

Activity Based-Costing System through three generation: ABC-TDABC- PFABC

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Abstract:

The aim of this paper is to review the most important features, characteristics and shortcomings of three approaches or tributaries of the Activity Based Costing system: ABC, TDABC and PFABC. We reviewed the most important points of each approach, and the contribution of each one in overcoming the shortcomings and constraints of the application of its predecessor. This paper concluded that these approaches constitute three (03) generations of the ABC system because the common denominator is the concept of "activity", and that activities consume resources, even if they differ in dependence on a single cost driver (time) for TDABC or multiple cost drivers for ABC or measure performance by calculating the productivity of each activity (calculating variance on the price of activity). We confirm that the birth of the first generation (ABC) and the second generation (TDABC) in the U.S. environment specifically and the practical applications that accompanied it, contributed to the enrichment and richness of the research field with academic research on this system. However, the birth of the third generation in a different environment has made the debate about it very modest, almost ten years after the publication of NAMAZI' article.

Keywords: activity, cost-driver, ABC, TDABC, PFABC.

1- Introduction:

The cost system is a system that achieves the continuity and sustainability of an enterprise and therefore is indispensable, especially

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in industrial enterprises, and the quality of the cost system depends on two factors: the cost of its application (to the least possible) and its ability to determine the costs accurately.

During a record period of time (from 1988 to 2009), research into cost models or methods of management accounting has come a long way, with the emergence of three generations that have established a major transformation of the concept of cost based on activity and performance.

At present, management accounting literature is full of various discussions and studies on past contributions, various aspects, assumptions, limitations, mainstream scientific surveys and investigations related to (ABC) and (TDABC).

Perhaps the problem faced by researchers in management accounting in the beginning (before the emergence of the ABC), is the search for another system for the distribution of indirect burdens, which ensures greater control over these costs and determines responsibilities.

Traditional systems have been using quantitative distribution keys (imputation rates) such as machine operating hours or direct working hours for the worker (although the relative importance of the direct working component and hence the direct costs generally due to mechanization and automation solutions) has become the issue of the distribution of indirect burdens of importance and the focus of attention of researchers in the area of management accounting.

The research led to the ABC method, which was seen as a revolution in management accounting, because it changed the classical view of the organization as a set of departments or cost centers; the organization is now seen as a wide range of activities (which in turn are divided into a range of tasks). The idea of "activity" was the main idea in this way, as well as the concept of "cost-driver", the measure on which indirect burdens are distributed on various activities.

However, after applying this method, it was criticized, primarily by the high cost of its application, which prompted its owners to quickly revive it by issuing an edited version known as "Time-Driven Activity-Based Costing", and it has also been criticized for applying this method to organizations whose activity can be measured in time as a single "cost-driver", as well as the difficulty of measuring time from one activity to another and sometimes invoking personal discretion.

And based on the criticisms of both methods, a third method (Namazi, 2009, pp. 34-46) emerged in 2009, based on the concept of "activity", which also focuses on the concept of performance in its two dimensions (efficiency and effectiveness), thereby calculating deviations (variances) on activity.

Based on a review of the cost system on the basis of activity by these three generations, we ask the following question:

1- Have all these methods really contributed to overcoming the problems associated with calculating costs at the management accounting level?

2- Is each method contributed to overcoming and resolving problems associated with its predecessor?

3- Is the emergence of the three methods part of what is known as the "diffusion of Innovation (DOI) Theory, developed by E.M. Rogers in 1962"?

To answer these questions, we will review the conceptual and intellectual framework, the origins of each method, the reasons, the circumstances and its merits, as well as the criticisms levelled at it. To draw the most important theoretical and practical additions to these three approaches.

2- Basic concepts related to research:

We will present the most important concepts used in this research:

- Total cost: The total burden represents direct, indirect and integrated cost of "a cost subject", and this total cost is the basis for pricing "cost topics".

- The cost theme: represents the final physical product or service provided to the customer.

- Cost drivers: Caused or limited cost is the resulting cost factor, and is the primary cause of the level or size of the activity. Cost analysis is one that addresses the cause of costs, bearing in mind that the cost-causing occurs before the activity itself.

