"Visión de Futuro" Año 9, Volumen N°16, N° 1, Enero - Julio 2012
URL de la Revista: www.fce.unam.edu.ar/revistacientifica/
URL del Documento: http://revistacientifica.fce.unam.edu.ar/index.php?option=com_content&view=article&id=274&Itemid=63
ISSN 1668 – 8708
Fecha de recepción: 27/09/11
Fecha de aprobación: 16/12/11

IMPROVEMENT OF KEY PROCESSES THROUGH THE ANALYSIS OF VALUE ADDED IN TECHNOLOGY- BASED COMPANIES A SINGLE PROJECT PRODUCTIONS OF THE WATER SECTOR IN CUBA

Reina Maylín, Hernández Oro; Alberto A., Medina León; Gilberto D., Hernández Pérez

Universidad Central Marta Abreu de Las Villas

Carretera A Camajuaní, Km $5^{1/2}$, 54830 – Santa Clara, Villa Clara - Cuba

E-mail: reinamho@uclv.edu.cu

SUMMARY

In this paper, we present the main results of research designed to improve key business processes, using a procedure designed for this purpose, and which includes among its main stages, the analysis of value added by activity, adapting to technology based companies' productions by one of the water sector project in Cuba. The procedure consistently combines different techniques such as multi-criteria decision analysis for selection of the key processes and analysis of value added by activity to identify key processes to improve and identify opportunities for improvement. The main results are able to identify, classify and relate the processes taking place in the organization, and represent them in a process map, and then determine the key processes for improvement, based on the analysis of value added at each process of each of the activities in it. Derived from the results obtained are proposed and implemented a set of organizational improvements had a positive economic impact for the company under study, allowing a positive conclusion on the feasibility of implementation, flexibility and robustness of the procedure developed in technology-based companies single project productions of the water sector in Cuba to support their business management.

KEYWORDS: Process Improvement; Analysis of Value Added; Technology-based Companies.

INTRODUCTION

In the contemporary context of global crisis and technological change at a very rapid worldwide scale, can distinguish several levels of operation of different organizations, play in society, one of which is the generation, development and application of scientific knowledge often carried out by academic institutions engaged in research and development (R & D) and the business sector, for the so-called technologically based enterprise (TBE), whose contribution to the creation of new quality jobs and their ability to generate high value added economic activity is increasingly subject to numerous analyzes and studies to improve efficiency and competitiveness (Camacho, 1999; Hidalgo, 2004).

Cuba is no stranger to this reality, and now projects into the search for new forms of organization and management of these businesses, where innovation and quality of their productions are two factors to achieve and maintain the stadium effectiveness and efficiency in the exploitation of the resources available, especially when it comes to those strategically important as are the natural ones, in particular water.

The Cuban water sector faces the challenge to supply drinking water to the population, while ensuring the supply of the precious fluid, the agricultural, industrial and social development in extreme rationality and even in environmentally critical context. In this context, research companies and water projects, considered by the content of their function and performance as EBT-(Monzon, 2008), the Cuban state has received the commission to fulfill part of this endeavor. To achieve this, these companies must have systems to organize and control its management effectively, which in practice is not always achieved due to the absence of a system of labor embodied in an effective procedure for the organization and continuous improvement of its key processes, which incorporates also a more accurate measurement of the satisfaction of external customers of the Organization, which finally decisively evaluate the quality of the final product in this type of

business, characterized among others, for the preparation of single projects (singular).

In the literature on the subject one is able to identify a set of methodologies, procedures, techniques and tools that help you achieve the proposed goals efficiently, where we focus on the concepts of activity and process. To this end, the original research proposed an analysis of the value added of activities that are part of the key processes of the organization, with a more comprehensive approach than that proposed by Trischler (1998), in which are only considered the analysis of activities on the basis of their contribution to achieving strategic objectives, expectations of interest groups, and those that are large consumers of resources (materials, time etc.), this analysis is enriched by other criteria designed specifically for EBT yields a single project, such as activities related by Albrecht (1992) as moments of truth features reviews of quality (which mean gaps in the satisfaction of external customers) and criterion of added value by the knowledge incorporated by the assessed activity (Hernandez, 2010).

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DEVELOPMENT

Materials and Methods

For the case of the organization and enhancement of processes in the EBT type under consideration, a method is proposed which is shown in simplified form in Figure 1, which is an enrichment proposed by Nogueira et al. (2004), this procedure has as antecedents, the methodologies and-or stages proposed by Harrington (1991), Heras (1996), Trishler (1998), Zaratiegui (1999) and Amozarrain (1999) and considers the use of techniques and tools, such as: the representation of processes through maps, multi-criteria analysis (Saaty 1999) for the selection of key processes to improve the description of processes using the tab processes, and proposed a specific procedure for the analysis of added value (Value Added Analysis-VAA) to reduce expenditures on activities that add value to the organization.

