Multiple Criteria Analysis of Activity-Based Costing (ABC) Using the Techniques of Classification and its Comparison with Traditional Costing and Strategic Management Accounting

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Abstract

Costing-based activity is a technique for exact allocation of direct and indirect sources of an organization based on its consumption on activities taken place. Activity-based costing system is one of the new costing systems that can be used separately or along with existing costing systems in order to provide the appropriate information in decision making. One of the most important features of the ABC that makes it distinct from the traditional systems is paying attention to new operational phenomena and effects of the technology governing available status, and using the appropriate procedures, it caused these effects to be absorbed the service provided quantitatively. This system in comparison with traditional costing systems, because of using the difference base, is easily able to calculate and measure the impact of new methods of calculating the costing of services. The present paper has been conducted in a descriptive review method, and the data required has been collected from sources of books, articles and internal and external valid websites. In this paper, in addition to multiple criteria analysis of activity-based costing based on classification techniques, the analysis of strategic management accounting concept has been done with an instrumental look and then the strategic management accounting advances that try to improve the activity-based costing model have been explained. Finally, while explaining the reasons to use the ABC method, with the help of case study, the assumptions has been matched by reality.

INTRODUCTION

Among the organizations, there is an increasing motivation for understanding the costs and causes of these costs. There is still confusion between understanding the costs and methods of measurement of costs though (such as activity-based costing, standard costing, project accounting, and target costing) so that the managers and staff have been confused and amazed dealing with identifying the cost. Looking more closely, different costing methods are not necessarily competitive [3]. During the increase of competition in business environment, organizations are seeking to collect or improve their costing information requirements, information that is accurate and relevant. In the past, companies were controlled using accounting information that was thought to reflect the costs of production and services properly. In fact, costing systems of many companies, extensive sharing indirect costs on average that was covered direct false and fictitious mean that was with a false and fictitious accuracy, provide misleading information to decision makers. This finally will lead to wrong decisions by directors of the companies [3].

In recent social and economic situations, the performance and efficiency have become an imperative issue, while the reality should be so that, reducing the use of resource in the same projects and activities, the management provides goods and services with the same quality. Activity-based costing (ABC) method is the most famous invention in the field of management accounting in last twenty years. This method in the manufacturing sector was primarily generated to respond the lack of satisfactory of traditional management accounting techniques that were based on methods on the basis of production volume in order to allocate...
manufacturing overhead to products. Traditional methods have many errors in terms of modern manufacturing. Today, the major costs associated with the production of a commodity are not related to the production volume. E.g. engineering costs, ordering process, planning, and quality control with high technologies, manufacturing order products or on time delivery take the costs that increase the activity into account and then allocate them to products which have been generated through the activity [2].

ABC system is a logical approach for the organizations' managers, which helps them to evaluate and describe the performance of organization and identify its costs. The idea behind activity-based costing system is simple and logical, the costs and expenses are not automatically created. There’s no cost within the organization, there are only activities to serve customers and there are also fees received for the services [2].

In order to overcome the generality of traditional costing system that is along with a very simple cost-sharing and lack of transparency for indirect costs, organizations have accepted and Activity-Based Costing (ABC) systems. The systems are based on a model that tracks both direct and indirect costs of organizations to products and services, and customers who have caused the costs [3].

**Defining the problem and research objectives:**

In our study all the techniques of SVM, BPN, K-NN are used to classify inventory. To evaluate the effectiveness of these techniques, the classification results are compared with the results of the MDA traditional model.

The four classification categories were first used in 1992 by Flores that are subjected to the inputs of average cost per unit, annual dollar usage, the critical factor and waiting time to receive the order. Classification results are modeled from four techniques that are classified in A, B, C groups. Hidden layer consists of eight neurons that are applied in input and output layers. A radial basis function is presented as a kernel function based on support vector machine. Selecting the optimal value of parameter K is when the classification is made with K-NN. In this study, the neighbor parameter K has the value of 3. K-NN is categorized under matlab.

