link between strategy and objectives the company might have (Rantapuzka and Sore, 2011; Chinedu *et al.*, 2014). Because of this, it is not suitable to take the implementation of ICTs from a mere technological approach into practice without considering the precise dimension of the human capital and its interaction with elements of the structural capital showing an imbalance in their components "failing in the integration of a single piece". This might lead to a situation where a great deal of technology is implemented for poorly-defined processes, or well-defined processes do not account for the support of suitable technology (see figure 2).

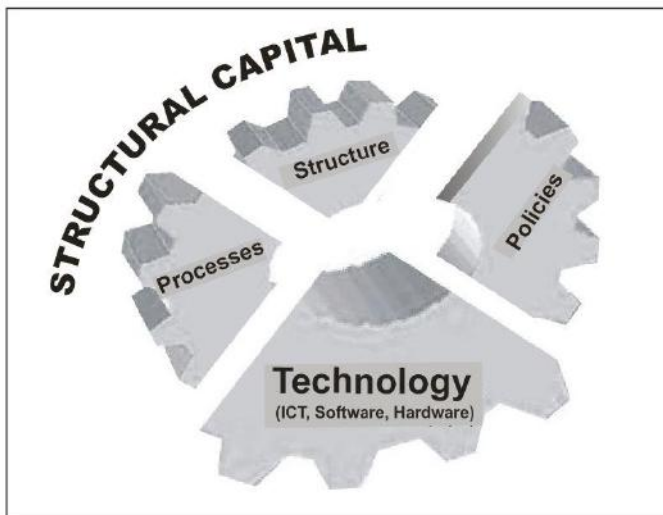


Fig.2: Scenario of technology adoption without considering the structural capital elements

Taking the concept of business process into account, it can be observed that its own definition involves the application of a systemic approach in an organizational environment since technology, knowledge and personal ability interrelate. According to the previous paragraphs, a possibility to take another perspective which is based on KM for the implementation of ICTs in SMEs is observed.

Here is where the proposal of a new conceptual models takes place. The objective of this proposal is to promote conditions to improve the exploitation of ICTs in business processes within SMEs where a model which allows to reach, through knowledge, a strengthening of the interrelation among intellectual capital factors and business processes and ICT implementation is planned and started. A description of this conceptual model is proposed below.

**3.2 Description of the conceptual model.**

The conceptual model being proposed is based on the combination of some KM processes, mainly the processes related to the identification, acquisition, application, codification, sharing and evaluation of knowledge. This model takes into account the participation of the human capital and its relationship with ICTs within business processes (see figure 3) where the staff plays a dominant role for possessing the knowledge. Therefore, it is recommended to use a simple language so that entrepreneurs and managers not possessing the required technological knowledge are able to understand that the purpose of the model is to implement suitable technology in relation to the resources available in the company. The elements of the model and how its parts interact are explained below.

