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Proposal of system performance evaluation, for a knowledge extration and organization model using a ERP.

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ABSTRACT

Much has been researched and discussed in the importance played by knowledge in organizations. We are witnessing the establishment of the knowledge economy, but this "new economy" brings in itself a whole complex system of metrics and evaluations, and cannot be dissociated from it. Due to its importance, the initiatives of knowledge management must be continually assessed on their progress in order to verify whether they are moving towards achieving the goals of success. Thus, good measurement practices should include not only how the organization quantifies its knowledge capital, but also how resources are allocated to supply their growth. Thinking about the aspects listed above, this paper presents an approach to a model for Knowledge extraction using an ERP system, suggesting the establishment of a set of indicators for assessing organizational performance. The objective is to evaluate the implementation of projects of knowledge management and thus observe the general development of the organization.

Keywords: Knowledge Extraction, Knowledge Assets, Knowledge Management, Knowledge Management Systems, System Performance Evaluation.

1. Introduction

Much has been searched and discoursed on the importance played for the *knowledge* in the organizations. In face of a scene of great complexity in the corporative world and in the society in general, we observe that economic and social phenomena, of world-wide reach, are responsible for the business environment reorganization . It is in this context that the Knowledge Management transforms itself into a valuable strategical resource. The creation and the implantation of processes that generate, store, manage and spread the knowledge represent the new challenge to be faced by the companies. The systems of knowledge Management (KMS - Knowledge Management Systems) apply to offer a structure to stimulate the sharing of the intellectual capital of the organization so that the invested resources in time and technology are effectively used.

Due to its importance, the knowledge management initiatives must continuously be surveyed in its progress in order to evaluate if they are going to reach the success objectives. Given to the complex and dynamics nature of the modern organizations, the knowledge management , as well as other organizational initiatives, cannot guarantee that the plans and strategies establishment by themselves will generate successful knowledge management projects .

In such a way, the measurement practice must not only include how the organization quantifies its knowledge capital , but also how the resources are placed to supply its growth.

Thinking about the enrolled aspects above, we will present in this work a knowledge extration and organization model having used as knowledge base a system of ERP (Represents the resources planning of a company, including all the aspects and computer resources necessary to the planning and the company efficient

administration.) with the implantation of a set of pointers in a model of organizational performance evaluation. The objective is to evaluate the implantation of knowledge management projects , particularly evaluating, through the use of the considered pointers by this project, observe the organization general evolution . The boarding proposal searched for contemplating the past, the present and the future of the company, so that it can walk through a learning process with its errors and rightness and thus place itself and analyze the context of its current existence, in order to plan and to act in its future from it.

2. The necessity of the Knowledge Management

The increasing information growth in this globalized world, presents clear signals of its overload (of information) and the immediate necessity to manage them, duly warned to lose them or even to not having knowledge that they exist.

According to a research carried by Informal (2006), “57.7% of the searched companies already adopt some formally or informally knowledge management practice . And the majority of the ones which do not adopt, intends to make it.” Still, according to same research, the companies have the proper company as their main knowledge source for their organizations,.

Nowadays, the companies are looking for getting the biggest possible profit inside their proper borders, making them take a better care of their intellectual capital and other internally joined information. A great part of information that help in the formation and the development of the strategical planning, are in ERP integrated systems of the proper company, what takes it to have necessity to know these information better and to search tools that allow to extract and to generate knowledge to the company, as a competitive differential.

The knowledge is something intangible, that we can't "imprison it". According to Davenport and Prusak (1998), knowledge can be compared with an alive system, that grows and modifies as it interacts with the environment. Knowledge, according to authors, is the combination of instincts, ideas, rules and procedures that guide action and decisions.

When we deal with Knowledge Management, according to Nonaka and Takeuchi (1997), it becomes basic to relate some important definitions:

The knowledge can be **explicit, implicit or tacit**:

- The **explicit** knowledge is that one that we have of some systemize form and we can transmit it in some type of language.
- The **implicit** knowledge is that one that we have, but we can not , or we do not want, become it explicit, but we can if wanting!
- The **tacit** knowledge is that one that we are able to use, but we do not have a good conscience on how we acquire or use it.

