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Selection and Control of Knowledge Intensive Core Processes to Improve Knowledge Management Initiatives

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Abstract: The document presents a methodology whose objective is to select the processes that will be considered high-priority to improve the possibility of success in Knowledge Management initiatives in an organization and show a proposed model to control this critical process. The main objective of this work is to analyze the selection and control of the Knowledge Intensive Core Processes (Critical Processes) inside an organization, from the perspective of the Knowledge Management using the model of knowledge that has been developed to study critical processes and the relationship and interaction between Knowledge Management and the Semantic Web in organizations. We present a model with a proposed interaction of these critical processes with the organization using technologies of Semantic Web and a methodology to select the critical processes.

Keywords: Knowledge Intensive Core Processes, Knowledge Management, Semantic Web, Critical Process Management

Introduction

HISTORICALLY WHEN AN organization decides to adopt KM, this decision arose generally from people whose information of this philosophy was only given by blurred references, readings in magazines, some book in fashion or the external recommendation. However many of these initial efforts failed, either for lack of knowledge of the KM process, or for lack of commitments of the administration or simply by selecting in erroneous ways the areas or processes of the organizational implementation which would be more profitable.

The document presents a methodology whose objective is to select the processes that will be considered high-priority to improve the possibility of success in KM initiatives in an organization and show a proposed model to control this critical process.

On the other hand, a recent study by the American Productivity and Quality Center [3] concluded: "*If you do not have a KM strategy, a framework, and an information technology model to support it . . . you end up in chaos*". Authors like Mintzberg [18], Porter [21] and Steiner [25] have written diverse books and articles related with the Management of the Organizations and as taking advantage of the strategic focus to reach bigger benefits. It is in these documents where they propose some models and methodologies whose objective is to obtain better benefits for the organization to make a better use of the resources. To reach these goals it is important to have a clear knowledge of these factors from the vision of the Strategic, Tactical and Operative levels.

Affirming that the knowledge is an important resource in the organizations, it arises what we know like KM. The development of the communications and the evolution of Internet has taken to the materialization of new technologies that make possible a direct interaction between common people and information systems, as among the same systems, actually, the recent advances in the development of a new type of web named the semantic web and his proven benefits to an upgraded communication between people, computers, databases, multimedia, etc, providing a suitable framework to take advantage of the benefits of this new assets to be used in combination of KM toward the attainment of the strategic goals of the organization.

The organizations today, also have many and varied elements that conform it, these are related with human resources, processes and technologies, forming a complex network that requires specialized techniques to analyse it.

This work is based on a Model of Organizational Knowledge, developed with the purpose of interrelating the Knowledge Management (KM) with the Semantic WEB (SW) [4], it is also related with the area of KM related to the identification, pursuit and control of the key processes of an organization.

The structure of the document that begins in Section 2 presents a Conceptual Framework about general aspects of some important topics related to the strategic processes of the organization, the intensive knowledge processes. Section 3 presents the basis of Knowledge management in critical processes and a proposed methodology that allows the organizations to discern in the first place if they should begin a process of KM and in what process of the organization it is profitable and advisable to propel a KM initiative, additionally in section 5 a model for critical process implementation is presented. Continuing the section 6 with the advances that so far we have had in the research of the methodology and the preliminary and finally section 7 concludes with a summary of this work.

Conceptual Framework

Knowledge Management in Organizations

KM is associated with the acquisition, uses and maintenance processes of the knowledge inside an organization. This discipline has emerged as a key activity in big corporations, since they consider internal knowledge as an intellectual asset that can help them improve their productivity, create added value and increase its competitiveness [2].

The main benefit of KM resides in the possibility of finding the sources of the knowledge that are relevant for the current problem, as well as to provide sources of the knowledge that can be used to solve that problems. These sources of knowledge can be divided in two categories: formal expert rules and documents. To allow more efficient search of the knowledge in this second category, the content of the documents is obtained through declarations based on ontologies, and these have a conditional form, that is, condition-action that allows us to use the same logical mechanisms for both categories. Finally, to search for outstanding knowledge, some expert rules can be used [27].

Semantic Web

SW is the new generation of the World Wide Web [5], the structure of the SW includes: software agents, metadata, mechanisms to find and connect semantic resources in the Web, etc. Some critical problems of information include applications such as: Acquisition and organization of information, findings of knowledge, data mining, and the visualization of these processes [23]. The SW is not guided only for the Internet, but rather it represents a group of technologies that can also work well on corporate intranets [8]. When organizational knowledge is distributed between diverse experts and documents, the technologies based on SW can support the processes of acquisition, modelling and management of this distributed knowledge. The creation of a corporative memory can be very promising because it could be materialized in a corporate SW formed by documents, ontologies and semantic annotations on these documents using a conceptual ontology vocabulary [6].

Relationship between KM and SW

An organization centred in knowledge will be able to incorporate the SW technologies in each part of the life cycle of the process of knowledge including its production, analysis, storage, search, dissemination and reutilization [8]. Hopefully with SW it will be possible to develop an advanced system for KM that allows, among other things for knowledge to be organized in conceptual spaces according to its meaning; automatic tools that will perform maintenance, verification of inconsistencies and extraction of new knowledge; searches based on questions instead of being based on words. The requested knowledge will be extracted and presented in a friendly way for all, it will be possible to make searches based on questions over several documents and it will be defined who can see certain parts of the information even when being in several documents [2].

We consider that SW can support the management of organizational knowledge by beginning to facilitate the structure of knowledge in such a way that it can be materialized in SW pages inside the corporate intranet. Once being in this structure, all members of the organization will continue interacting in a transparent way with the SW technologies to make specific searches of knowledge and to facilitate the inference of the new knowledge.

The Processes Knowledge

Process Overview

The major part of the organizational activity (exceeding 90% in some cases) can be described in terms of processes. Process is like a grouping of related activities [13]. According to Davenport [9], a process is an ordering of activities across time and place, with a beginning, an end, and clearly identified inputs and outputs.