- The activity: the activity of an element of work to be carried out to complete a project; It's a process that takes time and associated resources. (Jones and Dugdale, 2002, pp. 121-163).

3- First generation: Activity Based Costing (Traditional System)

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First, we note that the Activity Based Costing System (ABC) is originally a modern cost system based on the distribution of indirect burdens on activities (from the perspective that the enterprise in the modern sense is a wide range of activities rather than functions) rather than distributed to sections.

Since the industrial revolution, cost systems have not changed much, and have remained without fundamental changes despite the major technological developments in the world, which in turn have led to a significant development in production processes. In the 1980s, traditional cost systems seemed unable to meet the needs of enterprise-level decision makers. This period and earlier was characterized by growing indirect burdens, which have become an important part of the overall costs of economic enterprises.

At the end of the 1970s, the United States of America went through a political, moral and economic crisis. The "fordism model or system" has experienced a decline in the face of (and for the benefit) of the "Taylorism model" for Japanese industry. Value creation for the customer and shareholder has been highlighted, and the cost-effectiveness of the U.S. environment has been criticized. Some have argued that the U.S. industry crisis is caused by managers neglecting to follow indirect burdens and misspending. Expenditures drain the total cost compared to Japanese products. While well-managed expenses will be key factors for success for modern enterprises.

From the history of accounting, we find that the cost-effectiveness methods used in the United States of America were refined in the early 1920s in the Taylorian environment, which seeks to reduce the burden of the dominant direct labour in the cost structure. Indirect burdens were arbitrarily distributed for the sole purpose of reaching a match with the total amounts of financial accounting.

In the late 1960s and early 1970s, accounting writers focused on the relationship between activity and cost. However, in the 1980s, due to the perceived lack of accounting systems in giving accurate cost information, this relationship focused on more university and professional centers. This consideration was based mainly on three infrastructures:

- The first structure was the new change in the world that took place in different countries, especially Japan, to introduce modern technology and new production machinery.

- The second structure was in the 1980s, with the change in the conceptual philosophy of many corporate managers, as well as productivity, global competition and growth of customer satisfaction, and the main objective of managers was to ensure that product quality was monitored and costs reduced.

The third structure was that some accounting writers had explained the state of new production, the different technological roles and the director's new views. They claimed that traditional industrial accounting systems were responsible not only for the needs of managers but also for the information they had obtained leading to managers making wrong decisions. As a result, these writers attempted to introduce a new system called "Activity Based Costing System".

The ABC model emerged in the mid-1980s (Chea, 2011, pp. 3-10) through several enterprises that have formed case studies at Harvard Business School, such as (John Deere Component Works (A) and (B), Siemens EMW (A) and Kanthal (A)), and through articles by Cooper, Kaplan, Johnson, as well as the book (Kaplan and Johnson, 1987)).

This model is a method of calculating total costs that measures resource consumption by activities, the latter consumed in turn by "cost topics": products, orders or customers. It is based on the Postulate that says: **"Cost topics consume activities and activities that consume resources through cost drivers"**.

Since its emergence at the end of the 1980s, the ABC system has been the subject of many controversies regarding its characteristics, specifically at the level of discourse. The main task of the enterprise's managers is to seek the best possible financial results using the organization's resources. One of the most important tools that managers in the organization can use is cost accounting. Historically, this has been done using standard cost systems. But during the 1980s, the new model (ABC), which was accompanied by some controversy over whether or not it was a new way? One of the reasons for the emergence of this new method is the book of (Kaplan and Johnson, 1987), in which they criticized traditional cost systems. However, the source of this method can be attributed to the articles that "Kaplan" wrote in the mid-1980s.

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One of the reasons for the loss of importance is the change in production methods (Cooper and Kaplan, 1988, pp. 96-103).

Going back to the origin of this system, we find some of the cost calculation methods used by American enterprises in the 1960s, for example, "George J. Staubus" developed a similar theory in the 1970s. But according to "Jones and Dugdale", ABC's actual history began in 1984, the year "Robert Kaplan" was appointed professor of accounting at Harvard University.

