Resource Consumption Accounting (RCA): The Challenges and Application Obstacles in the Egyptian Automotive Industry

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Abstract

The field of management accounting is experiencing a punctuated modification toward more advanced methods and practices. RCA is an advanced approach to management accounting which emphasizes on managers as the most important users of the information and provides the best knowledge comparing to traditional management accounting. RCA is described as a system of managerial accounting, which classifies costs as fixed and variable and supports the process of decision making through defining precisely the idle capacity. Besides, RCA combines two costing approaches; activity based costing (ABC) and German cost accounting method known as GPK. The fundamental purpose of this research paper is to point out the possibility of adopting and applying RCA, explain the concepts of RCA, its components and distinguishing features, and identify the challenges and application troubles of this approach in the Egyptian business environment. The main findings of this study are: RCA – to a large extent - is a new technique in the Egyptian business environment and it needs an accurate database to identify the various resources of the company and emphasis on causal relationships between the company's resources and outputs, (2) RCA requires support from top management because any new concept cannot be adopted or applied without top management support physically and financially, and (3) RCA requires revising the organizational values in a company where there is a tendency to resistance that may be attributed to a lack of knowledge of the rules and application policies or fear from the failure in adopting and applying the new practices of management accounting.

Key Words

Resource Consumption Accounting (RCA), Automotive Industry, Egypt

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محاسبة إستهلاك الموارد:
التحديات و مشكلات التطبيق في قطاع صناعة السيارات المصري

ملخص البحث:

شهد مجال المحاسبة الإدارية في السنوات الأخيرة العديد من التغييرات و التطورات تجاه تبني أساليب و أدوات متقدمة لخدمة الإدارة في مجال إتخاذ القرارات. حيث يعتبر مفهوم محاسبة إستهلاك الموارد من أحد المفاهيم و الأدوات الحديثة للمحاسبة الإدارية الذي يؤكد علي المديرين كمستخدمين أساسيين للمعلومات و يقوم بإمدادهم بالمعلومات المفيدة و الدقيقة و ذلك مقارنة بالطرق التقليدية للمحاسبة الإدارية. يوصف مفهوم محاسبة إستهلاك الموارد بأنه نظام للمحاسبة الإدارية حيث يقوم بتصنيف التكاليف بشكل أساسي الي تكاليف ثابتة و تكاليف متغيرة بالاضافة الي إمداد الإدارة ببيانات التكلفة الحقيقية للمنتج أو الخدمة و إظهار بيانات الطاقة العاطلة للإدارة. بالإضافة إلي ذلك ، يدمج هذا المفهوم الحديث بين كل من مفهومي التكلفة علي أساس النشاط و نظام التكاليف المعيارية الألماني. و يتمثل الهدف الرئيسي للدراسة في "*إلي أي مدي يمكن تبني و تطبيق مفهوم محاسبة إستهلاك الموارد و التعرف علي مبادئ و اساسيات هذا المفهوم الحديث في بيئة الأعمال المصرية: خاصة في قطاع صناعة السيارات*". و خلصت الدراسة التطبيقية في مجال صناعة السيارات في مصر الي عدة نتائج أهمها: (١) يعتبر مفهوم محاسبة إستهلاك الموارد – إلي حد كبير – جديد في بيئة الأعمال المصرية و يحتاج بداية إلي عمل قاعدة بيانات جيدة للتعرف علي موارد الشركة المختلفة و المتعددة و ترسيخ التأكيد علي العلاقات السببية بين موارد الشركة من ناحية و مخرجاتها من ناحية أخري ، (٢) يحتاج مفهوم إستهلاك الموارد إلي دعم من إدارة الشركات ماديا و ماليا و معنويا ، (٣) يحتاج مفهوم محاسبة إستهلاك الموارد إلي إعادة نظر في ثقافة التغيير و التطوير و القيم التنظيمية في الشركة حيث أن هناك إتجاه إلي مقاومة من جانب الأيدي العاملة المصرية من تطبيق النظم الحديثة و المتطورة في مجال المحاسبة الإدارية حيث قد يرجع هذا إلي عدم معرفة قواعد و سياسات التطبيق أو الخوف من الإستغناء عن الأيدي العاملة الحالية علي إعتقاد أنها غير مؤهلة لتطبيق النظم و الأدوات الحديثة للمحاسبة الإدارية.

