

## **ACTIVITY-BASED MANAGEMENT IN A REENGINEERING ENVIRONMENT**

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Process Reengineering and Activity-Based Cost have demonstrated in many companies to be working methods that guide them to excellence status. Thus, this work shows the main concepts of Reengineering and Activity Based Cost on a restructuring enterprise basis.

In this work, cost indexes (cost performance measures) are presented for the management of an organized structure (established in a reengineering process) of the agricultural industry field based on an activity based cost system. Starting from these measures and the proposed structure, some important points are analyzed, such as: compatibility between activity based costing and the proposed restructuring based on reengineering; relationship between service suppliers and internal clients.

The work comes to the end analyzing some considerations about the role of cost indexes as a tool to Activity-Based Management and the variability of indexes in the agroindustry field.

Tema nº 6: Gestão de Custos, ABM (Activity Based Management), Reengenharia, TQC (Total Quality Control), Análise de Valor e Teoria das Restrições.

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In this work, cost indexes (cost performance measures) are presented for the management of an organized structure (established in a reengineering process) of the agricultural industry field based on an activity based cost system. Starting from these measures and the proposed structure, some important points are analyzed, such as: compatibility between activity based costing and the proposed restructuring based on reengineering; relationship between service suppliers and internal clients.

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### **1. Introduction**

According to Hammer and Champy [1993], most company management teams declare openly their preference for more flexible and adaptive organization in terms of market. They also want their products to be competitive in price, technology and quality, as well as providing excellent service to their clients. If these indeed are their objectives, than what explains the profile of so many disfunctional, non-competitive, and insensitive-to-client companies? The answer to this question lies in the way the companies work and why they work in that way.

Davenport [1994], has stated that a simple strategy formulation is not enough in a demanding 90's environment. Design processes are essential to carry out any strategy efficiently. It is during process design that the features of a new working environment are defined: speed, quality, and cost.

Speed and quality are characteristics more easily measured, where as not the case for the cost variable. For this a process-based cost methodology is required. ABC, *Activity Based Costing* has proven to be an effective tool for designing and controlling costs on the activity and process level.

This paper reinforces the reengineering concept. It describes reengineering as a function of the new working environment in companies and discusses the new role of people in organization, perspectives for performance and remuneration measures, and changes in organizational structures. Some concepts of Activity-Based Costing in a reengineering context are also dealt with.

We plan to show an organizational structure model when supported by a process performance indexes. Cost is an essential performance measure and it is computed here by ABC. We'll attempt to relate the formulation of activity cost by means of a cost index. The idea is to show how this new organizational structure will be managed.

Finally, this paper presents some considerations about the suggested model.

## **2. Company Organizational Structure**

A set of principles established two centuries ago, have molded company and its management. Hammer and Champy [1994], confirm that for two centuries people have built companies around Adam Smith's concept that complex industrial work must be divided into simpler and basic tasks. In his book *An Inquiry into the Nature and Causes of the Wealth of Nations*, Adam Smith observed that the Industrial Revolution generated unprecedented opportunities for the manufacturers (capitalists) to increase their workers productivity substantially reducing the cost of their products.

Improving on Adam Smith's idea, pyramidal organizational structures with several management and supervision levels emerged during the twentieth century, mainly after the Second World War. These organizational structures were ideals for planning and control. By organizing the work in small parts, supervisors ensured more exact and uniform performance by their workers. Budgets, now departmental, were more easily approved and controlled. However, job planning was generated and followed in the same segmented way. This organizational modality also required short training periods, since only few tasks were either complex or difficult to execute. In the sixties, with the introduction of new mechanization/automation technologies companies were encouraged to break down administrative tasks even further.

With an increasing number of tasks, global product or service processes became more sophisticated and more difficult to administer. According to Teodoro [1994], autocratic administrative structures were then created. They were divided into many functional departments, managed in a centralized way. One of the consequences of division of work into simpler repetitive stages was the increasing number of intermediate level managers. Another consequence was a larger gap between top management and product and/or service users. Unfortunately this kind of set-up led to a situation in which clients and their responses to company strategy only reach higher levels as a set of cold numbers climbing organizations' layers.