Processes typically consist of dozens of activities, each one with inputs and outputs. A routine, which consists of only one activity, is generally not referred to as a process. The activities are automated in some cases, while in others they are carried out manually. The inputs and outputs could take the form of materials, personnel, information, etc. which vary with the type of process and functional area [13]. It is evident that there are major differences in knowledge related

issues of the processes. Manufacturing processes tend to be very structured, dealing with raw material and its transformation to a finished good. They are automated in many cases. Non-manufacturing processes, on the other hand, deal with information as a raw material. Cognitive processes such as design involve human beings to a greater extent and tend to be highly individualistic [1]. From these points of view, Process is defined like a group of ordered activities (tasks) in an organization, through time and space with a defined objective.

Knowledge in Organizations

Knowledge, according to Davenport and Prusak [10], is 'a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information'. Other authors like Nonaka [19] include a distinction between tacit and explicit knowledge. Tacit knowledge is the knowledge that person posses and that are described as knowledge embedded in the individual's experience. This experience can be communicated and exchanged in a direct and effective way in the socialization process [19]. The explicit knowledge refers to the knowledge that is transferable in a formal and systematic way by means of a language, since it can be easily articulated and interchanged, because it is independent of the individual's mind. According to Maula [17], highly structured knowledge refers to explicit, digital (possibly information system, multimedia, printed format, etc.), formal, and classified knowledge. It is processed in a manner that is predefined by pre-defined rules (such as conventional information systems). Also Knowledge-based systems that have expanded opportunities for defining pre-defined rules can be included in this group. Less-structured knowledge refers to explicit, digital (possibly multimedia, printed format, etc.), informal and unclassified knowledge. It can refer to knowledge that contains unstructured personal elements, such as communication by electronic mail or discussions in intranets. Explicit less structured knowledge that is based on man-machine interaction forms an increasing portion of our daily activities, and brings an element of surprises to the organizational behaviour [17].

Amaravadi classifies seven dimensions of process knowledge as: Structural, Personnel and coordination, Performance and tools, Discourse, Results, Quality and objectives and Impacts and implications [1].

To approach knowledge in organizations, it is necessary to understand its characteristics so that, parting from these, sharing and mechanisms of reutilization can be established. Knowledge is contextual and includes an actionable summary and interpretation of experience. Similarly, process knowledge is also empirical, contextual and actionable. A process is the result of institutionalization of practice as pointed out earlier and process knowledge is a valuable product of this process.

Knowledge Intensive Processes

Organizational processes can be structured, semi structured and unstructured, Knowledge Intensive Processes (KIP) can be structured but are often also semi structured processes, because KIP are only partially mapped by the process model due to unpredictable decisions or tasks guided by creativity. Typically knowledge flows and knowledge transfers between media and persons are necessary to achieve a successful process completion [12]. Gronau also defines that a process is knowledge intensive if its value can only be created through the fulfilment of the knowledge requirements of the process participants. Clues for a KIP are additionally from the above-mentioned criteria:

- Diversity of information sources and media types
- Variance and dynamic development of process organization
- Many process participants with different expert's reports
- Use of creativity
- High degree of innovation
- An available degree of decision scope.

Core Processes

A core process is a collection of organizational interfunctional activities that are essential for customer satisfaction and to fulfill the organizational mission. These activities integrate people, materials, energy, equipment and information [14]. Core processes are the fundamental activities or group of activities that are so critical to an organization's success that failure to perform them will result in deterioration of the organization. These are typically processes that directly touch the organization's customers, reflect the major cost drivers in the organization, or are on the critical path in the service chain. Core processes are most often found within the customer/consumer life cycle in an organization, from the first interaction that a consumer has of an organization to the last interaction in the relationship [26]. Core processes are usually chains of tasks involving various departments and functions that define the fundamental purpose of existence of the organization and deliver (products, services, support, and information) to external customers. Core processes are supported by a number of enabling processes that provide vital inputs to the value-generating activities. Core processes should stimulate creativity and innovation, emphasize

on sense and response, and where knowledge creation is a by-product.

Organization's core processes must be identified. Processes that has experienced people and Knowledge located in them must be documented and shared to other people within core processes, this will avoid "re-inventing the wheel", fall past errors and best practices will be applied to solve new problems [20].

To select core processes, an evaluation of all processes of the organization must be made and select those that better fulfill the following characteristics:

- It has a direct impact with mission and vision
- It generates revenues or is the most critical to overall success of the organization.
- It has impact and it gives an added value to the company
- It allows to satisfy customer's requirements

Selection of Knowledge Management Critical Processes

Characteristics of Knowledge Management Critical Processes

After analysing several authors [7,11,12,14,18,20], we consider that in every organization exists a great variety of processes, some can be classified as core processes or from the perspective of KM as KIP, but all the core processes are not necessarily same grade knowledge intensive, neither all the KIP of the organization are core processes. Therefore select a non-knowledge intensive core process to manage their "limited or nonexistent" knowledge could be classified as an unnecessary expense by an organization with few economic resources. In this same sense, to manage knowledge in a process that is knowledge intensive but doesn't contribute direct benefits to the goals and objectives of the organization, it could also be considered a waste of resources, this doesn't mean that it is not important to manage the whole knowledge of the organization, what we affirm is: the initiatives of KM will contribute "tangible benefits" to the organization so that they continue being supported by the authorities

Select the best alternatives to begin KM in an Organization will be a priority before beginning any program of KM. The success of the first incursions to KM will allow to enlarge the reach of these programs and to cover more and more the objective of management of the whole knowledge of the Organization.

To these core processes that are same time KIP, we will call them "Knowledge Management Critical Processes" (KMCP) and we will define them in function of the following characteristics:

- It has a direct impact with mission and vision
- It generates revenues or is the most critical to overall success of the organization.
- It has impact and it gives an added it valued to company
- It allows satisfy customer's requirements
- Its value can only be created through the fulfilment of the knowledge requirements of the process participants
- It has diversity of information sources or fuzzy information
- The processes organization has variance and dynamic development
- The processes have many participants with different expert's reports
- It requires creativity, high degree of innovation or an available degree of decision scope.

Resuming: A KMCP is a process of the organization that besides being strategic (very important since it impacts in great measure in the achievement of the objectives) requires the use of great quantity of information and knowledge for it was able to conclude it with success. To be able to identify these KMCP we have to analyse in the first place, the processes of the organization from the strategic point of view and in second place identify the grade that knowledge is vital to reach the successful culmination of the same one.