Saints (2001) suggest that the Knowledge Management "is the systematic process of identification, creation, renewal and application of the knowledge that are strategical in an organization life. It is the administration of the organizations knowledge assets . It allows the organization to know what it knows."

2.1. Transference of Knowledge

Even with several concepts on the knowledge management , and its different approaches, still it is needed to advance in studies to offer solutions that imply in a more

complete, flexible and robust system, with which it can glimpse its evolution to a system of integrated and shared management of knowledge.

The construction of the knowledge management can be seen, according to Awad and Ghaziri (2004), as a life cycle that initiates with a master plan and a justification and finishes with a structuralized system to reach the knowledge management requirements of all the organization. A knowledge team representing the ideas of the company and a developer, experienced in capture, in the project and in the knowledge implementation, guarantee a well successful system.

According to authors, the most critical phase in the knowledge management systems cycle of life is the identification of the immediate, intermediate and long period necessities for the system in prospection. This means reviewing the employees knowledge nucleus; leading a cost and benefit analysis to determine the justification and the potential benefits of the system in planning; and determining the tools and the procedures to guarantee the integrity, precision and the implementation operational success (Awad and Ghaziri (2004)).

However, before a knowledge management system construction, it's necessary, according to Tiwana (2000), the definition of the main primary sources and the knowledge origin to form such system. In such a way, three basic steps are involved in the learning and discovery process. Still in accordance with Tiwana (2000), observing these three stages, it can be abstracted which information technology functionality type will go support this effort.

In summary these three stages are:

- **knowledge Acquisition** . It is the process of development and ideas creation , abilities and relationships. The most used TI technologies in this process are

tools for capturing data with filtering capacity, intelligent data bases, keyboard scanners, notations capture and electronic boards.

- **knowledge Sharing** . This stage is responsible to spread and to become available what is already known. This focus in the contribution and the collaborative support is the main factor that differentiate the knowledge management systems of the information systems. Examples of this tool category are Lotus Notes of IBM and SharePoint of Microsoft.
- **Knowledge Use**. The knowledge use gains prominence when the learning is integrated to the organization. Any available and systemized knowledge in the organization can be generalized and applied, at least in part, in a new situation. Any available computational infrastructure that supports these functions can be used.

In accordance with Tiwana (2000), these three stages do not need to be in sequence. In some situations they can occur in parallel.

3. Performance Evaluation

“Why measuring? This question can be answered on the affirmation that the success and the continuity of a company depend on its performance, which must also consider measurements, that allows to evaluate with what intensity a company reaches its intended objectives” CAVENAGHI (2001 p.92).

From the answers to the question above, there is a direction of which aspects to be considered in a performance management system, aiming the objectives set that the company proposed itself, and the necessary actions for its conquest.

According to ECCLES (*apud* CAVENAGHI, 2001 p.88), the main performance pointers, must not only be limited to the financial data. An increasing number of companies is reformulating its performance measurement systems, to follow not-financiers criteria and to fortify the competitive strategies, using parameters as: quality, customers satisfaction , innovation, market participation.

For BERTON (2003 p.50), it can be said that the traditional models of evaluation and control of the enterprise performance show the process of organizacional entropy, but do not demonstrate directly how external and intangible factors influence the company results.

In accordance with Wernke, Lembeck and Bornia (2003), the current stage of the international economy, combined with the new technologies developed mainly in the communication and computer science areas, is demanding of all the productive and administrative companies sectors, continuous adaptations in its organizacional structure, in order to follow the agility of the processes and the customers requests . With this, the intangible assets of the organization emerge, therefore there are each time more demanded capacities to create, to multiply and to use knowledge and abilities efficiently.

Still according to authors, the importance that the intangible assets are gaining lately is well-known. The directed attention to them is widely deserved, in view of the organizations and the businesses are redefining in terms of formats and of commercial transactions ways. Thus, factors as the organization image, its reputation, distribution canals, knowledge domain, marks and patents, amongst others, start to be important.