**The definition of activity based costing systems:**

ABC method was designed by Cooper and Kaplan in the United States of America during the 1980s onwards. This is a revised costing method that has the following features:
1) The possibility of more classification of costs as direct costs
2) Increase the number of indirect costs tanks and determine cost drivers.

ABC supports optimal resource allocation using smaller cost tanks called activity. Using cost drivers, the costs of these activities are the basis for allocating costs to other cost issues such as goods and services. Most of the management accounting advances is based on strategic management accounting. In searching for management accounting techniques to identify the decision-making process, Kaplan and Johnson suggested the following items to be considered:
- Deeper analysis of the organization processes and activities
- Linking operational and strategic management [1]

Activity-Based Costing (ABC) system and traditional costing differ in the following cases:

1. In traditional costing method, indirect costs are allocated based on a factor that usually has no relation with occupancy type and level. Allocation factors include labor hours required to produce one unit of product, direct labor costs, cost of purchasing goods returned for sale or the number of days taken to produce a product. These factors do not explain any causes for indirect costs. The problem with this approach is that the changes that occur in the basis of allocation are not appropriate with cost allocation changes. ABC system specified that specific products or customers do not appropriately use indirect costs and instead of applying factors mentioned the work that has been done by workforce and facilities for manufacturing products and services and the consumption rate of each of these activities must be used. ABC system task is tracking indirect costs to products, services and customers through identification of resource and their costs, as well as the use of these resources as a result of the activities and performance of activities in output data generation. Among these costs, salary and wage, operational requirements, utilities depreciation, consuming electricity can be named, indicating their performance capacity. ABC system clarifies the performance and cost of units. Activity-based costing is also including managerial behavior change [3].

**The purpose of activity-based costing:**

ABC’s main objective is to enable managers to make better decisions about the customers. Lebase argued that the ABC method is suitable to face the market problems. He described a method for organizing an ABC structure that is derived from characteristics of the customers. Some researchers believe that ABC is a way to compare the profitability of different customers. But basically the ABC has been created for manufacturing companies. Activities describe the production process (chain of materials supply, manufacturing, adjustments, etc.) and cost drivers identify key factors of production (labor hours of personnel and machines, the number of orders, manufacturing). Creating value is beyond manufacturing product, for example customer relationship is
one of the key factors in creating value. This can lead to the development of numerous models to analyze customer profitability [1].

To implement ABC accounting systems, there are four steps as following [2]:
1. Determine and identify key activities and cost drivers related to them
2. Allocate working time to activities
3. Share salaries and other costs to activity cost drivers
4. Determine the cost per unit

A plan for the implementation of activity-based costing (ABC):
An accurate and regular guide to create initiative in ABC system is considering the end of costing process. In fact, it's a mandatory reason to improve the outputs of a process. Over time, the knowledge of decision type or analysis of ABC system will not be different from the performance of other processes. Before you begin, you need to be aware of your expectations in relation to the outputs of a process. Following these rules, an organization finds that the ABC system is designed to respond to some ones and it's not merely for public organizations [3]. Many of the achievements are obtained by the design and implementation of ABC system. However, there is no general achievement at the global level that is true and without error. In order to achieve the concept of profitability many companies especially large companies know ABC as a great final achievement where a part of the organization is selected to implement the concept of ABC.

There is the project capability through the actual costs and revenues if the main objective is to achieve ABC system inputs. Predicted budget revenues and costs will be used the budgets and predictions may have much difference with the actual results. In the continuation of activities, internal relations between cost drivers are identified. Then, sharing ratios and the costs of each activity are determined. After that, the costs assigned to each of the products and customers are identified. The success of this project is achieved through a company's validity to extensively implement ABC. [3]

Preliminary Design of System (ABC):
ABC system can be investigated from two perspectives: allocation perspective (sharing price) and process perspective. Cost allocation perspective provides information on resource and activities and the product price; on the other hand, process perspective prepares operational data (often nonfinancial) on the processes and operations related to them. You can see the first perspective in horizontal section, as well as the process perspective which can be seen in vertical section of the following figure. The activities performance is the necessary and common part of both perspectives [3].