At that time, like many researchers, who formed the so-called "Harvard team", who were interested in the decline of the U.S. economy in the face of the Japanese economy and the pressures that American enterprises have been exposed to in an environment marked by a major transformation (Globalization, the information revolution, intense competition, instability), "Kaplan" has also published numerous articles on the subject (Kaplan, 1984) where he criticized traditional accountability for management. The importance that this researcher gave to "field research" brought him on the margins of the "quantitative current" which dominated the American scientific community in the 1980s.

In this context, "Bogdanouiu" confirms that Activity-Based Costing (ABC) is a methodology that produces a bill of activities for cost objects such as individual products, services, or customers by measuring the cost and performance of activities and resources. It provides more accurate cost information than traditional cost accounting systems by recognizing the causal relationships among resources, activities, and cost objects (Bogdanouiu, 2009, p.10).

The ABC system is defined as a tool for managing total quality of cost and measuring the performance of activities, resources and cost of "cost topics" (i.e., products and services) (Chea, 2011, p. 3).

The ABC system is designed on the following assumptions
:(Huang, 1999, pp. 21-27)

- 1- Activities consume resources;
- 2- Services and customers consume activities;
- 3- The system focuses on consumption rather than spending;
- 4- Each resource consumed "driver" is different from the other;
- 5- Activities used in multiple products and services can be assembled;
- 6- There is homogeneity between different cost pools;

7- Costs in these complexes are in a state of permanent change.

3-1. Stages of the application of the Activity Based-Costing system (ABC):

In practice, the application of the ABC system goes through the following steps:

- 1- Identifying activities;
- 2- Identifying the cost drivers;
- 3- Allocation of resource costs to activities;
- 4- Allocation of activities costs to products;
- 5- Calculating the unity cost of the product.

The question is sometimes asked whether the ABC system is an innovation or not?, It is noteworthy that the methodology that has been adopted has borrowed both innovation and marketing theory, and at the same time, we find the answer to this question with "Rogers": "An innovation is an idea, practice, or project that is perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 12). The Activity-Based Costing system (ABC) is an innovation born between 1987 and 1988, the result of parallel actions by the "Harvard Network" with the "Computer-Aided Manufacturing International (CAM-I) network". Two separate networks are behind the ABC method (Jones and Dugdale, 2002):

a- The Harvard Network (Cooper - Kaplan - Johnson)

In 1985, "Robin Cooper", one of Kaplan's colleagues at Harvard, discovered and described in a case study the innovative costing practices in place at "Schrader Bellows". The collaboration, which was very fruitful between "Kaplan" and "Cooper", began in 1986. A year later, independently of "Cooper", "Kaplan" published a case study on "John Deere", similar in many respects to the case "Schrader Bellows"; this is the first reference on what will later be known as the (ABC). Yet according to (Johnson, 1992), the concept of "Activity" in the sense of the (ABC) was first used by "General Electric" in the 1960s.

The first contact between "Kaplan" and "H. Thomas Johnson", a professor at "Portland State University", is older, dating back to 1982 (Johnson, 2002); their cooperation materialized in 1987, the year of the publication of the "Relevance lost: the rise and fall of management accounting". In the final chapters of the book, "Johnson and Kaplan", drawing on their experiences, set out some of the principles of the

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(ABC). Also in 1987, "Johnson" published the results of research on the indirect load allocation system at "Weyerhaeuser" (Johnson and Loewe, 1987 How Weyerhaeuser). Johnson's comments are consistent with those previously made by "Cooper and Kaplan". Members of the "Harvard network" design the (ABC) method based on innovative costing practices observed in U.S. industry. For them, the (ABC) is designed to solve the difficulties faced by traditional management accounting in the face of changes in the environment and the increasing volume of indirect expenses.

b- The CAM-I network

CAM-I (which originally means "Computer-Aided Manufacturing International" and later changed into "Consortium for Advanced Manufacturing International") is a research and development organization involving large industrial groups, U.S. government agencies, public institutions, audit firms, academics and ultimately associations. CAM-I's main concern is the computerization of technological processes and its impact on the functioning of companies what they call AMT (advanced manufacturing technology).