## **3. Why Reengineering is so Useful Today**

For more than a hundred years, successful entrepreneurs have created pioneer business organizations for products and services, and manufacturing and distribution. It is not surprising that these innovative companies have served as organizational models for firms worldwide. The pioneer American companies created, for example, industrial consumer goods at accessible prices. They also built and operated railroads spread all over the continent. These companies achieved several technological advances and generated a high consumption standard never seen in the world before. Many of these companies and their offspring suffer a weaker performance. This wasn't due to any structural failure specifically, but was rather an effect caused by world changes and their inability to adapt. The principle under which they were organized was only adequate for previous conditions that are no longer valid.

According to Gilmore [1993] and Uehara [1994], since the middle seventies manufacturing companies are feeling pressured by a more and more demanding market in:

costs reduction, products and services quality improvement, production cycle reduction, customized products and more specialized supply services.

Gilmore [1993] also states that bigger companies and corporations were built based on a mass production mentality. Industrial and administrative processes were entirely oriented to manufacture standard products. In other words, processes were designed to maximize efficiency from the point of view of mass production. With the current transformation - encompassing clients, competitors and short life cycle products - traditional processes became inappropriate for the current business environment.

The recovery of industry's competitive capability is not a matter of making people work harder. In reality, the point is to make them learn how to work better. Company managers believed their companies would recover if their products and services were updated. In fact, at present, products have limited life cycle and even the best ones become outmoded. It is not the products per se that ensures a long term success, but instead the processes that create these products. Good products don't generate winners. Winners, instead, generate good products [Hammer and Champy, 1994].

Current performance problems experienced by companies are the inevitable consequence of process division. People involved in processes tend to give priority to their departments and bosses while forgetting the client.

These process must be re-evaluate for companies to learn to adapt as profitability as possible. According to Davenport [1994], Process Reengineering, which mixes Information Technology and Human Resource Management, can improve business performance considerably.

#### **4. Business Process Reengineering**

Reengineering can be defined as a set of changes taking place in a company's business processes and global structure. Its goal is to obtain significant advantages in competitive performance. Uehara [1994] shows that depending on the dimensions of the problems to be faced and the goals to be reached, reengineering can, in fact, lead to a radical transformation in company management, ethics and routine in difficult situation.

According to Rigby [1993], there are four principal components in any business restructuring process which define reengineering:

- A profound change in the concept of how work must be executed inside a process, which would lead to improvements in productivity and cycle times;
- A structural reorganization, generally supported by a breakdown in functional hierarchical structures for working teams in each process;
- A new information and measurement system, using high technology to induce better dissemination of information and decision-making; and,
- A new value system emphasizing company clients.

#### **5. Reengineering and the New Working Environment**

When a process is reformulated by reengineering, services previously restricted and oriented to tasks evolve to multi-dimensional levels. People that followed instructions, now have options and make decisions. Functional departments are no longer necessary. Managers that acted as supervisors now behave as instructors. Employees concentrate in client necessities rather than on pleasing supervisors. The main changes that occur a company using process reengineering will be presented next.

### *Role Changes*

Workers in an established reengineering environment are necessarily more independent in decision-making. Teams, of one or more persons, performing process-oriented tasks are self managed. Within the bounds of their obligations with respect to the organization - deadlines, productivity goals, quality standards, costs, etc. - they decide how and when work will be done.

Since management gives responsibility to the teams to perform the whole process, it also needs to give them authority and self-management tools to make the necessary decisions.

### *Modified Performance Measurements and Remuneration Standards*

In traditional companies, employee remuneration is relatively simple: employees are paid for their time. Remuneration based on a hierarchical criterion (seniority) is inconsistent with reengineering principles (self management and autonomy). In reengineered companies, the contribution and performance must be a principal basis for remuneration. Therefore, a series of control measures is created in order to cover employee performance to define remuneration. Remuneration varies and is based on awards and bonus rather than on salary increases.