The general procedure proposed consists of three (3) general phases and eleven (11) stages, where, in general, one identifies the relevant processes and codes of the organization,

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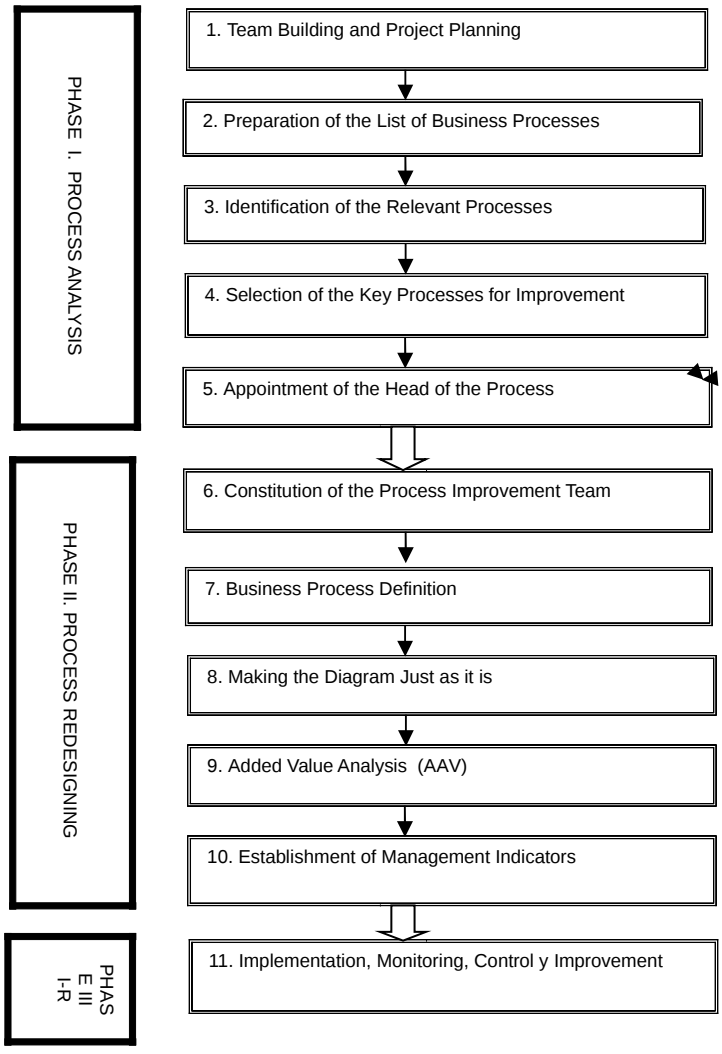
determine their sequence and interaction with other processes design / redesign, tracking and analyzing them, is performed, we implement the necessary actions to achieve planned results and continual improvement of these processes.

Figure 1. Process of improvement processes with external customer focus



Source: Own elaboration as from Nogueira Rivera et al. (2004)

Description of the Phases and Stages

Phase 1: Process Analysis

In this phase is a detailed analysis of business processes, with emphasis on proper identification and establishment of their interrelationships. It consists, in turn, of five (5) phases,

whose main objective is to detect, through the application of different techniques and tools, the key processes with a view to its improvement.

Stage 1. Team building and project planning

This stage includes mainly the formation of an interdisciplinary team to perform all analyzes in group dynamics, it is suggested to involve, wherever possible, members of senior management of the organization, to secure from their own conception, implementation of the improvements proposed.

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Stage 2. Preparation of list of business processes

To get the information needed to identify and then make a list of business processes, different methods can be used, depending on the characteristics of their processes and the type of information to relieve, one of the most used and recommended, is the Brainstorm. To start the application of this method one can take as reference a list of processes obtained from the analysis of flow diagrams of the company or other organizations with similar objects.

Stage 3. Identification of the relevant processes

Once listed the processes of the company by the expert group these should be presented to senior management of the organization for review, analysis and approval. If this list is extensive, and in order to reduce it, we proceed to select the relevant processes called (Nogueira, 2004), which is suggested to work with the group of selected experts. At this stage one also builds up the map of processes which is an excellent tool for graphing and visualization.

Stage 4. Identification (selection) of key processes for improvement

In order to rank among which processes are identified as relevant or key priority for improvement, we build a matrix of impacts (see Figure 2), based on the following criteria: strategic objectives (Voe), impact on customers (Vrc), potential for success in the short term (Vecp), which

incorporates other criteria, such as variability (Vvar) and repeatability (Vr) of processes (already used before by Nogueira, 2004, for this purpose), and economic weight (Vpe) (Hernandez, 2010), because the Cuban organizations in general are particularly subject to high pressures and challenges in the rational use of financial resources and performance of investments. After selecting the criteria to be used in the impact matrix, one must weigh these testing it with Analytical Hierarchy Method (AHC), also known as Saaty Method, is useful. This is necessary because the particular characteristics of the different production systems (in this case, production / service for a unique project, with high customer contact) and the particular conditions of the process, may influence the importance that members give to a process on another for the case of the improvement.