In addition to this vast field of investigation, THE CAM-I launched in 1985 a research project on the cost management system, a three-phase project: conceptual design (1986), systems design (1987) and implementation (1988). This project, which will later prove to be the most successful ever conducted by CAM-I, is entrusted to a working group led by "James Brimson", a consultant. The result of the project is activity accounting, which aims to "measure the cost of resources consumed in the performance of significant business activities" (Jones and Dugdale, 2002, p.132). In 1988, "James Brimson" and "Callie Berliner" published a book describing this method: "Cost management for today's advanced manufacturing: the CAM-I conceptual design". The name adopted by "CAM-I" is activity accounting, but in reality the basis of the method is the same as for the (ABC). The costing system proposed by "CAM-I" emerges on the one hand from developments in the field, particularly in U.S. companies, and on the other hand the ideas expressed by U.S. companies University (In 1988, "George Foster" of "Stanford", "Robert Kaplan", "Robin Cooper" and "Wickham Skinner" of "Harvard",

"Anthony Hopwood" of "LSE" were all members of "CAM-I" (Jones and Dugdale, 2002)).

While the "Harvard network" is relatively dense and its leaders (Kaplan, Johnson and Cooper) are easy to identify, the CAM-I network is larger but also appears to be more diffuse; there is only one character that stands out: "James Brimson", who will publish many books on the (ABC).

After 1992, the two networks disintegrated. Later, at the end of the 1990s, the (ABC) system matured: The process of its deployment has stagnated and the desired results are declining. Because of these factors, this method has become the subject of a real strategy for diversification. Thus, three ways emerged (Derived) (Time driven ABC, Feature costing and MBA), each developed by one of the members of the original networks in collaboration with consultants. There are those who believe that the emergence, dissemination, as well as developments that accompanied (ABC) followed a marketing logic mainly (Zelinschi, 2009, p. 1).

The history of the abbreviated letters of the Activity Based Costing system remains interesting; what we call "three letter acronym" or "TLA", i.e., "three letters for the acronym", is easy to remember, suggestive or meaningful.

In their book: "Relevance Lost: The Rise and Fall of Management Accounting", (Johnson and Kaplan) did not appoint and name the new management accounting method who proposed it this year. In April 1988, (Cooper and Kaplan) called it "transaction costing"; in June of the same year, (Johnson) introduced the concept of "Activity-Based Costing". However, according to (Jones and Dugdale), (ABC) first appeared in the case study of the American enterprise (John Deere), specialized in the manufacture of agricultural equipment, published in 1987. In October 1989, (Cooper) made it the title of one of his articles: "ABC: key to future costs". From the above, the appearance (ABC) and later (TDABC) can be described through the theory of "diffusion of innovations" (Namazi, 2016b, p. 1015). Diffusion is the dissemination of a new idea or an innovative technique through a population.

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3-2. Difficulties in implementing the Activity Based-Costing method (ABC):

In fact, despite the important advantages of this method, many enterprises have found difficulties and problems when using them, especially for complex activities. The four main causes of these problems are: (Bruggeman, Everaert And Levant, 2005, p. 3) (1) The complexity of the models so that the importance remains uncertain, (2) measurement errors for activities, (3) and (4) the time for implementing the method and the difficulties of neutralizing this cost-effective system.

The Activity Based-Costing system (ABC) is designed to reduce the specification errors (customization errors) that we observe when building and designing total cost models. These errors appear when using cost-volume drivers (quota, time, quantity of materials...), if these costs are generated by non-volume activities in fact. Also, this system is designed to minimize assembly errors. There will be more accuracy when more analysis centers and cost drivers are available in order to follow up on resource consumption by products and services.

In addition to criticizing the high cost of this method, it is also criticized for not conforming to GAAP, as it relies on the allocation of some out-of-production burdens such as Research and Development expenses on products, the data in this method are also subjective, difficult to verify and may be inappropriate (Kaplan and Anderson, 2007, p. 10).