### *Organizational Structure Changes*

When the whole process becomes a team's work, process management is required. Decisions on interdepartmental problems which require manager and supervisor meetings, in a post-reengineering environment must be made by teams during the work process.

Work is organized around processes and teams that execute them. Thus, reformulated organizational structure tends to be leveled since work is performed by teams of equals, working autonomously and helped by few managers.

## **6. Activity-Based Costing**

According to Turney [1992], ABC is a method for assigning cost and measuring performance. It uses technical terms such as *activity driver* to describe how the assignment and measurement works.

Activity-Based Costing is founded on an accumulation and tracking process of costs and performance data of the company activities. It provides a feedback of the real results comparing them to planned costs. In that way, the ABC helps and directs the company to formulate strategic plans and to take operational decisions, identifying opportunities to improve the business [Brimson, 1991].

The ABC approach is based on the idea of identifying how the resources (materials, labour force, technology) are spent in the activities' execution. Such activities are performed to benefit cost objects (products, services or clients). Thus, the activities are a powerful basis to manage the business [Hronec, 1994].

## **7. Opportunities of Using ABC in Reengineering**

According to Wilcox [1994], the traditional costing systems had their development oriented to product costs only based on volume measurements (labour force hours, machine hours). Stocks were always considered as assets and indirect costs (most of them fixed)

were always divided by an increasing production. People thought that, like this, it was possible to make the company more profitable. Thus, in manufacturing, cost reduction was always attempted by reducing the man or machine hours rate for each unit, and therefore increasing productivity.

With this kind of costing system, it was easily understood why there was always strong pressure towards cost reduction in manufacturing and few initiatives for cost reduction in administrative areas.

Administrative work has never been considered a global process and part of the company. As already emphasized administration seemed purely departmental. Efficiency for each department was pursued with the departmental managers only worried about their budget and their performance standards (in general financial measurements). The problem is: the fragmented structure create internal disagreements, mainly when problems such as sluggish process or service quality came up.

According to Peña and Lima [1994], both ABC and reengineering, develop the same point of view on organizations. Organizations were not dealt with as a set of functional departments, instead, as a chain of activities that interact in a given process. From a reengineering and ABC point of view, companies are not seen as blocks of departments, but as chains of processes.

Therefore, ABC is a technique that helps in reengineering in the following stages:

- *Analytical Stage*  
In the analytical stage of the company's processes, activity costing indicates which processes present the most promising opportunities for cost reduction. In other words, in this stage, it is possible to better define which processes must be approached by reengineering.
- *Restructuring Stage*  
Activity cost analysis in the existing processes provides a good basis for understanding which directions should be taken for reengineering changes in a restructuring stage. In a reengineering environment activity costing is also an essential tool, because it allows to follow the new reformulated processes costs. This paper emphasizes this stage by suggesting performance indexes for activity cost to manage organizational structures established by reengineering. In the following sections, the structure suggested by reengineering in a agroindustry case study and the cost indexes computed by the ABC costing system are described.

## **8. Organizational Structure Proposal for Agroindustry**

Agroindustry is basically characterized as a process industry such as the sugarcane (sugar and alcohol) and the citrus fruit industries (orange juice and derivatives). Production activities are characterized by a continuous physical flow. There is also a series of support activities to ensure execution of the production.

The main objective of this paper is to propose an activity-based management model for agroindustry processes. From the standpoint of an organizational redefinition of the human resources in responsibility frontiers (designed and established by a reengineering approach), performance measurements will be proposed, which support company processes management. How activity-based costing is used as a tool to determine cost performance measurements and their implications in the management model, will be described in detail.

From a reengineering point of view, the proposal is centered on the duties and functions of the reorganization, substituting the company supervision and leadership level. Figure 1 shows this structure in a simplified way. The industrial process is divided in several subprocesses where one or more activities are identified. A responsibility frontier for each subprocess is defined and will be managed by a working team to execute associated activities.

Therefore, an organizational structure is created with only three different hierarchical levels: the plant manager, subprocess coordinators and factory workers. A management model based on activities is defined from this new structure of organization oriented by processes.