Then one calculates the range for the selection of the key processes for improvement, based on the calculation of the total score (Ts) of each process, based on a proposal Likert scale given for the case, with a range of between 1 (bad) to 7 (excellent). To calculate the mean total score (Mt score) and maximum (max Ts) these expressions are proposed (1) and (2), taking 4 as the average value of the scale.

$$\text{Mt score} = NO*4*(Voe)+4*(Vrc)+4*(Vecp)+4*(Vvar)+4*(Vr)+4*(Vpe) \quad (1)$$

$$\text{Max Ts} = NO*7*(Voe)+7*(Vrc)+7*(Vecp)+7*(Vvar)+7*(Vr)+7*(Vpe) \quad (2)$$

Where:

The processes whose score is in the range proposed in expression (3) shall be classified as key for improvement:

$$\text{Mt score} \leq Ts \leq \text{Max Ts} \quad (3)$$

Stage 5. Appointment of the process manager

After selecting the key processes and relevantly appointing the heads of each one of these for improvement, thereby ensuring continuity of direction and execution of the following stages and phases of the proposed procedure.

Phase 2: Process Redesign

In this phase it is proposed to redesign the selected process as key in the previous phase according to their score (Pt) obtained in previous stages, and that is, in fact, an improvement or development of it.

This redesign is based on the use of process description and analysis techniques, such as the Processes tab, the graphical diagram called As-is, and Analysis of value added (AVA) as a basis for further improvement.

Figure 2. Selection matrix of key processes for improvement.

	Strategic Objectives										
Processes	1	2	3	n	IP (Voe)	RC (VRC)	ECP (VECP)	V (Vv)	R (Vr)	PE (VPF)	Pt

Source: Adapted from Hernandez (2010)

Stage 6. Constitution of the process improvement team

At this stage, one chooses the team members to improve processes, as a good practice, it is suggested to avoid forming a formal team, and include in this people who can really contribute elements for designing or redesigning on the basis of their qualification, experience and creative ability.

Stage 7. Business Process Definition

In the literature there is full agreement on the need to represent or describe the process as a necessary step prior to its improvement and should be implemented effectively. To adequately describe a process there are several tools, among which are the Processes tab. For this case, the elements that compose it are: name of the process, responsible, objective or purpose output, the result of the process, providers, recipients or customers, other stakeholders, sequence of activities, resources, indicators (measures of performance of a process) and risks (may require even drawing up a risk map).

Stage 8. Making the process diagram

The process maps or diagrams, in addition to encourage new thinking is one of the most effective ways to gain a greater understanding of existing processes (Hernandez et al., 2009). This is recommended to establish a diagram As is (As-Is), which according to Trischler (1998), provides visibility into the process and helps people understand it, plus it also shows the steps to follow to produce the output and serves to inform policy , procedures and work instructions in use.

Stage 9. Analysis of value added

The analysis of added value is an essential tool to improve the effectiveness and efficiency of business processes, whether the goal is to effect fundamental change in the direction of the company, as solve a present operational problem. To perform this analysis, in the particular case of enterprises with a technological bases of productions per single project, one intendes to assess other criteria such as: the characteristics of product / service, which differ significantly from the expectations previously defined expectations by the external customers, the so-called moments of truth and where the added value of an activity for these businesses is precisely built on knowledge, for this purpose and as part of the proposal, the so-called criterion was added VAKI (Value Added by Knowledge Incorporated) (Hernandez Oro, 2010). All these criteria are evaluated together in a matrix for assessing the value added (see Figure 3), for establishing the lower and upper limits of 0 (no value) and 5 (higher value) respectively. The result can throw that one of these activitties have no reason to be determined by the absence of added value as well as others that, although adding some value (e g, low or medium), can be improved. To perform this classification C_a is considered as the total of possible relationships (criteria), and applied intervals are considered in expressions (4), (5), (6) and (7).

Figure 3: Matrix for the estimation of added value per activities

Activities	Strategic Objectives			Interest Groups			Quality Characteristics			Moments of Truth	VAKI	Total	Classification
	1	…	n	1	…	k	1	…	m				
1													
2													
…													
N													

Source: Own elaboration

(4) $C_a = 0$; does not provide value

(5) $0 < C_a \leq C-1$; Weak added value

(6) $C+1 \leq C_a \leq 3C$; Medium added value

(7) $3C < C_a \leq 5C$; Strong added value

With the results of applying the method of value added analysis proceeds to propose improvements to the process to be decided by the group, after considering the classification of activities according to their value as shown in Figure 3, then these improvements are plotted in a diagram As is that is very effective to show the proposed changes to the process.