"Kaplan" goes so far as to wonder if (ABC) was not accepted 10 years after its emergence: "Despite the attractive value of this proposal, it has not been universally accepted. In an annual survey to adopt management tools, ABC is ranked below average, with only 50% approval as an acceptance rate. For a system that gives companies an insight into the cost and profitability of products, processes, services, and customers..." (Kaplan and Anderson, 2007, p. 10).

But for "Kaplan", the "paradox of this system" is caused by conceptual factors, i.e. those inherent in the (ABC) concept.

4- The second generation: Time-Driven Activity-Based Costing (TD-ABC).

"Robert S. Kaplan and Steven R. Anderson" describe the Time-Driven Activity-Based Costing system under the subtitle "TIME-DRIVEN ABC: AN ELEGANT, MORE ACCURATE APPROACH": "Fortunately, a solution to all these problems with conventional ABC now exists. We have recently devised, tested, and implemented a new approach, which we call Time-Driven Activity-Based Costing. As we will demonstrate, TDABC is a rare example of a free lunch; it is simpler, cheaper, and far more powerful than the conventional ABC approach." (Kaplan and Anderson, 2007, pp. 17-18).

According to "Kaplan and Anderson", the (TD-ABC) system has a number of advantages: (Kaplan and Anderson, 2007, pp. 24-25)

- 1- Easier and faster to build an accurate model;
- 2- Integrates well with data now available from ERP and customer relationship management systems (this makes the system more dynamic and less people-intensive);
- 3- Drives costs to transactions and orders using specific characteristics of particular orders, processes, suppliers, and customers;
4. Can be run monthly to capture the economics of the most recent operations;
5. Provides visibility to process efficiencies and capacity utilization;
- 6- Forecasts resource demands, allowing companies to budget for resource capacity on the basis of predicted order quantities and complexity;
- 7- Is easily scalable to enterprisewide models via enterprise-scalable applications software and database technologies;
- 8- Enables fast and inexpensive model maintenance;
- 9- Supplies granular information to assist users with identifying the root cause of problems;
- 10- Can be used in any industry or company with complexity in customers, products, channels, segments, and processes and large amounts of people and capital expenditures.

The Time-Driven Activity-Based Costing system can be broken down into 6 steps: (Bruggeman, Everaert and Levant, 2005, pp. 6-10)

- 1- Identify the different groups of resources that contribute to an activity;
- 2- Estimate the cost of each resource group;

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- 3- Estimate the normal capacity of each resource group in terms of hours of work;
- 4- Calculate the unit costs of each resource group by dividing the total costs of these groups by their normal capacity into working hours;
- 5- For each activity, determine the time required based on the time drivers and characteristics of the action;
- 6- Multiply the unit costs of resources by the time required to complete the activity.

The interest of the (TD-ABC) model is related to the time estimate (step 5 above). (Kaplan and Cooper, 1998, pp 292-296) had previously proposed to use in the traditional RATE-Based ABC system, the normal capacity of a group of resources (in hours of work), consumed by different activities. From this normal capacity, the resources used were allocated to these activities according to the standard time required (steps 3 and 4 above). What is new about the (TD-ABC) is that the time required to perform each activity is now estimated for each task from the different characteristics of these tasks. The result of these estimates is the determination of "time inducers" to construct "time equations".

The system has also been criticized, although it can be applied in different industries, but this application remains limited to time-measured situations, as it is the only "cost-driver". In addition to time-measuring problems, the process of measuring the time required for each activity is subject to personal or self-assessment.

Furthermore, the cost system based on time-oriented activities suffers from the following shortcomings: (Namazi, 2016b, p. 1017)

- 1- Lack of identifying various activities in the first implementation step;
- 2- Problems associated with determining the practical capacity costs rate;
- 3- Applying a uniform capacity costs rate;
- 4- Managers' time estimation for each activity;
- 5- Determination of unused capacity;
- 6- Lack of data accuracy, and
- 7- Limitations of managerial decision makings.