All the previously pointed questions leak out to the sprouting of a new concept, called by Stewart (1998) as Intellectual Capital (IC). According to the author, intellectual

capital is the addition of the knowledge of all the ones in a company, what provides competitive advantage to it. In contrast of the assets, to which entrepreneurs and accountants are familiar with - property, plants, equipment, money -, the intellectual capital is intangible. In this definition enters, for example, the work force knowledge: the training and the intuition of a team or the workers know-how.

Edvinsson and Malone (1998) define that the intellectual capital involves three questions basically:

- the value of the intellectual capital exceeds, for many times, the value of the assets that consist in the balance;
- the intellectual capital is the raw material of which the financial results are made: financial results derive from the raw material of the intellectual capital;
- directors and managers have to distinguish two types of intellectual capital, called as human capital and structural capital .

In literature there are some interesting models from the point of view of scope and relation of its tangible and intangible pointers, two of which show sufficiently adequate for what this work is considered: the Skandia Navigator models and the Balanced Score Card - BSC.

3.1 The Skandia Navigator Model

Considered by Edvinsson and Malone (1998), has as description that

“The Intellectual Capital is measured with the analysis of up to 164 metric measures (91 based in intellectual and 73 in the traditional measures), covering

5 components: (1) financier; (2) customer; (3) processes; (4) renewal and development and (5) human.” *GLOBALBRANDS* (2007).

Figure 1 shows the five Navigator components.

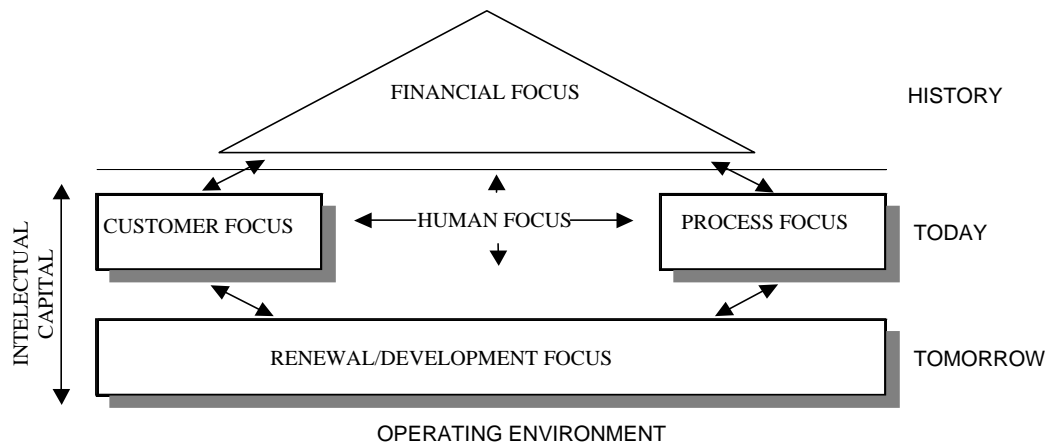


Figure 1: Skandia Navigator Model

Source: Edvinsson & Malone, 1998

In accordance with Vidigal (2003), in **Figure 2** the Financier represents the “past”, what the company has already made, the components Customer, Human and Process indicate the “present”, what is being made, and the Renewal and Development component points to the “future”, indicating what the company must do to prepare itself to what will come. **Figure 2** also shows that the company Intellectual Capital has focus in the present and the future of the company.

“The tool is based on development of indexes that allows to evaluate the intangible evolution in different dimensions: financier; customer; processes; renewal and development; human”. **VIDIGAL** (2003).

3.2 The *Balanced Score Card* Model

In accordance with Kaplan and Norton (apud BERTON, 2003), Balanced Score Card (BSC) translates mission and strategy in objectives and measures, organized according to four different perspectives: financier, customer, internal processes and the learning and growth.

“But the basic is that the BSC provokes in the organization the necessity to search the objectives and strategies consensus, the innovation as daily action, the feedback culture and the components of the company education in search of common objectives.” BERTON (1998).