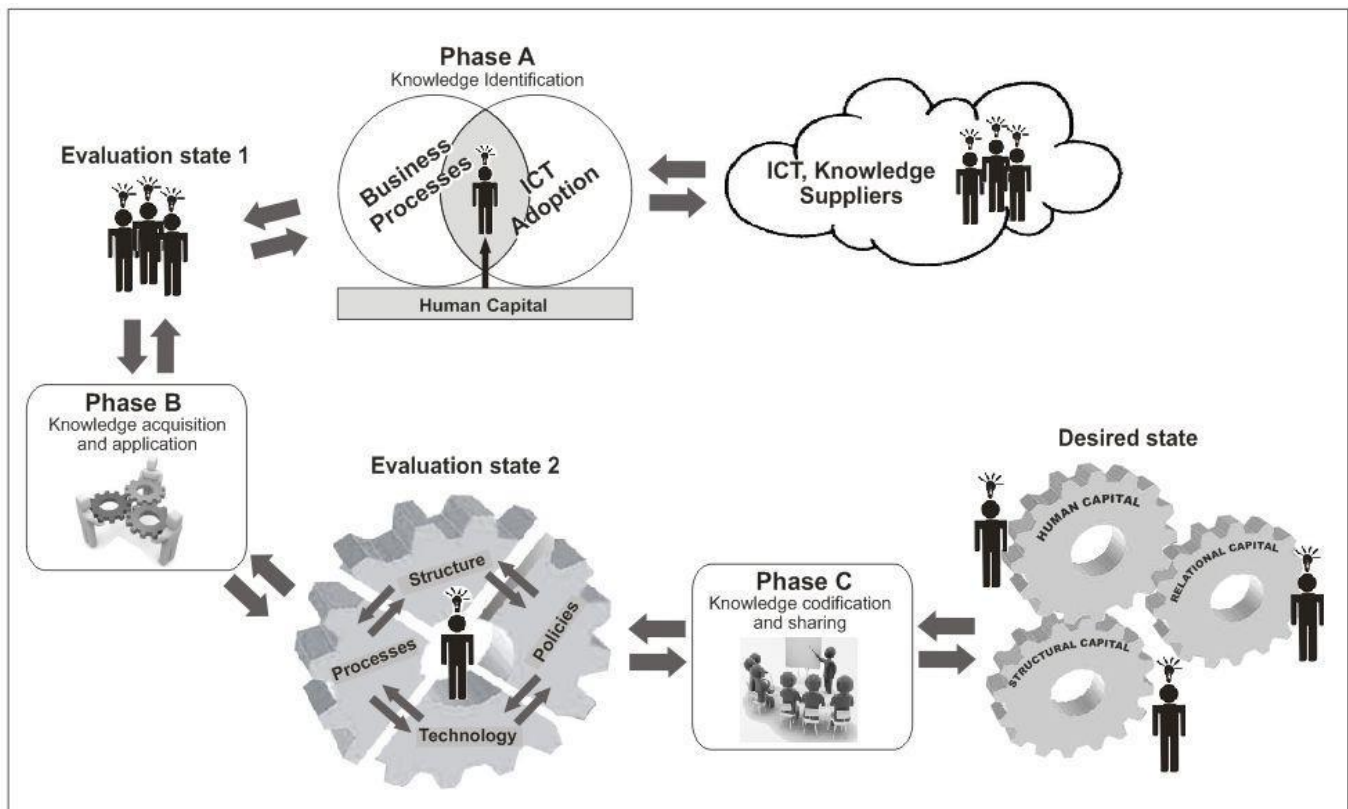


Fig.3: Conceptual model based on KM.

**3.2.1 Phase A: Knowledge Identification**

It consists in determining the current state, in identifying the existing knowledge and the knowledge needs within the SME in relation to the ICTs and their processes, as well as their relationship with external suppliers which are in conditions to give advice. In contrast with a traditional process of technology acquisition, KM application is included since the beginning of the model accounting with the participation of the staff involved in the development

process. Each SME must elaborate a list of questions that need to be addressed based on the particular characteristics of the business processes involved in the application of ICTs. As it was already mentioned, not all SMEs have the same level of sophistication in their business processes and in their technology requirements. Table 2 shows typical questions that might be asked in relation to business processes and ICT implementation.

*Table.2: Some questions regarding business processes and ICT implementation.*

Business process analysis in relation to the ICT implementation within SMEs	
Business Process	ICT Implementation
Process name:	(External supplier profile evaluation)
What is the purpose of this process? When does the process take place? What are the activities involved in the process? Who performs the process? What other functional areas within the company are related to the process? How long does the process take? What type of technology is used in order to perform the process?	Is there any ICT implementation in this process? Is it known how to implement ICT in the process? What are the advantages that would be obtained with the ICT implementation? What is the budget needed and how long it will take to implement the ICT in this process? Is there well-trained staff to transfer knowledge from ICTs in this process?

Source: Originally made.

Questions in the left column are oriented to the staff of the company itself, this is observed with the business process approach and its organizational scope. Questions in the right column require a certain degree of knowledge on ICTs oriented to the process under study because these questions are oriented to possible suppliers or external advisors. The columns in the right in table 3 can be applied to as many external suppliers as needed in order to reach a broader perspective when assessing the answers of all the questioned being asked.