Fig. 1: Preliminary Design of ABC System.

There are differences on costing purposes as following:
"Cost sharing perspective" assigns resources costs (e.g. salaries, supplies) to the cost of activities (e.g. manpower or asset) and identifies the sum of them in the cost of the product (e.g. products and customers). "Process perspective" puts the activities in order during the time and then the cost of activities is accumulated from the beginning to the end of a business process.

ABC system puts an emphasis on the first perspective. According to ABC that is the abbreviation of (activity-based-costing), the greatest advantage of this system is derived from the cost measurement of different parts (product cost) and consumption based on activity driver.

The term of driver may be a bit confusing. "Resource drivers" for employees indicate a time when they spend doing activities. Resource drivers also reflect purchased indirect materials items. The consumption amount of direct material is the same "activity drivers" that is the outputs size of an activity. For example, doing client-related activities is sale order process and the cost center is the number of sale orders. The final driver of a
product is where the process output can be integrated with other outputs, like when a customer purchases a combination of products. Costing rule to choose among all these resources is to compare the level of costs made directly with the number of these drivers.

Data collection (ABC):

Two types of data are provided for ABC project: Perceptual and transactional. Perceptual data acts in order to improve ABC system design and transactional data are used to integrate the cost flow with the model of system.

Activity-based costing analysis is a common and effective method to classify inventory items to specific groups that are managed and controlled separately. As a result, activity-based costing analysis classifies inventory items into three categories A, B, C based on annual dollar consumption. Multi-criteria inventory classification has been the target of some researchers to achieve another important criterion to investigate. The researchers have compared the classification of artificial intelligence techniques with traditional multiple discriminant analysis. For example, all the basic techniques including: Support Vector Machine (SVM), BPN networks and K-NN algorithm. To test the effectiveness of these techniques, the classification results are compared based on four modeling techniques. Our results indicate that all techniques show more accuracy than the traditional multiple discriminant analysis.

Statistical analyzes show that support vector machine (SVM) has more accuracy classification capability than the basic techniques.

Recommendations suggest the implementation of basic techniques for multiple discriminant analysis of activity-based costing in human resource planning systems. Inventory effective management plays an important role in the success of supply chain management. For companies that support thousands of inventory items, it is unrealistic to provide the same liability whatsoever for each item. Managers need to classify the items to properly control each category of inventory based on their importance.

Indirect costs are replaced with direct costs of products or services that are supplied to customers. In response to this replacement cause, factors such as technology, devices controlling equipment automatically or by computer were proposed. In other words, organizations are making what was dependent on jobs in the past as automatic. So this is known as the second reason for the company's costing system change. The main reason for this change was the gradual increase in goods and services. In the past few decades, most companies have a significant increase in the diversity of their products and services, as well as the use of different methods of sharing and selling. In fact, companies offer more types and diversity of services. The big change has led to the great complexities resulting in increasing of overhead costs. In fact, the overhead cost components that are replaced with the cost of wage and do not mean a company's inefficiency. In fact, this means that a company offers wider variety of products to more customers. The main problem of traditional costing was that the dramatic increase in indirect costs was consequently followed by an increase in sharing basis, which in some cases led to the allocation with reasonable cost. In fact, what ABC does is to track resource consumption and costs allocation based on the cause and relationships between them. With the help of RCA method, costs created by different organizational units can be places in various cost tanks, through which the allocation of resource to activities will become easier. Tools like RCA may provide possibility of optimal allocation of resource so that managers can better understand the results of their strategic decisions. In contrast, some researchers believe that the issue of resource allocation represents a problem and has to be investigated strategically. In some interpretations, the activities are very slight (such as just-in-time method and specific industries such as chemicals) and the ABC method may not be very useful. That's why fans of process costing method recommend making a series of activities as processes. These techniques are related to the fourth dimension of table. Once the processes complexity is low, the standard ABC method will be so slight, so in that case we need a simplified ABC so that puts several activities together and creates a process that only requires one cost drive. Process costing methods are examples of this type of model. Time- Driven ABC is a kind of ABC where the cost driver is the time. The method is resulted from the last developments in ABC. The method is indeed an ABC simplified method. Using this method, the activities determination can be very simple. ABC method is based on time driver, converting the cost drivers to time equivalent such as employees' standard working hours. These standards can be modified when conditions are changed. This is actually a way to re-introduce the standard costing method. Using this method, we can highlight the costs of ancillary activities.