### 8.1. Management Model

This management model created by reengineering, is based on managing each subprocess activity by frontier responsibility coordinators. These people must manage the execution of the subprocess activities. They will in charge of a series of performance measurements. These measurements, also called control variables, can be defined based on different requirements such as: activity output quality, conformity with production routine, product delivery time (next step or outside client), and costs performance measures.

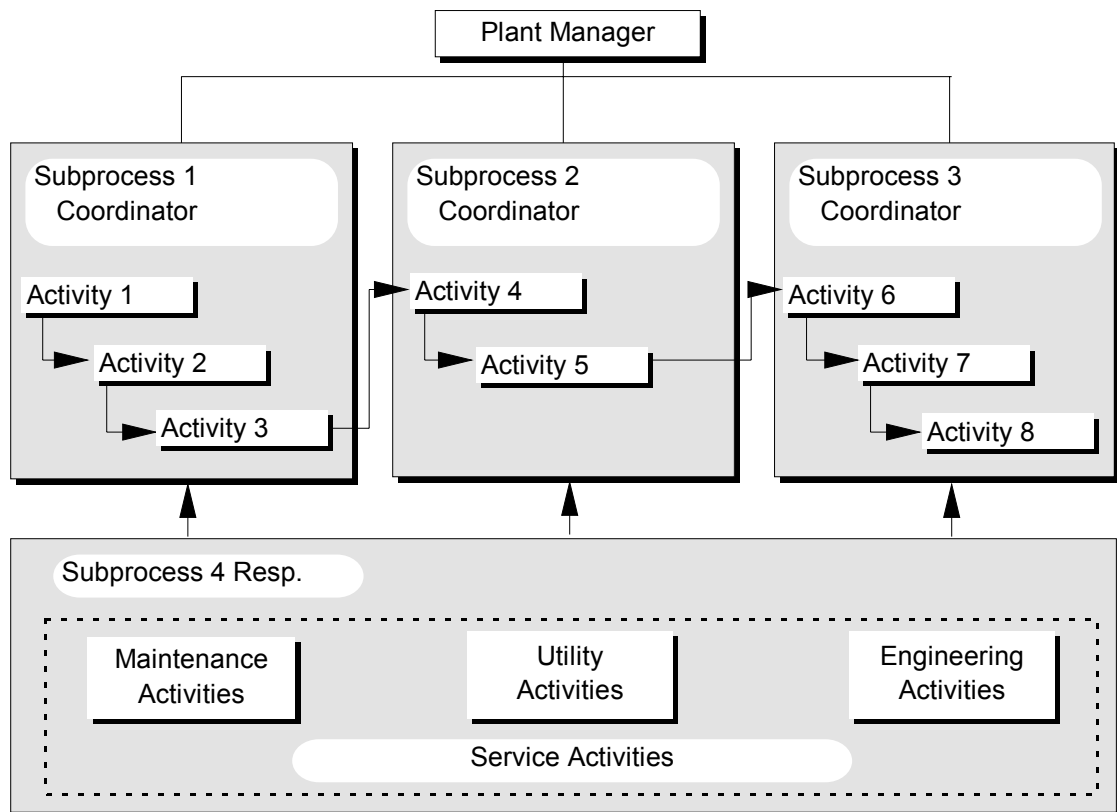


Figure 1. Implemented organizational structure

These control variables are the basic source of information for business process management and they work also as a parameter to determine the coordinator's variable remuneration. In other words, each coordinator has autonomy to manage activities as a function of the proposed targets for each one of the control variables.

This paper, however, discusses only cost index determination, because it is closely related to the use of Activities-Based Costing as an auxiliary tool for reengineering.

*The Management Model and ABC.*

It is in this stage that Activity-Based Costing is an important tool because it is from the data generated by ABC that cost indexes will be calculated. Therefore, there is the necessity to model a flow structure of costs that supports the new organizational structure proposed by reengineering. Thus, cost centers are created from the subprocesses, that is, for each subprocess one or more cost centers may exist. And the activity costs for each responsibility frontier is computed as a function of the resource cost drivers.