In the BSC, the company is evaluated through its four perspectives: Internal financier, Customer, Processes and Learning; that must be marked out in the company strategy . According to MOREIRA (apud CAVENAGHI, 2001 p.90), the measures of performance must be visualized as auxiliary instruments in the identification of possible problems and also proceed to the accompaniment of the systems of operations performance to which they relate.

Paiva (apud WERNKE, 2003) points that the accounting of the intellectual capital does not justify the abandonment or the disdain of the financial accounting. It signals, though, a concern in providing more consistent information concerning the company patrimony, mainly for assuming that innumerable intangible order factors contribute for its market value . It finishes arguing that “while the `tradicional' accounting points past elements, the intellectual capital travels to the future”.

4. Technology of Information , Knowledge Management and *Balanced Score Card*

Norton (apud COUTINHO, 2006) affirms that " Each time more, the value creation is connected to the Information Capital and other intangible assets." , and " It is not possible to manage what is not measured". The called intangible assets (*intangible assets*), understood as the inherent value to the mark, the business processes, support technologies , the leadership, people abilities , among other intangible factors in the organizations, nowadays already correspond to 85% of the organizations value listed in Stock exchange.

“Therefore, one of the functions of the BSC is to translate the creation of financial value (tangible) from the intangible assets”, and that “the strategical alignment of the Information Technology (IT) with the business through the BSC has allowed an evolution of **IT** as enterprise strategical nucleus.”

According to **WALLACE** (apud **CAVENAGHI**, 2001 p.112), IT has a critical position, in the development and implementation of new performance measures . When the organizations try to extract information, to offer support to these new performance measures, using the database and the existing systems, implanted according to a traditional vision, frequently discover that such systems are not adjusted to satisfy its necessities.

In this direction a company needs instruments that can, of a side, indicate its performance and, of another one, instruments that can generate information so that it evaluates its position in the market and in itself. For that, the performance pointers represent a powerful instrument that offers to the company conditions to carry through this verification and evaluation of consistent form. **FISCHMANN and ZILBER** (2002).

According to Nonaka and Takeuchi (1997), we can use the following pointers related to the information systems: (a) level of processes computerization ; (b) degree of solutions reuse; (c) level of activity of practical communities; (d) degree of documentation updating ; (e) amount of useful contributions to innovation; and (f) frequency of access on the Intranet.

Davenport and Prusak (1998), on the other hand, suggest other pointers, which are: (a) amount of incorporated suggestions to the processes; (b) perception of the collaborators in relation to the company medias ; and (c) average time of problems solution . Normally, according to Vidigal (2003), the pointers fall again into one of the following categories:

- Effort Pointers - initiatives, for example: amount of trained people, amount of available documents in the organizacional memory, etc.;
- Result Pointers - objective, for example: increase of market share, increase of productivity, reduction of customers claim, reduction of operational costs, etc.;
- Quantitative: expresses in amounts, more objective, for example: percentage of trained people, amount of contributions to the organizacional memory, percentage of rework reduction , etc.;
- Qualitative: can be translated in numbers, due to observation, more subjective, for example: Intranet satisfaction level, customer perception to the after-sales service, etc.

Teixeira Filho (2002), demonstrates his concern to the use of the ROI (Return over investment), for finding that it is inadequate for Knowledge Management and proposes the ROE (Return over expectations) to evaluate these initiatives. He also proposes

specific pointers for the Knowledge Management implantation , as it can be observed in **Table 1**.

Table 1. Specific indicators of the implantation of Knowledge Management

Item	Measures
<i>I – Organizational Memory</i>	Use statistics and updating
<i>II – Communication</i>	Level of use of the available communication resources
<i>III - Safety and Protection</i>	Index of frauds, leaks, invasions, virus and flaws of safety of information
<i>IV – Updating and Management of Content</i>	Amount of useful contributions to the content of the organizational memory
<i>V - Formation and Recycling of Human resources</i>	The collaborators' qualification in the strategic competences
<i>VI – Sharing</i>	Participation level activates in the communities of practices
<i>VII - Information Systems and Database</i>	Computerization level / integration of business processes
<i>VIII – Investments</i>	Investment level in intangible assets
<i>IX - Processes</i>	Level of updated mapping of processes in the organizational memory
<i>X - Innovation</i>	Amount of useful contributions to the innovation of processes / products / services

Source: Adapted of TEIXEIRA FILHO (2002).