This method is created based on the strong assumptions and that's the cost of time consuming. This method is used only in some particular cases, such as supply chain materials management, product standardized processes, facilities telecommunication centers, hospitals, etc. But for research and development processes, marketing and more complex products are not beneficial and useful. Furthermore, some errors may occur when setting standards and that the method is based on the standards of consuming internal time.
**CPA and its relation with activity-based costing:**

CPA includes revenues created by customers, as well as costs used to generate the revenues. Using the CPA method, we can examine a customer's profitability. Managers' objectives are to provide conditions under which customers have the main contribution in determining operating income and profitability of the company. CPA basis is the reorganization of ABC structure. Therefore, it's related to the marketing and business aspects of management. Kuchta and Troska believe that ABC is an appropriate method for classification of customers' profitability. They believe that customer-centric ABC can help to determine products and customers that have more profitability, which activities are customer-centric, do processes have customer-value-added or not. Using the RCA systems, we try to provide more detailed information about the company's operation for decision makers. With the help of the third dimension raised in the table, we use techniques that put the emphasis on determining the levels of relationship between the costs and company to identify what costs are strategic and what are organizational. In some cases, the complexity of the processes and strategies are very high. ABC method is not sufficient to respond to these needs; thus we need other ways to allocate resource. Resource consumption accounting (RCA) method help the ABC method to be more complete using a deeper analysis.

**Concept of Strategic Management Accounting:**

In this section we develop the strategic management accounting concept with focusing on ABC method. In the first stages of research, we are going to found that whether the ABC method can be a tool for strategic management accounting? According to Teller's opinion there are three types of strategic management accounting:

- **Limited SMA Approach:** In this case, management accounting is a tool to reduce and control strategy. This is a poor approach to strategic control that does not offer in-depth analysis of strategic cost drivers. In this approach, to view the competitive environment and investigate customers' expectations, quantitative indicators are needed. This type of approach is not useful for examining the organizational structure. This kind of SMA does not require the increase of knowledge.

- **Moderate SMA Approach:** in this case, management accounting is a mean for authenticating the strategic assumptions. This type of approach is more as a guide to strategic control that requires a deeper analysis of the strategic assumptions. In fact the strategic assumptions are key drivers of success that are provided by the management accounting along the value chain.

- **Advanced SMA Approach:** in this case, we take the ABC method into consideration as a tool related to the strategic management accounting. It seems that the ABC method is able to recognize the enterprise architecture as determining the relationship between strategic and operational management. The aim of linking strategic and operational management is to test available strategies and attempt to create new strategies. We aim not to analyze the limitations of the ABC method, but to study its performance evolution.

**Applications of activity-based costing and their strategic potential:**

Table 1 expresses is a combination of using aspects of the ABC. This typology is the result of an overview of academic and professional activities.

<table>
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<th>An example of using tools</th>
<th>Dimensions of using ABC</th>
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<tr>
<td>ABC Customer-centric</td>
<td>First dimension: Stakeholders</td>
</tr>
<tr>
<td>ABC created by competitor analysis</td>
<td>Expand range of cost to customers, resource suppliers, and other stakeholders</td>
</tr>
<tr>
<td>Target costing</td>
<td>Second dimension, costs are spread</td>
</tr>
<tr>
<td>Activity-based planning and budgeting</td>
<td>Analysis of future costs over the life cycle during the project</td>
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<td>Direct costing</td>
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We have considered 4 dimensions in the Table. A tool can contain one or more of these dimensions. The first dimension refers to a management accounting approach that takes stakeholder into account. This means that if we consider the stakeholders in a company, it will have a positive impact on firm performance.