A description of the procedure of activity costing and of the proposal for cost indexes, giving details of the way these indexes are computed, follows.

## **8.2. Activity Costing**

In the proposed structure, each activity cost is calculated by the Activity-Based Cost system. Two kinds of allocations in the activity cost composition are identified:

- center's resource costs allocations related to the resources required for each specific activity; and,
- allocations related to cover internal services cost (mechanical maintenance, water treatment, vapor generation, refrigeration, compressed air, and others), as illustrated in Figure 1.

### *Center Resource Costs*

Resource costs are related to expenses for manpower, electrical energy, equipment depreciation, consumption goods, among others. These items originate in the cost centers themselves. Through resource cost drivers, these expenses are allocated to activities inside each responsibility frontier. For example, the electricity used in a subprocess is allocated to activities based on a cost driver defined by kilowatts per hour. People working in activities in the same frontier can be allocated to activities based on a cost driver defined by man hours.

To simplify the resource cost allocation process, cost pools may be created to group resource costs allocated to related activities by means of the same cost driver. Thus, an individual allocation criterion for each cost pool is defined.

### *Service Activities*

Service activities are those which support production. Mechanical maintenance, for instance, executes a support activity which incurs cost for the benefitted activity. The cost allocation for the benefitted activity is based on a cost driver that, in this case, is defined by mechanical maintenance hours.

In the case of utilities, the evaporation activity for example, very common in citrus fruit industries, receives a utility service of vapor generation. In this case, the costs related to vapor consumption are measured by vapour tons absorbed in the evaporation activity.

## **8.3. Determination of Cost Indexes**

The determination of cost indexes is arrived at by total activity cost and the volume of work performed. In a process industry, the activity output can be measured in produced