5- The third generation: Performance-Focused Activity-Based Costing (PF-ABC)

In 2009, "Namazi" introduced the third generation of (ABC) under the label "Performance Focused Activity-Based Costing". This system, unlike (ABC), focuses heavily on "time as a driver", with the choice of "different cost drivers", and has created greater flexibility in allocating costs to activities that are created within the organization.

PFABC is the link point for two systems: the Activity-Based Costing system (ABC) and the Activity-Based Management System (ABM), which confuses indirect cost setting on products and services, with measurement of sections performance independently of each other and creating deviations (variances) of rate, efficiency and volume of production.

According to "Namazi", this system has three advantages: 1) for performance control; 2) to solve some problems associated with TDABC; and 3) to further extend the implications of conventional (ABC) as well as (TDABC) systems. (Namazi, 2009, 36)

Managers should permanently manage two separate accounting systems. One to determine product expenses and the other to control and evaluate performance. Maintaining these systems puts the administration of enterprise in the face of high expenditures as well as many problems. To eliminate this problem, a unified system called a "Performance Focused Activity-Based Costing" (PFABC) has been proposed.

This new system is based on nine-step process for each cost object. (Namazi, 2009, pp. 34-46).

5-1. The first step: identifying major activities:

This phase is similar to the first phase of the conventional Activities-Based Costing system (ABC) that has been neglected in the (TDABC) at its first stage. This stage is necessary for two reasons:

1- The nature and behavior of the costs of each activity are usually different from other activities.

2- It is one of the main components of the ABC system which should be retained in order to continue the administrative production process.

5-2. The second step: Determining actual resources used for each activity

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Workers who run a designed activity can identify the type and quantity of resources needed for each activity, based on behavior or corporate data systems, especially the accounting data system. Resources may include time, quantity of direct materials, or other appropriate measures. But the resource must have a definite relationship with the cost. This creates a lot of flexibility in choosing the capacity of various effective resources. This phase includes identifying the true behavior of the resources that have led to the cost issue in terms of resources: flexible and promised resources. Flexible resources have behaviors such as variable costs and promised resources have behaviors such as fixed costs.

5-3. The third step: Determining actual rate of each resource activity

The actual rate, for each activity in ABC, is determined by the percentage of time for each activity accomplished by individuals. In TDABC, however, only one process cost rate per segment is determined by dividing the total capacity cost used for the practical capacity of the resources used, based on time. In PFABC, actual cost rates are determined separately for each of the company's activities based on different programs through current data systems according to actual data, taking into accounts the resources and behaviors of its costs.

5-4. The fourth step: Cost determination of each activity

In PFABC, the cost of each activity is determined taking into account the resource cost behavior. When the resource is variable costs, the cost of input factors is calculated by multiplying the actual resources used in each activity by the actual price of the resources used.

Actual Cost of Activity = Actual Resource acquired for an Activity x Actual Price of the resource Consumed

$$AC_I = AR_i \times AP_i$$

5-5. The 5th step: Calculating activity's standard rate

We note that this step does not exist in the ABC system and does not exist in the TDABC system, but it is an essential step in the PFABC implementation process. In this step, we estimate the standard rate for each activity. It can be estimated using many techniques such as: internal and external indicators, market mechanism, statistical methods such as regression analysis and time series, work measurement technique... etc.

5-6. The sixth step: Calculating activity price variance

We also note that this step does not exist in the ABC system and does not exist in the TDABC system, where the deviation (variance) of the price of the activity is determined by calculating the actual resources gained for the activity and then multiplying it at the standard price of the resources consumed, subtracting the output from the actual cost of the activity in order to obtain price deviation for flexible resources. Price deviation for flexible resources is determined by comparing actual costs with a flexible budget, where:

$$\text{Flexible Balance (BF)} > \text{Actual Costs (CR)} \Rightarrow \text{favorable variance}$$

$$\text{Flexible Balance (BF)} < \text{Actual Costs (CR)} \Rightarrow \text{unfavorable variance}$$

5-7. The 7th step: Calculating the costs of applied activities

We note that this step is similar in its application to The TDABC system, with the difference that PFABC takes into account two important things: the behaviors of the resources consumed are flexible resources or committed resources.