The second dimension is related to a prospective approach of management accounting.

The third dimension reorganizes more sophisticated management accounting systems. Some researchers improved management accounting systems via the following ways to overcome the shortcomings of ABC:

- More review of activities and tasks structure
- The rational allocation of resources to activities
- Statistical methods to establish a connection between the consumption of resources and activities to cost drivers.

In contrast, the fourth dimension reorganizes the simplified management accounting techniques. But you have to know there is a chain and relationship between the third and fourth dimensions. The management accounting system can incorporate the simple and more complex parts.

In fact, many researchers and workers believe that the ABC has several shortcomings like (Anderson and Young). More criticism about the ABC method is as:

Many workers in this field believe that the implementation of ABC is costly, time consuming and difficult to adjust.

There are many weaknesses, particularly in the service sector in using the ABC method and finally many people believe that the ABC method is very complex. So in some cases it fails to determine the company's strategic decision-making processes.

Our observations suggest that the balancing between the two features of a tool in a way that the tool is revised and has no previous problems and also it could be easily used is difficult. In the latter case, the group members took some of statistical tests in order to check and evaluate the amount of coordination and congruence of the activities costs, and also to determine the cost drivers; that's why the model used is very accurate. Moreover, in the latter case because of that the high level project manager is mostly involved in project, and is looking to achieve quick results, the rate of participation is less. In general, both companies have been successful in establishing a strategic ABC relating to computer services. The companies considered the average approach of strategic management accounting. The company's also took the advanced approach of strategic management accounting because for example some costs calculation might lead to false choices and the strategy change.

**Conclusion:**

In this paper we have investigated the concept of strategic management accounting with an emphasis on ABC model and presented various aspects of management accounting and showed that a variety of ABC can be used that have strategic aspect. In this study, we concluded that the ABC is a suitable method for the development and improvement of management accounting systems in order to advance strategic decisions.

ABC is a powerful management tool that is provided to respond to minimal impact of cost accounting and traditional industrial management. ABC system preference was since it was found that public costs drivers and cost accounts are more efficient in the calculation of costs and provision of clarity in understanding of the drivers in comparison with the previous systems that sharing based on products generates distorted financial cost in comparison with the costs track by the ABC system. Generality of the ABC system was resulted from the rapid increase in the outputs of all firms (requirements, products, services and customers). This in turn leads to increase complexity in a costing system that included the growth of indirect costs. Creating attraction through quality and managers' rely on the rate of competitors' sale for standardization could not overcome the solution of consumers' demands for use. Many companies need to respond to different customers and to maximize shareholder wealth of the few products Click here to discuss not only increase sales of profitable growth problem As a result of the sale of the business unit. Many companies tended to be multi products in order to meet different needs of the customers and maximize the shareholders property, here the increase of sale is not just discussed, but the business unit's problem of profitability is as a result of the sale. In spite of all the topics, the ABC system is not the only healing elixir of the organization, until recently, management costs should represent management's performance in the field of quality of potential risk services available, so any organization was aware of its costs rule, having a management accounting system like the ABC system is beneficial and efficient for all stakeholders, including employees and customers to stockholders. With the help of study conducted in France, it was determined that the two ABC method used are strategic management accounting tools and the ABC applied in the latter case is more complicated than one used in the former case.

For future research, we tend to conduct investigations in other areas and even we can focus on the relationship between the working members in a sector to describe organizational learning processes. This paper analyzes the strategic management accounting with an instrumental view. We try to show that in the strategic management accounting approach what level of ABC can be applied and we're also going to examine the issue of whether the ABC is a related tool to advance strategies? Also providing an overview of how universities research and adopting new models of cost accounting as activity-based costing and time-driven activity-based costing with focus on the strengths and weaknesses of both approaches to determine which of the two methods is more appropriate.

**REFERENCES**