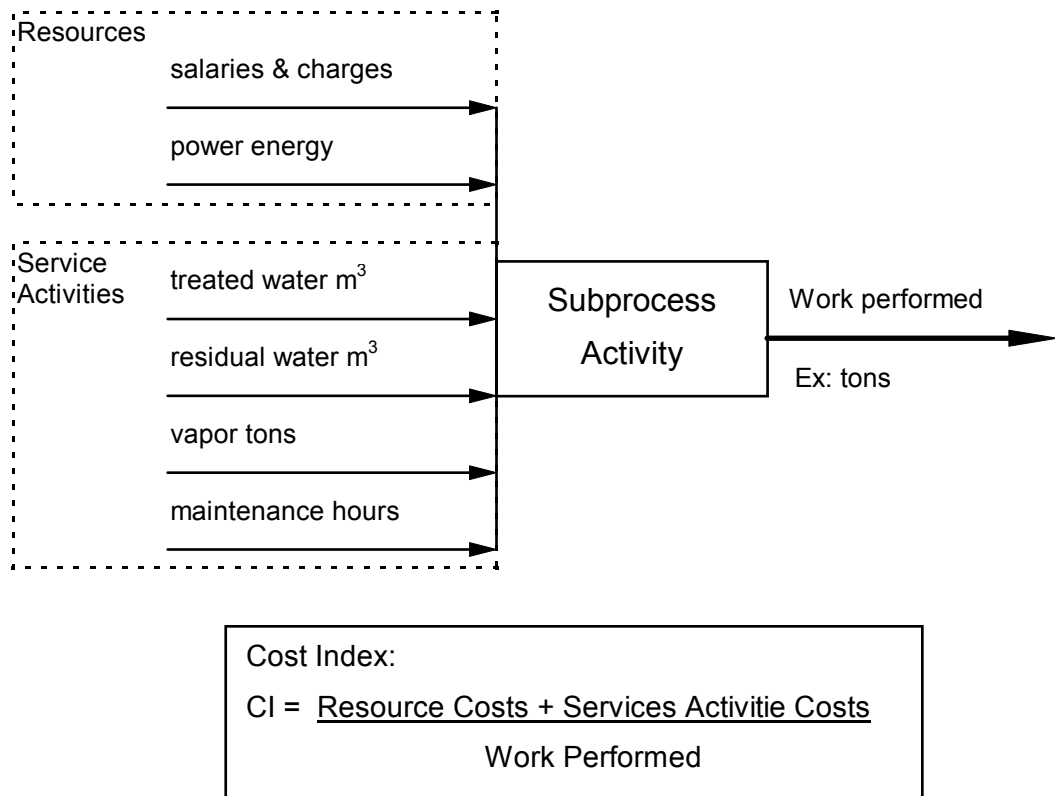


Figure 2. Composition of the Cost Index

tons. Figure 2 shows the composition of the cost index for the activities and factors that have an influence on this index. The frontier coordinator must improve performance in managing to provide better cost indexes for each activity in his subprocess.

At shop floor level a frontier coordinator will manage resource and service consumption quantities (cost drivers) and nor costs per se.

ABC offers a ranking of resource and internal service costs based on activity cost make up. By means of cost ranking provided by ABC coordinators will know where to apply their efforts in activity management by making use of priority cost drivers. Therefore, the responsables for activities administration will have better parameters to enhanced them.

As already noted, cost index is one of the parameters to measure the performance of people who execute activities. Thus, a variable remuneration is determined for each frontier coordinator based on positive or negative results deduced from performance indexes.

## 9. Considerations on Cost Indexes

We would like to address ourselves now some questions on the internal supplier-client relationship (for activity cost make up), the seasonal characteristics of the cost index in agroindustry and the necessity to determine an annual rate (based on the crop) to formalize the internal services rate.

### Internal Supplier-Client Relationship

The relations between service suppliers and internal clients must be disciplined in order to obtain correct activity cost. The better these relations are quantified the better the

cost indexes will be obtained. Therefore, decisions made from results obtained by the indexes will only be well directed if the cost performance measurements are correct.

For a company applying this type of reengineering, must initially initially map out supplier-client relationships by defining the amount of services to be provided, expressed by cost drivers. Therefore, in this new working environment, frontier coordinator must administrate both their on resource and received internal service quantities (vapour tons, compressed air m<sup>3</sup>, maintenance hours, treated water m<sup>3</sup>, among others).

This control can be improved along time, with implantation of digital or analogical control systems and management information systems.

#### *Index Seasonality*

Agroindustrial production seasonal through the year. As a consequence, in the proposed cost index formula the fraction's denominator (work performed) will present great variations during harvest time and will fall to zero in the out of season period. The fraction's numerator (costs) occurs during harvest time (fixed and variable costs) and also out-of-season (fixed costs as man power, equipment maintenance, among others). In this case, the index must be of an annual nature. An annual analysis will inhibit distortions in cost index calculations. Both the numerator (costs) and the denominator (work performed) must have accumulated values.

Figure 3 shows the cost index behavior for an activity during a harvest period. The accumulated behavior of this index changes as a function of different costs and production levels during the year. Thus, a coordinator for a subprocess must try to follow the curve determined by the cost index and attempt to correct possible deviations that could occur during harvest time.

#### *Determination of an Annual Rate for Service-Supplier Cost Indexes*

Every internal service surveyed by the supplier-client relationship must be performed based on an annualized supplier cost index.