**3.2.2 Evaluation state 1**

It consists in answering and assessing every point related to suppliers, technology, processes, training, human resources, costs, implementation time, as well as the accomplishment of objectives taking into account the questions related to Who? Which? Where? How? Why? When? How much? The evaluation of these questions aims to get a detailed knowledge of the process and to select the supplier or the suppliers with the most adequate profile in terms of knowledge and experience related to the implementation of the ICTs and having the ability to fulfill the need in terms of knowledge and to create the suitable conditions for the SME to improve the use of the ICTs within the business

processes. Therefore, it becomes important for these suppliers not only to provide technology but also to possess knowledge in the implementation of ICTs in order to propose an appropriate training plan. If this evaluation state does not provide with clear knowledge about the process being analyzed by the company or if it does not provide suitable prospects in knowledge and experience able to give advice then questions must continue to be asked and assessed both by the company and the other suppliers that match the conditions in the most favorable manner. Once this evaluation is satisfactorily finished, phase B takes place.

**3.2.3 Phase B: Knowledge acquisition and application.**

This is one of the crucial parts of the model, since it is preceded by the evaluation of the current situation of the company and it also considers two very important processes to KM: acquisition and application. During this phase, acquisition of knowledge must be taken into account in order to satisfy the needs of information proposed at the beginning. Application of the knowledge acquired should be linked with various aspects involving the use of technological equipment, software application, and the relations among different areas within the company directly

present in the elements conforming human capital and also structural capital and relational capital. The application of this knowledge should provide with results related to the objective proposed in the first place of the business process, this involves the participation of all the employees, collaborators and managers in order for the knowledge to be applied in the working areas previously defined. Once concluded, this phase leads way to evaluation state 2.

### 3.2.4 Evaluation state 2.

In this state of evaluation, some questions related to knowledge application can be considered, for instance: Is ICT implementation in accordance with the business process being analyzed? Is the business process supported by a suitable organizational structure? Are company policies appropriately supported by the organizational structure and also by the processes and the technology being applied? Do the personnel involved in the process possess enough knowledge and abilities for the ICT implementation? If the results of this evaluation reflect an appropriate knowledge application, then the first request has been accomplished to a good coupling level among the structural capital elements. This means that ICT implementation considers human capital and its interaction with structural capital elements “being able to integrate it in one piece”. This situation can be seen in figure 3, in evaluation state 2, it is represented with arrows in two directions among processes, technology, policies and structure which means the necessary conditions to go on to phase C are met. If the evaluation state does not provide satisfactory results, phase B needs to be reinforced and analyzed. In consequence, evaluation state 1 should be evaluated which might result in the restarting of phase A in order to continue with the following stages or to go back to previous phases or evaluation stated as needed to achieve the objectives of each stage of the model.

### 3.2.5 Phase C: To codify and to share knowledge.

In this phase of the model, two other processes of KM are carried out: codification and sharing of knowledge. First, knowledge is codified, that is, passive knowledge (non-documented knowledge, based on personal experiences and skills) is transformed into explicit knowledge (documented knowledge to be used by the company). Codification includes organization, storage and retrieving of explicit knowledge. In this phase, documentation of everything related to knowledge applied on ICT implementation is included as well as processes and people being involved. Process manuals or diagrams showing the knowledge needed for a particular process can be elaborated.

Documentation can be performed by any means within the company, giving preference to new technologies, either documents or electronic files to ease its organization, storage and retrieving. Once knowledge is codified, there will be knowledge sources that will reinforce human capital by having better conditions to adequately share internal and external knowledge to reinforce relational capital, based on the same technology used by people within the organization.

### 3.2.6 Desired state.

To improve the level of utilization of ICTs in business process. If the desired state proposed in the model has been achieved, this means that all the stages of the model have been satisfactorily and systematically performed and the three factors of intellectual capital have been achieved. If the last phase of the model related to the sharing of knowledge is not being achieved, other strategies aimed to the company staff should be implemented. For example, in order to share knowledge, it is necessary to promote good attitudes among people, both for who receive knowledge and for those who provide it. It must be taken in to account that human capital participation offers feedback to structural capital and relational capital with the objective of the intellectual capital factors interacting in a suitable manner, achieving with this that every individual collaborated in a work environment that leads to a continuous improvement of the company.