The cost of flexible resources implemented is calculated as follows:

$$\text{Cost of implemented flexible resources} = (\text{standard resource acquired} \times \text{actual work provided}) \times \text{the standard price of the supplier}$$

5-8. The 8th step: Calculating the quantity variance

This variance is also new, i.e. it is not in the ABC system and is not in the TDABC system. Quantity variance measures performance from an efficiency perspective. Quantity variance shows whether the firm's production manager has used more than the standard amount of resources in real production for a particular or designated product or service.

The quantity variance for flexible resources is determined by comparing committed resources with the budget flexible, where:

$$\text{Flexible Budget (BF)} > \text{Applied Resources (RE)} \Rightarrow \text{unfavorable variance (negative performance).}$$

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Flexible Budget (BF) < Applied Resources (RE) \Rightarrow favorable variance (positive performance).

5-9. The Ninth step: Calculating the productivity of each activity

We finish this last phase, when measuring the productivity of each activity, which the previous models did not provide. Because productivity is measured by the efficiency and efficiency indicators:

The effectiveness variance measures the extent to which pre-planned goals are achieved.

The Efficiency variance measures the efficiency of resource use efficiently, i.e. without waste.

Conclusion:

From the foregoing we conclude the following conclusions:

1- There is a consensus that the traditional cost-calculation system (the conventional system) has proved to be a failure to accurately and fairly determine total costs (in the case of multiple products), because this system uses quantitative distribution keys when distributing indirect burdens on products.

2- Studies have shown that the traditional cost accounting system is the first enemy of productivity because it uses rates to measure the efficiency of internal performance and measure volume deviations, which encourages inventory accumulation, and focused on reducing costs internally, which affects the strategy of continuous improvement.(Graves & Gurd, 1998, p. 36)

3- The ABC's three generations were born, raised, sustained and regressed as a result of the demands of the business environment.

4- The initial application of the ABC system allowed organizations to achieve a competitive advantage by focusing on customers who achieve the highest returns.

5- Studies have shown that the ABC system is applicable in all organizations, especially in those where indirect costs, especially fixed ones, account for a large proportion of the total costs.

6- The extensive use of technology has contributed to the emergence of the three generations of the ABC system.

7- ABC is expensive, complex and difficult to update.

8- ABC neglects unused energy.

9- Despite the many advantages offered by ABC and TDABC, their criticism has been linked to their failure to provide performance databases through two indicators: efficiency and effectiveness.

10- Although TDABC can be applied to different industries, its application is limited to cases where "time" can be used as a single cost driver.

11- The TDABC system assumes that the relationship between the activities and resources consumed is linear, absolute and completely certain. However, in fact, many management decisions such as C-V-P analysis, profitability determination, investment decisions, and product lifecycle are made under certain counting conditions. The prevailing relationship may be nonlinear, ambiguous and uncertain (Namazi, 2016a, p. 473).

12- For PFABC, despite the criticism sought by the system's creator for the two systems or the previous two generations, especially TDABC, it is practical applications that will clarify the problems with its application. To date, the system has not been criticized, nor have statistics been provided on its uses. In our view, the birth of the first and modified ABC system in the U.S. environment specifically and the practical applications that accompanied it contributed to the enrichment and richness of the research field with academic research on the system. The birth of the third version in a different environment made the debate about it very modest, despite the fact that almost ten years after the publication of "Namazi".

13- The three approaches have contributed to overcoming many of the constraints related to cost calculation (indirect burden distribution). Each approach attempted to overcome the problems associated with the application of its predecessor (its predecessors), and provided an important theoretical and conceptual framework, such as bypassing the concept of cost centers, down to the concept of activity, cost drivers, time as a single cost driver, and finally linking the system to the concept of performance by measuring efficiency and effectiveness and calculating deviations on activity. At the operational level, however, the problem of databases and the cost of completing, maintaining and updating these rules remains, in our view, the common denominator of these three contributions.

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14- Finally, we can say that the three approaches fall within the framework of what is known as the "diffusion of innovation theory".

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