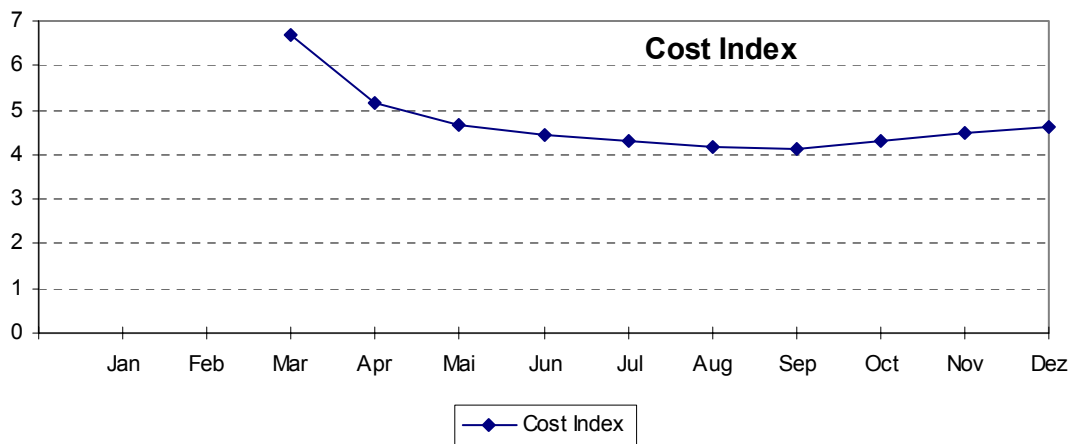
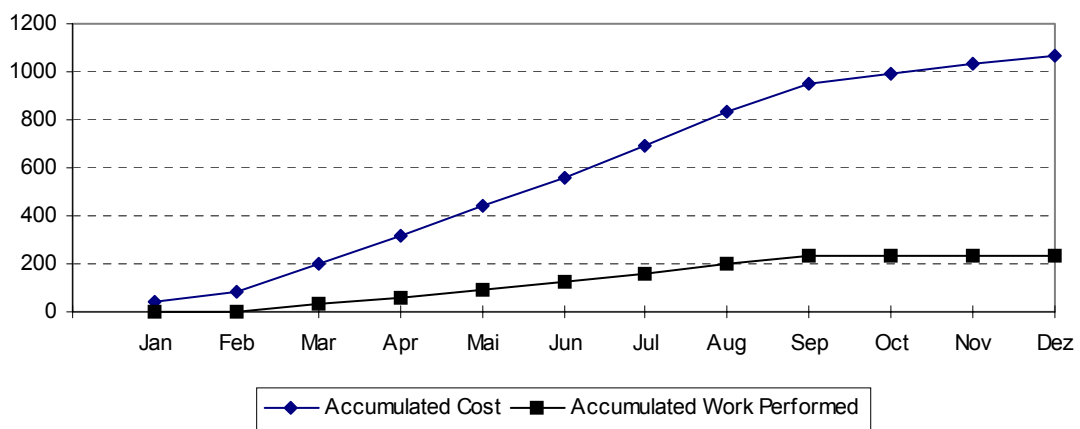
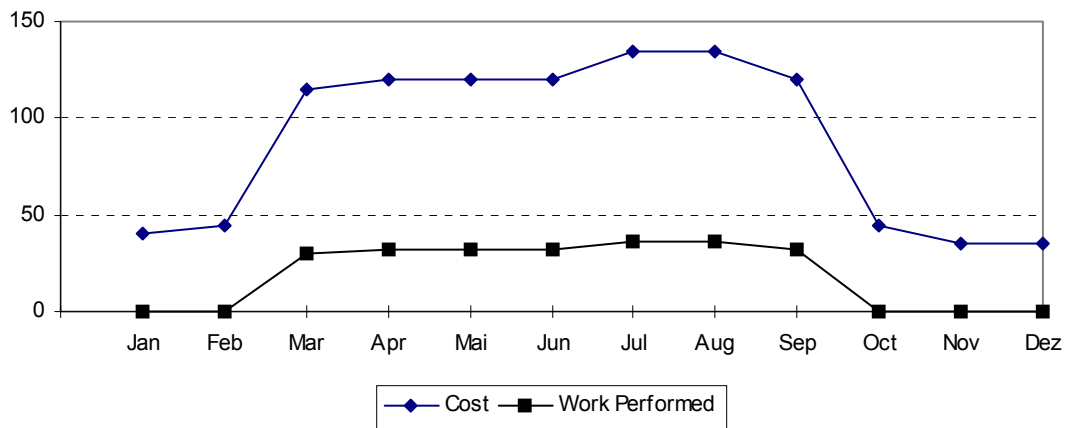


Figure 3. Cost Index Behavior

Vapor generation costs are a clear example in a process industry. The boilers originate costs along the whole harvest period (manpower fixed cost, for example), but don't produce vapor during the whole year. In the juice industry specifically, an evaporation activity occurs only in some months of the year for well differentiated levels of volume of evaporated juice. Thus the evaporation also expends different amounts of vapour tons. Therefore, what

is the cost of each vapor ton? If the adopted solution were allocating month-to-month costs, the cost per ton would have large variations and there would be months in which boiler cost would not be allocated to evaporation because they would not be evaporating juice. Thus our solution was to determine annual rates for service supplier costs. These rates must be calculated from every projected cost and every foreseen production for the harvest. This solution is applicable to all internal factory suppliers (maintenance, refrigeration, compressed air, drinking water, process control, among others).