Methodology to Select KMCP for KM Initiatives

A brief description of the methodology: The main core processes are selected. This selection is based on strategic approaches. Later these processes disintegrate in individual tasks, which are evaluated individually with the approaches of knowledge. Once the tasks are evaluated, a value wills calcule what represents knowledge intensive core process, taking the values of the previous steps. Finally an evaluation to make the pertinent decisions is carried out

Previous Recommendations

Before initiating the methodology of selection of KMCP in the organization, it is necessary to define a responsible team (internal or external) that take the control of the pursuit of the KM process, we named this team: Knowledge Team (K-team), additionally the strategical team of the organization (managers and advisors) will have to make a firm commitment to support this process, and define people in charge of the direction to serve as interface between them and the K-team, all these people form the management team (M-team). When these teams are defined, an initial meeting is necessary where Knowledge,

KMCP and KM concepts and criteria must be explained.

As in all the processes of decision to be able to initiate, it is required to have previous steps:

The K-Team must collect all the related information of the organization, specially the relative to the strategic scope of the organization like: Mission, Vision, Objectives and Goals.

The M-team with the support of the K-team will define the Strategic Processes Criteria (SPC) as well the Knowledge Intensive Criteria (KIC) relative to the organization, and then it must be valuated. In first place an importance criteria weight (W) must be assigned to every criteria related to the other criteria's, then the two team's will evaluate the criteria's on the perspective of a benchmark with the competition, (there is no need for a formal study, a fast evaluation can be adequate), the K-team will help the M-team to value in first place the enterprise value of the criteria (E), and secondly the competition value in that same criteria (B). The spirit of this evaluation is to adjust the selection of the core processes to the processes that need more progress in relation of the competition. See Tables 1 and 2 as example:

Strategic Processes Criteria (SPC)	W	E	B
Product Sales	7	5	7
Procurement Costs	9	8	6
Information Processes Costs	4	8	8
...			

Table 1: Example of SPC Definition

Knowledge Intensive Criteria (KIC)	KW
Knowledge Sharing	7
Use of Tacit Knowledge	9
Use of Explicit Knowledge	4
...	

Table 2: Example of KIC Definition

Once the criteria's are defined, the K-team will create a formulary (figure 1) using only the strategic criteria previously defined, this formulary must recollect all the general information of a process (name, objective, localization, the involved people and technologies, etc) and an evaluation of the correlation of the process with every strategic criterion. The M-team will fill these forms for each process. The degree of commitment in the filling of these initial forms will be able to serve like indicative of the compromise of the M-team to the KM process, if lack of commitment in these initial stages is detected, it will be necessary to coldly evaluate the convenience of continuing the process.

Once this previous steps are surpassed the K-team can initiate the sequence of selection activities of the KMCP using the methodology of the figure 2.