## IV. DISCUSSION

As it can be observed, the conceptual model here proposed has as an objective to improve the level of exploitation of ICTs in business processes within SMEs. This model integrates KM processes and aspects related to ICT implementation, proposing the implementation of a feasible dynamic in a simple language in the context of Mexican SMEs. The solution applied to the low utilization of ICTs within SMEs requires the complementation with a strategy considering decisions with respect to informatics and ICT users in order to achieve an appropriate use of the resources oriented to business processes (Builes, 2015). SMEs need to develop abilities to absorb knowledge of external sources, that is, the capacity to recognize, get and assimilate external knowledge, in order to access avant-garde knowledge despite the limitations in resources, and a strategy consisting in establishing KM projects for this purpose (Filippini *et al.*, 2010). For this reason, the model proposed in this investigation agrees with the one discussed by Nurach and Chandrachai (2012), where they point out that every organization has its own way to deal with data,



information and knowledge and it creates its own structures, that is why it is important to consider that knowledge is built from information available both outside and inside the organization. Consequently, SMEs identify and acquire knowledge from their environment as a measurement to “take advantage of knowledge” but it has to be pointed out that the ICTs results are not automatically generated solely by the implementation, because the maximum potentiality of ICTs comes with changes in internal processes and relationships of the company with its suppliers, clients and partners (OCDE, 2012). It is therefore important that each SME develops or adapts a model of ICT implementation within the organization due to the fact that the dynamics of a company with respect to other might vary (Castillo and Jumbo, 2010). ICTs undoubtedly represent a great opportunity for SMEs to improve their competitiveness, but its implementation needs to be based on efficiency and productivity measurements (Maldonado *et al.*, 2010). In consequence, the application of this model puts KM processes into practice with respect to corresponding evaluation states, paving the way to systematically go further in the implementation of ICTs showing evidence that the SMEs could get better results with a suitable knowledge in their business processes achieving a good balance among human, structural and relational capital. Rashid (2012) and Heredia (2014) mention that the use of ICTs favors economic growth in companies because when correctly implemented they ease the use of information and improve the education level of the workforce. Therefore, it becomes essential for SMEs to implement ICTs (Taylor, 2015). Mexican SMEs should use ICTs extensively in their production processes, since there are SMEs willing to work for a continuous improvement, taking advantage of the simple structures they already possess and the few hierarchies which favor inter-professional relationships (Perez-Soltero *et al.*, 2013). The use of ICTs easing KM or some of their specific processes has to be taken into account in order to manipulate different types of internal or external information in digital formats or the access to information going around the company. This is where ICTs represent a valuable and viable tool to promote KM (Chaverra and Arias, 2012).

## V. CONCLUSIONS

According to this research, there is a poor level of utilization of ICTs in most of SMEs due to the lack of organizational culture in this type of companies which do not recognize ICTs as tools to promote competitiveness and productivity. Nevertheless, as it can be observed in this work, there are also evidences that ICTs implemented in

SMEs represent a key factor in the change some companies currently face. Although it is true that ICTs are important tools for businesses, they do not guarantee quick results or in the long term. It is important to recognize that in the first place, the implementation of technology is a necessary but not a sufficient condition. For this reason, KM represents a starting point in the model proposed in order to get better results regarding the utilization of ICTs in business processes within SMEs, since human capital can only acquire and apply knowledge to use technology in a creative way, supplying the organization with a competitive tool and better productivity to improve and differentiate the management of human and material resources and to be able to implement improvements in their processes, products or services. In consequence, it can be observed that a constant learning process and the ability to develop new competences regarding the application of ICTs turn tools into facilitators for business activities. Although many factors are present during the implementation stage, the main factor in which should sustain is human capital which in turn makes it knowledge, skills and abilities possible when ICTs occur in all the internal aspects of a company (management, customer and supplier communication, sales systems, marketing, production and human resources).

In Mexico, SMEs represent a vast area of opportunity to improve and to implement informatic technology and it becomes feasible to propose a KM-centered model where business processes are integrated and a higher level of technology utilization is allowed (from analysis of requirements for KM). ICT implementation orients the company to integrate appropriate organizational abilities, policies, cultures and technologies. Lack of knowledge represents a disadvantage since it prevents the development of the company and of any other resources.

Among future perspectives, the development of a new method able to explain in detail the way to implement the model proposed to apply it to several Mexican SMEs to analyze their performance. With this method, it would be possible to verify adaptability among different business processes to analyze and evaluate knowledge necessities in terms of ICTs, and with the establishment of appropriate indicators, the impact of its implementation can be evaluated. It is important to be aware about the technological changes that might affect the improvement of the processes which involve the constant update of the sources of knowledge, the basic resource SMEs have to maintain an adequate level of competitiveness.

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