Stage 10. Establishment of management indicators

The main objective of the measurement of a process is to have a rational amount of relevant indicators on aspects of efficiency (rational use of resources to achieve the proposed objective), effectiveness (do the right thing and achieve the expected results), effectiveness (defined as the integration of the concepts of efficiency and effectiveness, I e achieving the results expected through the rational use of available resources) and impact (relative to transformation of the state of the object or situation as a result of an action or group of actions). Thus, to develop this stage and according to the points above, we recommend working closely with the process improvement team selected to design indicators consistent with the basic objectives of the process in question and that also are aligned with the strategic objectives of the Organization.

Phase 3. Implementation of Results

This is the phase where there are implemented gradually results in the improvement of

processes. This implies that senior management should follow very closely this process and engage in it, and plan improvements in the short term, it is a process of organizational change, which may arise (and indeed it is normal that it arise) resistance to this change that threaten the good atmosphere of the company.

Stage 11. Implementation, implementation, monitoring, control and improvement

This final stage, and so far unique to this phase of the process generally proposes the implementation / gradual implementation of all previous steps, so it is necessary to establish an order for the proposed improvements, as decided by the areas involved, which facilitates better control of the process management. It also includes the implementation of indicators of process management and monitoring activities (monitoring) and control as well as making the necessary adjustments to ensure the effectiveness of measures and actions to improve practice processes. This phase (and corresponding stage) has a cardinal importance and usefulness for the enrichment of the proposed procedure, by its strong practical utility as the closure of the procedure and to thereby avoid the common mistake, unfortunately, that good solutions deteriorate due to bad implementations / deployments. To carry out this step the so called dashboards, are considered very useful which:

> ...is one of the most powerful tools that companies can employ to ensure that the strategy implemented correctly. In fact, the problem of many companies is to design the strategy, but how to ensure that the strategy is implemented successfully made... [Heras, J. M. ápud Nogueira, D. 2004, p. 112][(1)]

Results

The Research Company and Water Projects in Villa Clara (EIPH-VC)-object of case study original research because they are representative of its type in the sector in Cuba is considered a technology based company producing a single project or singular, or spawn its customers the ultimate in advisory services, consulting and waterworks projects, for it has a highly qualified technical personnel with vast experience, supported by the implementation of major projects, both in Cuba and abroad.

Experimentally applying the procedure proposed in the EIPH-VC, we obtained a set of benefits compared to the current proceeding, tangible some and intangible others, associated essentially to the management process of this organization, such as better identification and description of the relationships between processes and their classification, by implementing the process map, identifying the key processes for improvement, and their ranking by the method of analysis of value added (AVA) for activities, a characterization of a more complete picture of the key processes for improvement, by making the information about the process and the inclusion of a map of potential risks when applying the technique in order to propose improvements (e g organizational), such as: enhancing the activities based on a greater contribution of value to achieve a reduction in process cycle time and improved quality in the contractual documentation. In addition, we were able to incorporate Scorecard that has the EIPH-VC (under development), management indicators generated in research, facilitating the implementation, control and monitoring of the proposed procedure.

Discussion of Results

The practical results showed that research can be considered similar to those obtained with the application of methodological invariants of this procedure to other organizations, including other sectors). However, the greatest contrasts in positive (and therefore methodological contributions to the original procedure) was observed in the analysis stage of the value added by activities, which for this type of business (technology-based projects and productions only) is unique incorporated as estimates of the value criteria, the gaps in the external customer satisfaction index VAEK.

The experimental implementation of all phases and stages of the proposed procedure allowed us to prove, first, their feasibility and parsimony, as the proposal of a new tool, but flexible and robust by the inclusion of different techniques from various sources (mathematics, statistics and group dynamics) in its different phases and stages, required only premised on prior knowledge of the process steps and staff trained in techniques of group dynamics. The proposed solution also revealed the adequacy of information, rationality and acceptance, both by workers and by senior

management, because on the one hand, it did not generate or require more information than would ordinarily be handled in the organization, and secondly, to ensure that all its phases and stages to adapt to the existing organizational environment, without having generated much resistance to the proposed changes and to contribute to the EIPH-VC for their perfection.

CONCLUSION

The organization and process improvement is a current trend in the management of modern organizations, which tends increasingly to replace the traditionally role-based, since more expeditious ways to achieve customer satisfaction, which is greater or lesser extent, the main goal of any company, even more so in those defined as production technology based on single projects, where quality is especially determined by the requirements and expectations of external customers. The proposed procedure covers these two edges (the process approach and continuous improvement) in an innovative and relatively simple way, demonstrating its viability as a methodological tool for improving management and performance in such firms.

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