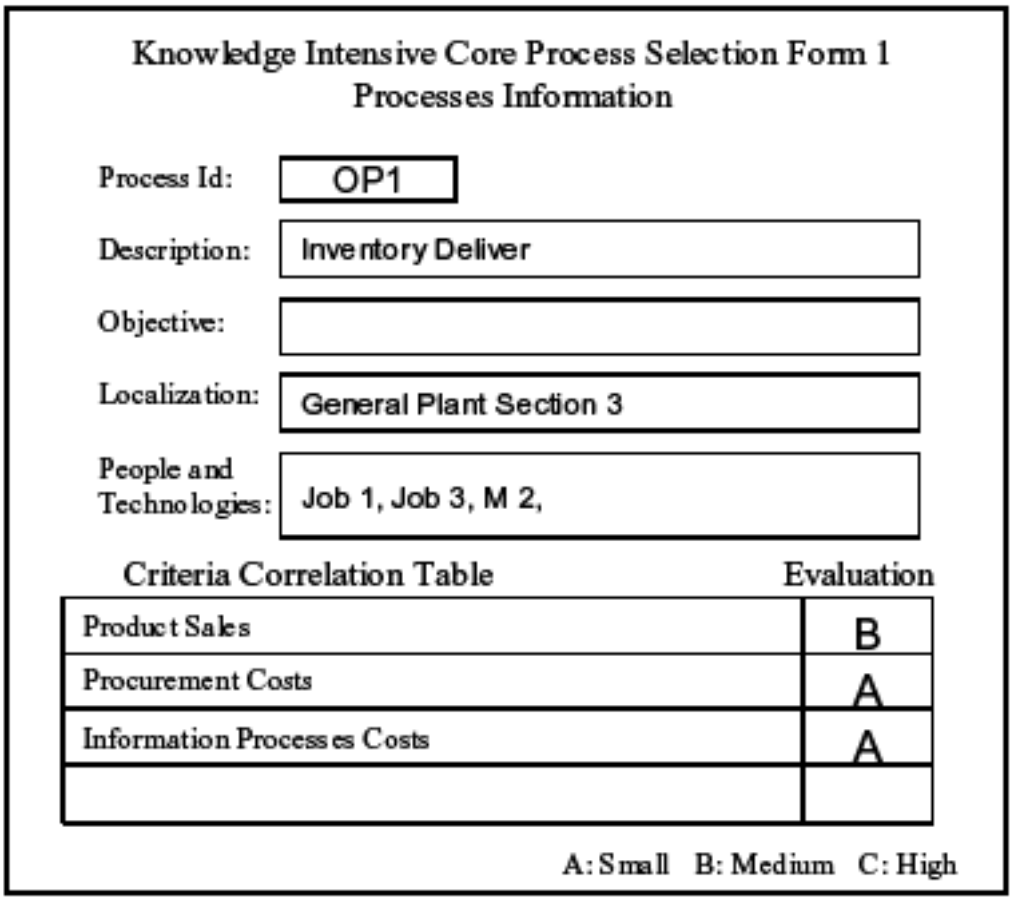

Figure 1: Process Formulary Example

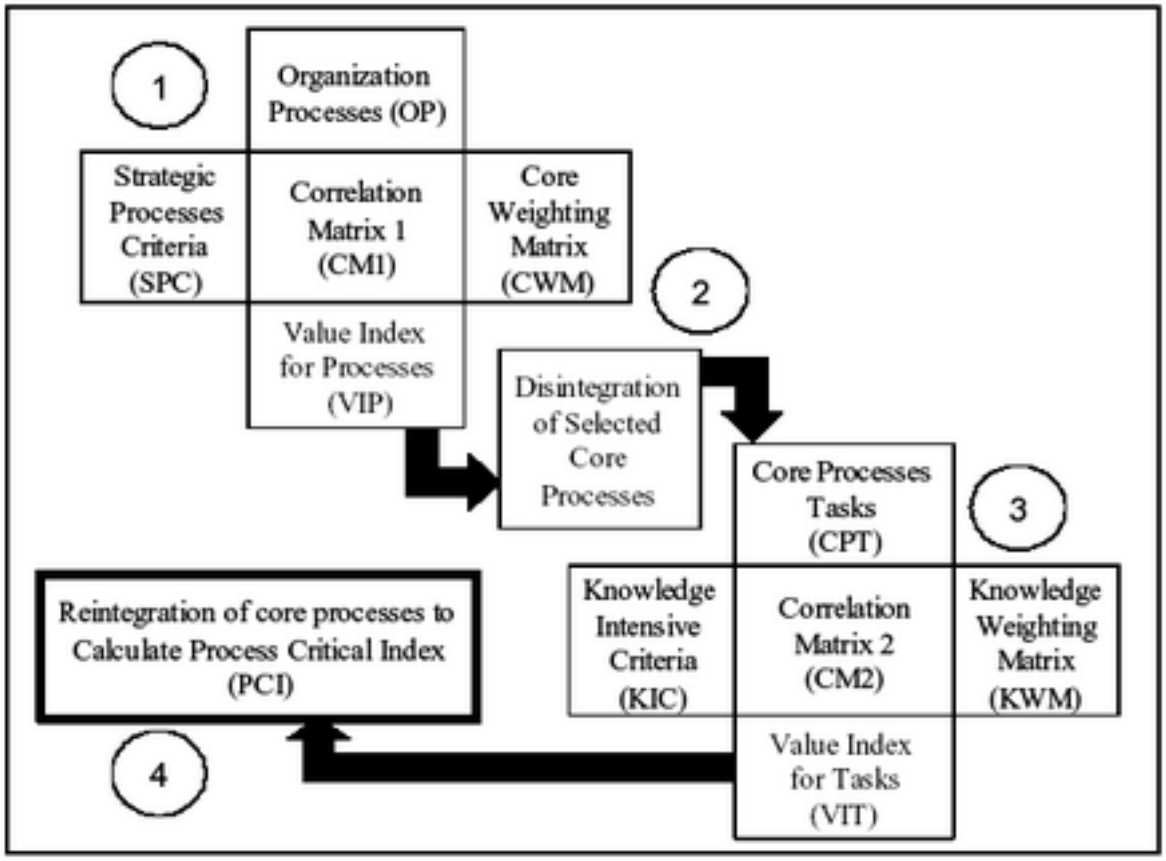

Figure 2: Flowchart of KMCP Selection Methodology

Notation

- **OP**: Organization Processes
- **SPC**: Strategic processes criteria
- **KIC**: Knowledge Intensive Criteria
- KW: Knowledge Weight
- **W**: Weight of Core Criteria
- **E**: Auto evaluation of Strategic Criteria
- **B**: Evaluation of Competitors in Strategic Criteria
- **CWM**: Core Weighting Matrix
- **VIP**: Value Index for Processes
- **CM1**: Correlation values (Strategic Criteria vs. OP)
- **CPT**: Core Processes Tasks
- **KWM**: Knowledge Weighting Matrix
- **VIT**: Value Index for Tasks
- **CM2**: Correlation Values (Knowledge Criteria vs. CPT)
- **PCI**: Process Critical Index
- **TE**: Task Evaluation
- **PTE**: Previous Task Evaluation
- **NTE**: Next Task Evaluation

KMCP Selection Methodology

The method for the selection of KMCP consists in four steps:

- The first step consist on the selection of critical processes, taking as it bases the previous full forms of the processes, the strategic criteria (SPC), the relative importance of the related criterion to the other criteria (W), the evaluation of the organization in this criterion (E) and the evaluation of the criterion in relation to the competition (B), we will come to the filling of the correlation matrix 1 (see figure 3), will be used here as example a triad of possible values (a: little relation b: medium relation c: high relation) or null in case of not existing relation. Note: the values can be adapted, by other scales according to particular necessities, by example the values are: null=0, a= 2, b= 5 and c = 9. Next we calculated CWM and VIP taking as it bases W, E and B and the table from values assigned to the weights of the correlation matrix 1 using the following equations: (example in figure 4),

$$CWMi = \frac{Wi \bullet Bi}{Ei} \qquad VIP_j = \sum_{i=1}^{n} CWM_i \bullet CM1_{i,j}$$