Therefore, the internal client will have the responsibility to administrate the quantities of service received from different suppliers during the harvest period. This service will have a single annual cost rate.

Frontier coordinators related to service supplying activities, will have two main concerns:

- Every activity related to service supply must have a curve for its cost index, as shown in Figure 3. The coordinator must manage costs while remaining in the curve;
- Taking into account that the curve has a feature of accumulated costs for the harvest, the last value represents an annual rate that must be used as a basis to make the allocations to the clients.

## **10. Conclusions**

Inside this proposal for the creation of an organizational structure for agroindustry, this paper tried to outline an Activity-Based Management model, resulting from a reengineering implantation process.

The main feature of this organizational structure is the delegation of responsibility. Coordinators for each subprocess will be autonomous to manage their activities and they will be able to perform this task through the understanding and the use of performance measures. Subprocess coordinators will be in charged by of plant management for work targets based on proposed indexes, thus defining their variable remuneration.

One of the performance measures proposed in the model the activity cost indexes, was described in detail. At this point, the Activity-Based Costing was a fundamental tool, providing necessary information to support cost performance measures. It is clear that cost indexes are not the only necessary information to validate a management model created by reengineering. Nevertheless, they constitute an important step in this direction.

In cost index determination we tried to identify and analyze the factors responsible for its make up (resource and internal service costs), while considering the seasonal characteristics of the indexes in agroindustry, the importance of the relationships between supplier-client and also the necessity of an annual cost rate for internal service cost assignment.

## **11. Bibliografy**

1. BRIMSON, James A. - Activity Accounting: An Activity-Based Costing Approach - 1.ed. New York: JOHN WILEY & SONS INC, 1991
2. DAVENPORT, Thomas - Process Innovation - Harvard Business School. Boston, Massachusetts, USA, 1993.
3. DAVENPORT, Thomas - Reengenharia de Processos - Tradução de Waltensir Dutra, 1 ed, Rio de Janeiro, Editora Campus, 1994
4. GILMORE, James H. - Reengineering for Mass Customization - Cost Management, Fall 1993

5. HAMMER, Michael and CHAMPY, James - Reengenharia: Revolucionando a Empresa em Função dos Clientes, da Concorrência e das Grandes Mudanças da Gerência - Tradução de Ivo Korytovsky, Rio de Janeiro, Ed. CAMPUS, 1994
6. HRONEC, Steven M. - Sinais Vitais: Usando medidas do desempenho da qualidade, tempo e custo para traçar a rota para o futuro de sua empresa - 1.ed. São Paulo: McGraw-Hill, 1994
7. PEÑA, S. C. and LIMA P. C. - O uso do Custeio Baseado em Atividades como uma Ferramenta para Reengenharia de Processos de Negócio - I Congresso Nacional de Gestão Estratégica dos Custos, 1994
8. RIGBY, D. - The Secret History of Process Reengineering - Planning Review, mar/abr, 1993
9. UEHARA, Irineu - Reengenharia sem medo da autocrítica - Revista Byte, junho, 1994
10. TEODORO, José M. - Reengenharia e Mudanças Radicais para Enfrentar os Concorrentes - Informativo Dinâmico IOB, Edição 61, agosto, 1994
11. TURNEY, Peter B. B.. Common Cents: The ABC Performance Breakthrough (How to Succeed With Activity Based Costing). Hillsboro, OR: COST TECHNOLOGY, 1992, p 322
12. WILCOX, Chris - Using ABC as a catalyst for business process reengineering. As Easy as ABC, N19, winter, 1994