For the intention of this work, there is no necessity of having a so great pointers extension , at this moment, what would take time and increase the complexity of the analysis of results. When using BSC as limiting of the evaluation process, we can take as orientation an example figure proposal for Keys (2006), that from the traditional picture of balanced scorecard, with its four related perspectives, modifies it focusing the area of Information Systems . Figure 2 follows.

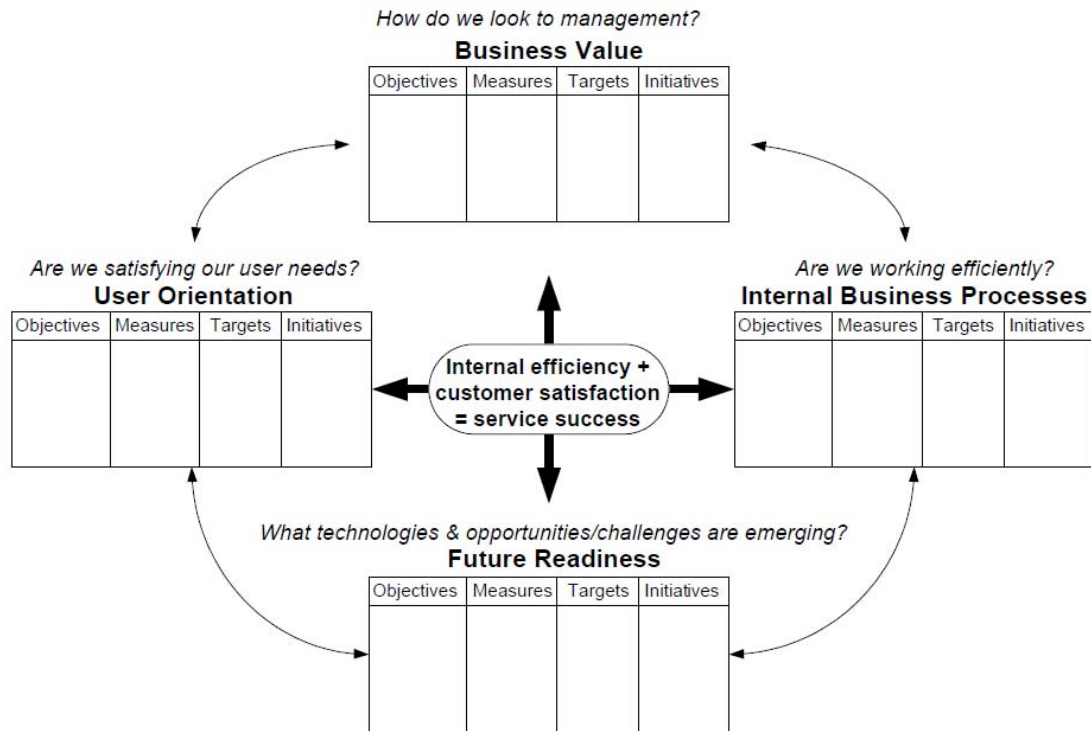


Figure 2: Balanced scorecard adapted for IT

Source: Keys (2006)

According to Keys (2006), the Knowledge Management , provides two great benefits for the organization:

- It improves the organization performance through the increase of efficiency, productivity, quality and innovation; and
- Growth of the organization financial value for the treatment of people knowledge as a similar asset to the traditional assets as inventory and “facilities capital”

These benefits must delineate a bigger work, for all an organization, but for the objective considered here, that is to evaluate the extration system and knowledge organization in relation to the specific pointers of this work, it adopted the pointers, for use in any knowledge system , proposed by Keys (2006) in table 2, for forming a

representative and agreeing set of the values that are being analyzed. As the system will be generating reports indicating the cause and effect relations waited and historical series, it can be refined the pointers set to improve the evaluation.