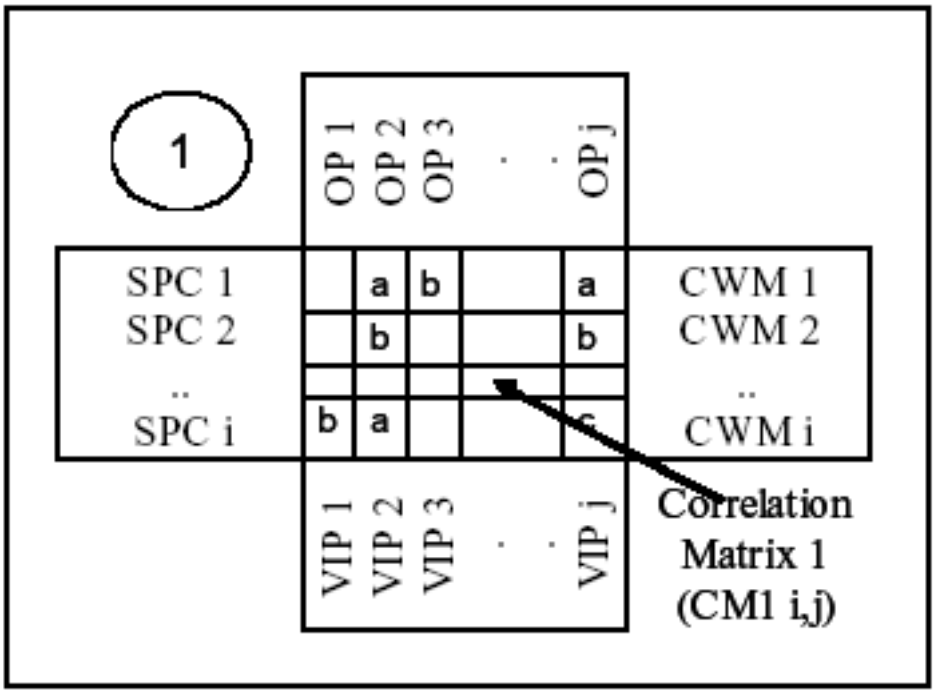

Figure 3: Step 1: Filling of the Correlation Matrix 1

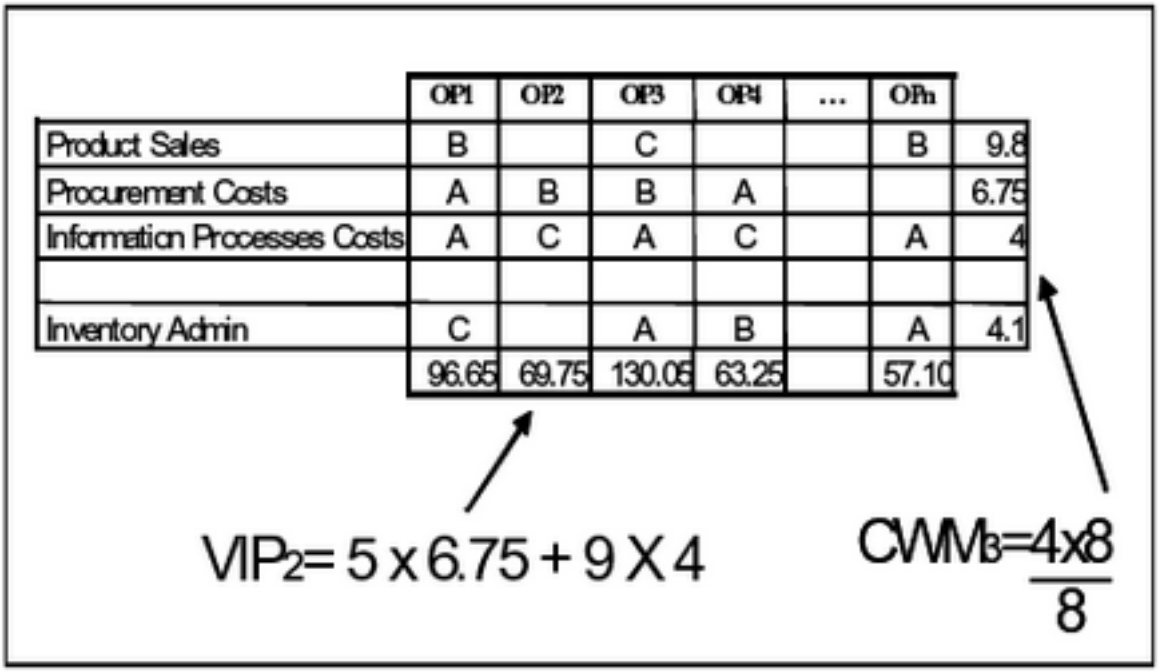

Figure 4: Example of Correlation Matrix 1

- The second step denominated "disintegration of the selected core processes" implies a detailed analysis of the core's processes with greater VIP, the number of selected core processes will depend on the number of processes of the organiz-

ation and the K-team criteria (minimum 2), as well as of the criteria that in common agreements defined between the M-team and the K-team. These selected processes will be disintegrated, separating them in individual tasks, taking as minimum unit of separation the people that make the task, in others words, if an individual makes more of one task within the process in sequential and continuous order it is considered like a single task, but if the tasks that he makes are not continuous, that means, if this people are suppliers to another task and later the processes return to him, it will be considered like several tasks. For each task, this people, with the support of the K-team, will have to make the filling of a formulary (figure 5) that contains at least: Evaluation of its task (TE), evaluation of the previous task or supplier (PTE), evaluation of the later task or client (NTE), this evaluation will be made for each particular criteria relative to the knowledge criteria raised in the earlier steps of the methodology, reason why if we have five criteria, we will have three evaluations (TE, PTE and NTE) of each one.

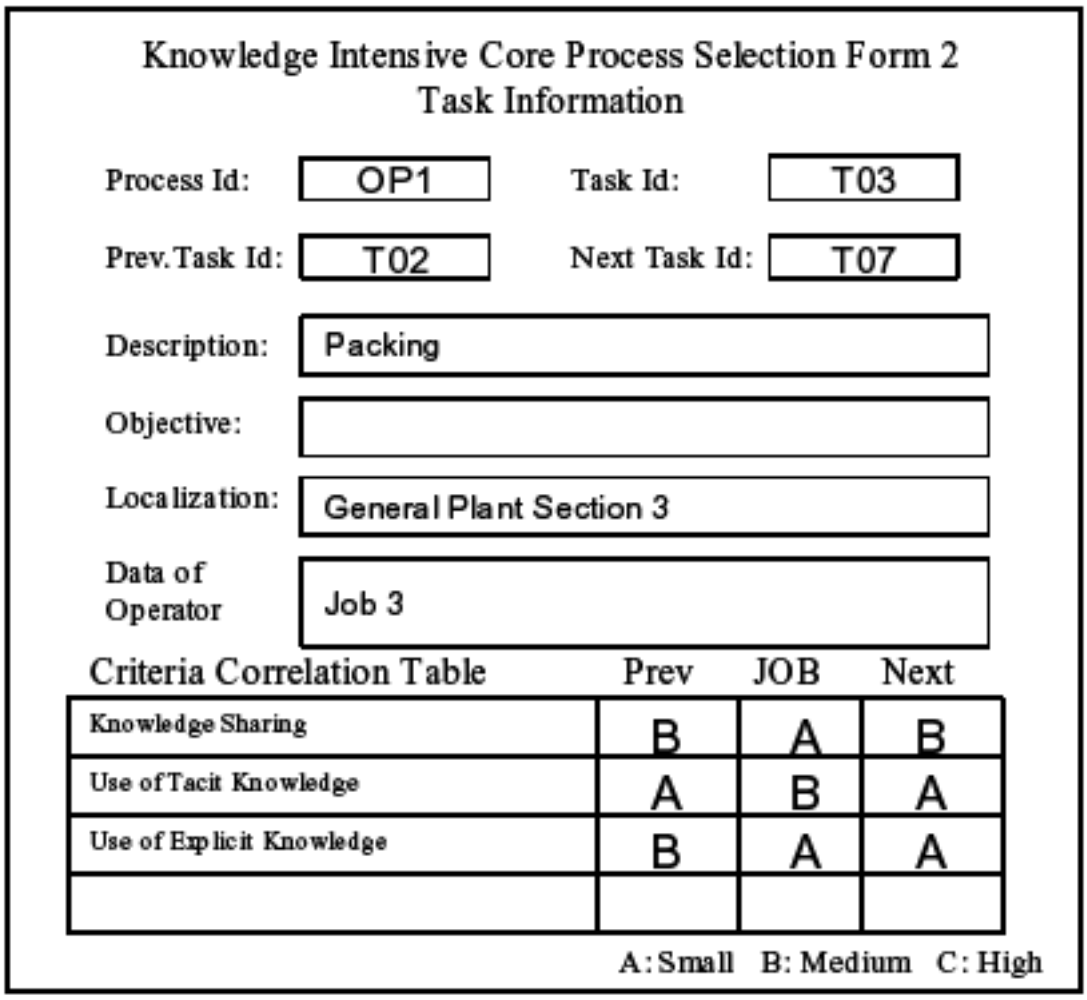

Figure 5: Task Formulary Example

- In the third step of the process, the defined and valued knowledge criteria (KIC and KWM) are used, we also need the previously full forms of the tasks associated to the Cores processes (CPT), with all this info the matrix can begin to be filled, the most important value to fill is the correlation matrix 2 (figure 6), assigning to cell CM2 i,j the resulting value of the adjust with weights (2, 6, 2) the evaluations of correlation of tasks NTE, TE, PTE using the following equation:

$$CM\,2_{i,j} = \frac{2 \bullet NTE_{i,j-1} + 6 \bullet TE_{i,j} + 2 \bullet PTE_{i,j+1}}{10}$$

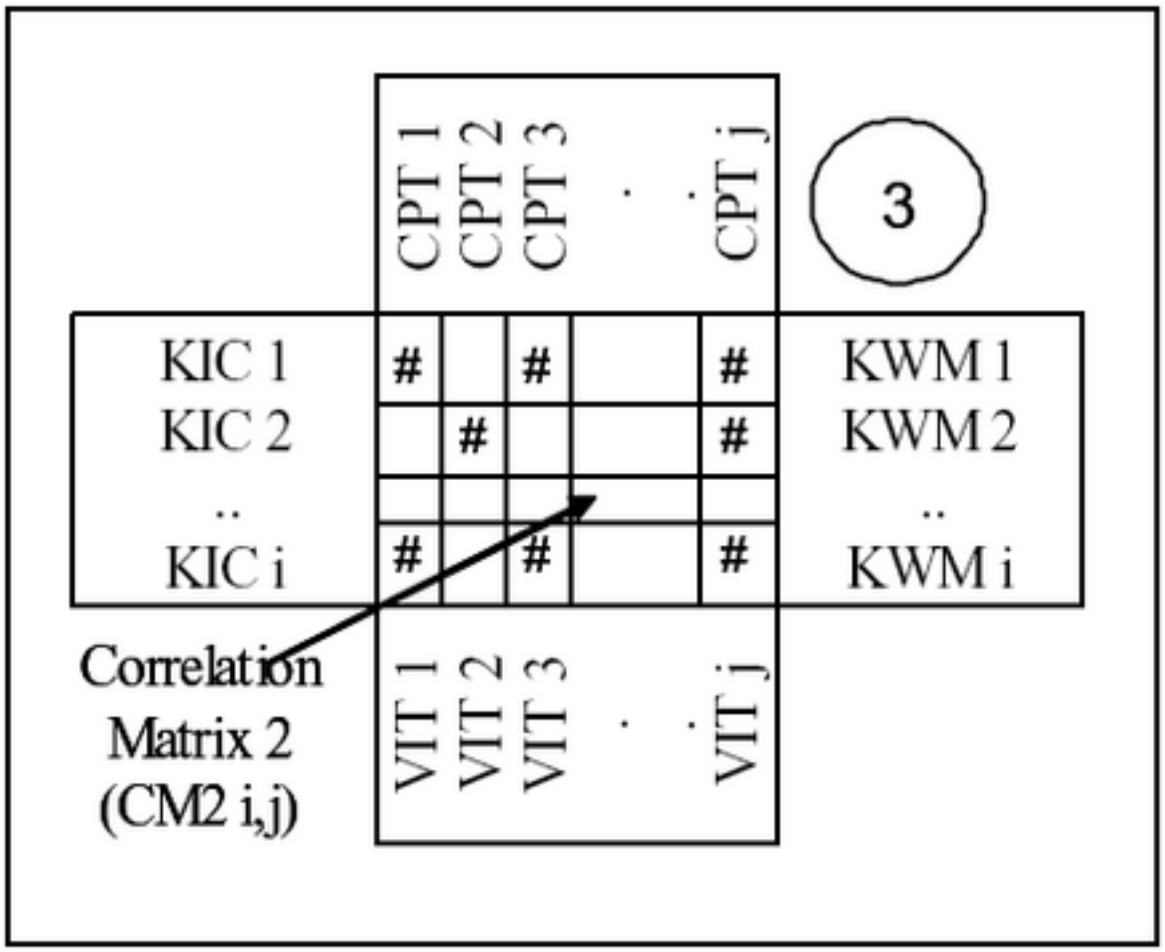

Figure 6: Step 3: Filling the Correlation Matrix 3

The objective of this adjust is to reduce the probability of an erroneous value, taking into account the opinion from the client and internal suppliers from that task, but giving greater weight to the opinion of the individual that makes the task, as every values, the K-team can make the decision to modify this ponder.