Table 2. Pointers for Knowledge Management

Outcome	<ul style="list-style-type: none"> • Time, money, or personnel time saved as a result of implementing initiative • Percentage of successful programs compared to those before KM implementation
Output	<ul style="list-style-type: none"> • Usefulness surveys where users evaluate how useful initiatives have been in helping them accomplish their objectives • Usage anecdotes where users describe (in quantitative terms) how the initiative has contributed to business objectives
System	<ul style="list-style-type: none"> • Latency (response times) • Number of downloads • Number of site accesses • Dwell time per page or section • Usability survey • Frequency of use • Navigation path analysis • Number of help desk calls • Number of users

	<ul style="list-style-type: none"> • Percentage of total employees using system
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Source: Keys (2006)

This pointers set will have, in the beginning, evaluate a process known as KDD - Knowledge Discovery in Databases, that involves several steps, according to FAYYAD (1996), as: selection of interest data in the ERP/database, these interest data pre-processing , transformation of these pre-processed data, transformed data mining, discovering/generating standards that will be interpreted generating knowledge. The knowledge must be extracted from ERP, in a way that is useful and generates value, financier or competitive advantage, for the organization.

5. Final Considerations

This article presents a model of evaluation for a model of Knowledge Management, in particular, the knowledge extration and organization, using an ERP as database. It is intended with the results of the evaluation model to improve the knowledge extration and organization model , validating or not the rules of the organization system, indicating new aproaches.

The choice of the evaluation method falls again on the BSC for it to have its use sufficiently spread out in the market, ripened and exhaustingly tested, proving its effectiveness, obtaining translate objectives and strategies, becoming them clearer, facilitating the pointers identification and its adoption. The BSC allows that an ample pointers set is tested, offering important nuances for the organization analysis . Its easiness in dealing with intangible assets, in this case , was particularly important for its adoption.

Regarding the knowledge and organization extraction system of the, it is being defined an ERP with free code data base that can allow modifications, if necessary, in its code and data format, aiming at the adequacy for the use with knowledge management systems . At the moment, the ERP5 use was worked, that uses the data base Zope, but without conclusive, only prospectivos results and of familiarization was worked. The use of a ERP is made important to be able to use real data and formats of an organization, integrating the system to the ERP as, for example, a module of ERP itself. Still a KDD approach is studied (Knowledge Discovery in Databases, or discovery of knowledge in databases), with a DataMining process (data mining) adjusted to this specific case. As illustration of the KDD process, Figure 3 shows to the conception of FAYYAD (1996).

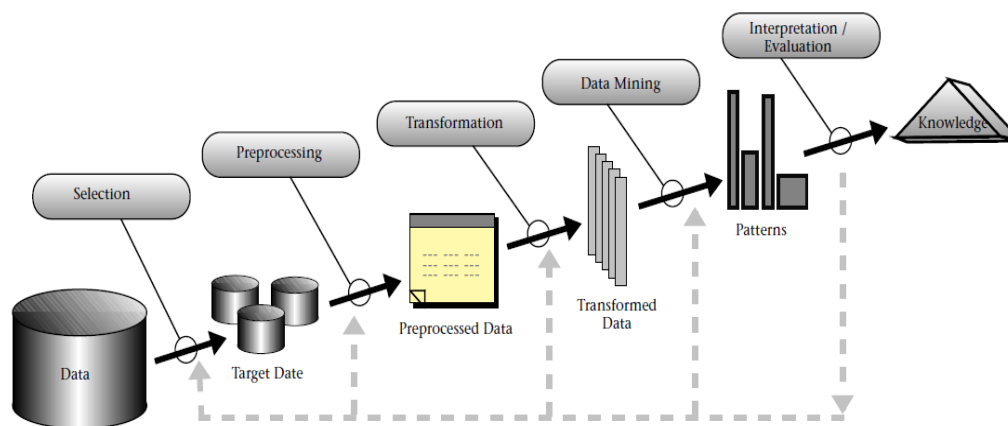


Figure 3: A general vision of the steps that compose process KDD

Source: FAYYAD (1996)

Concluding, it is seen that much has to be made in the areas of Knowledge Management and Performance Evaluation , using already existing models and implementing the systems in the practical, what here it is placed as a work for close next future.

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