When tasks have no previous or following evaluations it will be due to consider to the evaluation equal to TE. Once concluded this stage we come to calculate KWMi and VITj with the following equations (example in figure 7):

$$KWM_i = \frac{KW_i}{\sum_{i=1}^{n} KW_i} \qquad VIT_j = \sum_{i=1}^{n} KWM_i \bullet CM2_{i,j}$$

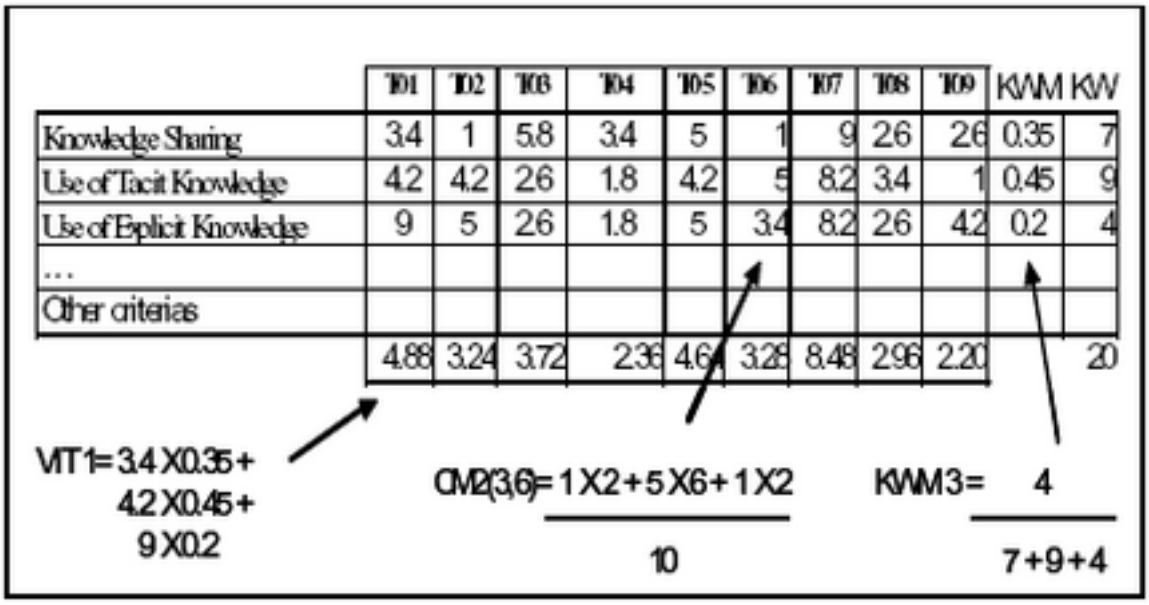

Figure 7: Example of Correlation Matrix 2

- The fourth step is related to assign a value to core process depending on its previous value (VIP) fit with the values of intensity of the knowledge of its tasks (VIT), reason why for each Core Process selected previously in step 2 and considering all the tasks related to him, and we calculated its PCI using the following equation:

$$PCI_k = VIP_k \bullet \sum_{\text{All the tasks of PCI}} VIT$$

Once calculated the Processes Critical Index the K-team will be able to make the related pertinent decisions to the process by which it will have to initiate KM, the Processes that has greater PCI will be the most critical process. A complete extended example of the methodology can be revised in "Knowledge intensive core processes selection as a strategy to improve knowledge management initiatives"[24]

Model to Implement Knowledge Management of Critical Processes

We consider that the SW offers a group of technologies that can improve KM. Without losing the view of the general context of the organization, we assume that KM and SW both target in the organization's objectives. Therefore we propose an Organizational Knowledge Model (OKM) according to the definition of systems and recapturing ideas from other authors, considering that one of a company's main objectives is related with the optimization of: Processes, Human Resources, and Technologies, where all are in the Mission, Vision, Objectives and Goals (figure 8).

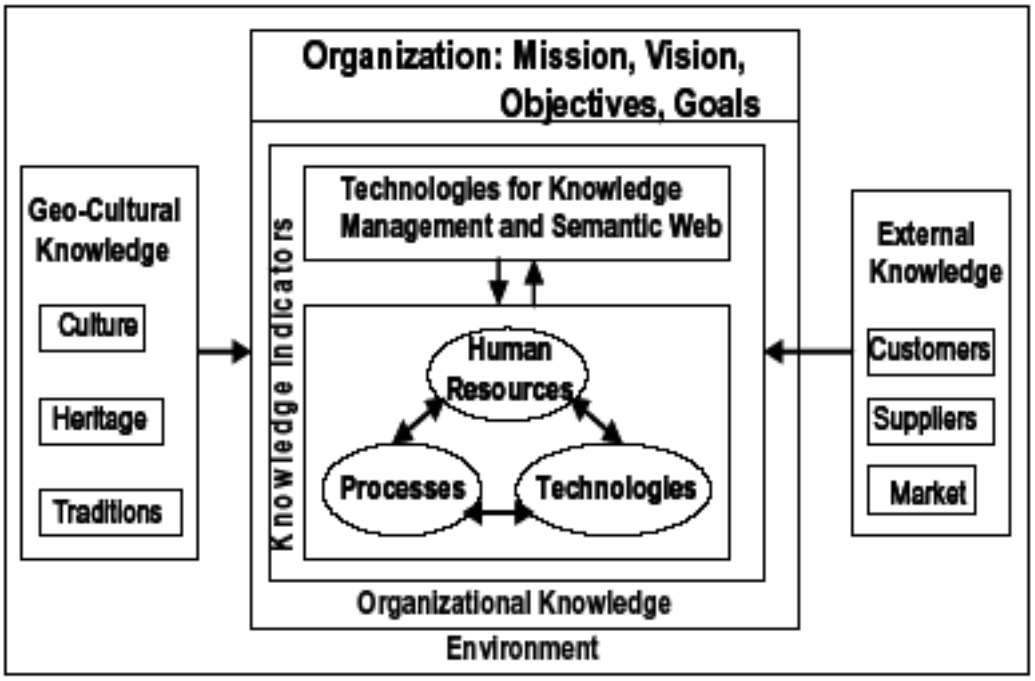

Figure 8: Organizacional Knowledge Model [4]

To reach them, we need to consider the External knowledge, which consists basically in the customers, the suppliers and the forces of the market, and they mark in a direct way into the internal knowledge organization. We can't leave behind the Geo-cultural knowledge, related to culture, values, heritage, traditions. Consequently the External and Geo-cultural knowledge impacts in socio-political aspects, which are framed in what we denominate Environment. These three (the external, and geo-cultural knowledge as the environment) interact with the main element which is related to the Organizational Knowledge in the internal environment of the organization, where people, processes and technology interact as the central axis of this model through the support of technologies to the management of knowledge. It is in this last point where we are interested in emphasizing the importance of the relationship of KM and SW.

Model for Manage KM Critical Processes using SW

In order to give greater clarity to this model, in figure 9 we show how the critical processes interact with the organization. In the first place, we will limit the human resources in sub group to which we will denominate knowledge collective, which this related the people who work and influence directly with the knowledge of the critical processes, and in which will be due to focus of significant way the KM efforts, we can see in addition that when being using as technological frame SW, our proposal is technological reason why it requires the use of technologies of the information for the KM implementation, integrating its advantages to all the processes of the organization through the use of information systems. This model integrate to the organization, verifying itself at any moment the goals and objectives, as well as the external situation to the organization, with the purpose of being able to make adaptations that allow their evolution.

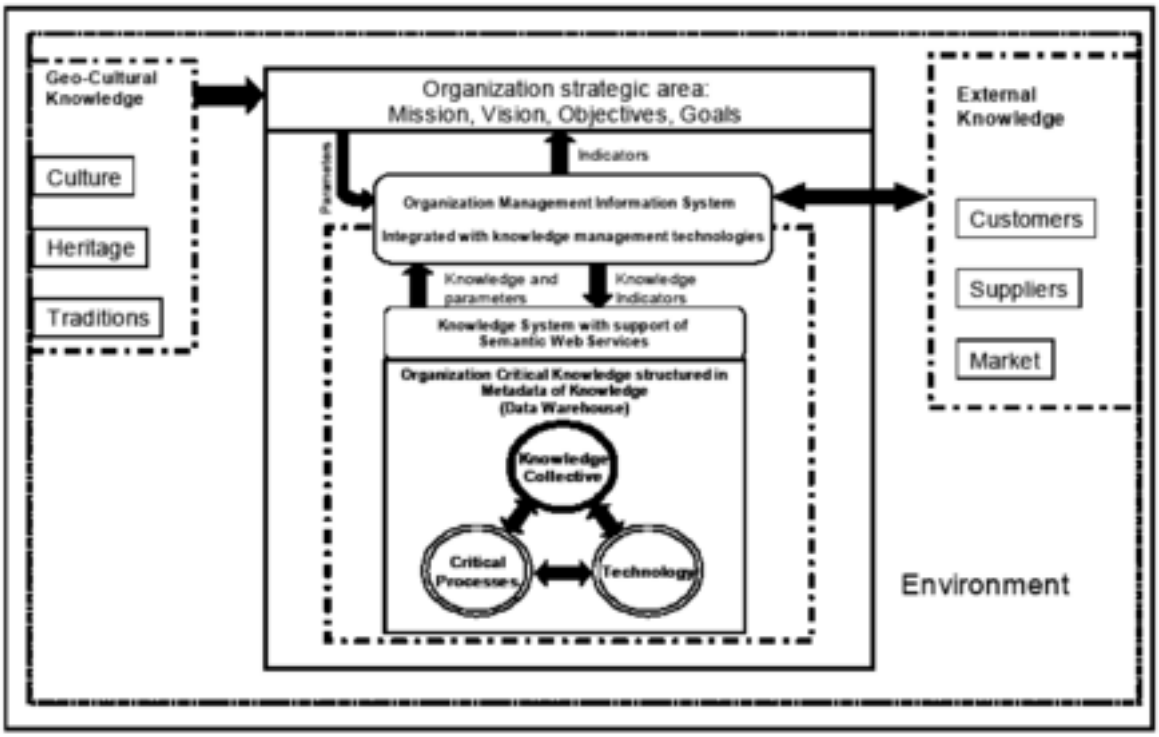

Figure 9: Model to Manage Critical Processes Knowledge Using SW

Current and Future Work

Tests are being carried out to the methodology, at the time, more testing's are in process in an educational institution. In future months, tests will be carried out in the educational and business field, the model will be tested by consulting groups in the Northwest Region of Mexico and in Spain as well, our purpose is to adjust the methodology for different users, and develop a computer application to support the process of selection. This will provide feedback so we can make changes and adjustments to select best parameters as to improve the methodology in the event of being necessary, obtaining with it a better understanding of the interaction KMCP in the organization.

Summary

The integration of KM and SW technologies, will allow the development of systems based on knowledge that will provide more efficient, easy and opportune information, this will aim with more effectiveness in the organizations objectives.

The methodology to select the KMCP has been developed focusing on the core processes and adding a knowledge perspective to improve the results of first knowledge management initiatives in organizations. Applying this approach will be an efficient strategy to select the KMCP and stop wasting money and efforts. Strategic and knowledge management criteria are considered to select the KMCP.

Taking an erroneous decision selecting the area of the organization where the first KM initiatives where implemented, are one of the mayor future obstacles for complete KM program in organizations.

This methodology establishes a clear strategy to select a suitable place where the knowledge management should be initiated, and the model can be used as a framework to raise a methodology that allows developing computer solutions to manage the knowledge on critical processes.

One contribution of this work is that the decision-making process integrates elements relative to the quantity of knowledge that is contained in the core process, allowing selecting one or several critical processes from where to begin the knowledge management process.

In relation to other works of selection of critical processes this methodology presents some advantages:

- It is simple and quick to apply.
- It is based on tacit information contained in minds of the Managers of the organization (the information is easy to obtain).
- The methodology can be automated with information technologies.

The limitations of the method are still in research, and at the moment it is being integrated to a methodology of knowledge management that has to be fo-

cused in it's main objectives in the Knowledge intensive core processes.

Finally, selecting the correct process to begin Knowledge Management Initiatives will be the first right step to the development of a Knowledge Management program in an organization.

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