الكلمات المفتاحية:

محاسبة إستهلاك الموارد – صناعة السيارات – مصر

1 – Introduction

Numerous cost and managerial accounting systems have been developed since 1990s as a consequence of the deficiency of the conventional accounting systems in order to adapt with a number of ongoing production developments such as technological improvements, cost structure changes, and the emergence of lean thoughts (Okutmus, 2015). Likewise, several studies have pointed out that up to 80% of firms continue to use conventional production costs approaches, in spite of that several cost and management accountants in these firms articulate discontent with relying on the consequences of their managerial and cost accounting systems (Perkins and Stovall, 2011; Wynn et al , 2013). Thus, the management accounting profession is seeking to develop the tools and information for planning, monitoring and controlling enterprise performance and effective decision support. Besides, the fundamental goals of management accounting system are: computing product costs, determining the consequences of product's profitability, and controlling budgets and costs (Cokins et al, 2012). So, several management accounting techniques and tools have been launched so as to assist managers in determining the product cost. ABC is considered the most well-known management accounting practices which focuses on the firm's activities and the costs of such activities. Another techniques: time-driven ABC (TDABC) (Wegmann, 2008) which was introduced to address the defects of ABC approach, TDABC focuses on the per (time) unit cost of all possible activities. As well, the theory of constraints (TOC) is an advanced technique to handling costs and improving quality through dealing with firm's constraints in a proper manner. Furthermore, TOC creates a particular approach to cope with such constraints to reinforce the objectives of constant enhancements (Abbas, 2015).

Along with the prior techniques, there is quite a lot of management accounting techniques that have been established during the last two decades (*for instance*: activity–based management (ABM), activity–based budgeting (ABB), value chain analysis, time driven ABC (TDABC), Resource Consumption Accounting (RCA), target costing). Another challenge for next generation cost management system is RCA (Wynn et al, 2013). RCA emphasizes the per unit cost of the resources that are involved in process execution and emphasizes the resource perspective and determines the over/under utilization of resources. The rest of the research paper is designed in the succeeding order: section two reviews the literature related to RCA and quite a few aforementioned studies of applying RCA in different dimensions, section three gives a brief overview about the automotive sector in Egypt, section four outlines the research limitations, section five develops the research hypotheses, section six indicates the research methodology, section seven addresses the analysis and discussions, section eight sketches the cofactors for the success of RCA implementation, and finally section nine displays concluding remarks and several recommendations for future research.

2 - Literature Review

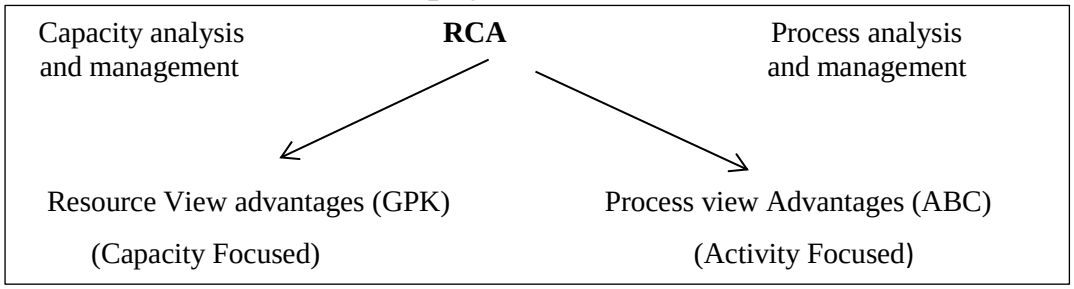
There are a number of critics that have been directed to the conventional costing models. These models do not handle the available cost information because they are constructed on streamlined suppositions of cost behavior, and they are planned to handle restricted obtainability of data (Tse and Gong, 2009). Accordingly, such models are not applicable particularly in a dynamic business environment which has more variability in outputs. Furthermore, some survey studies have been conducted to shed the light on the degree of precision of cost data. IMA & Ernst and Young (2003) have organized an applied survey and they found out that ninety eight percent of managers consider the cost information is distorted whereas approximately forty percent think their cost information is extensively misrepresented. Thus, Polejewski (2009) indicated that there is a crucial necessity to a contemporary solution that can develop the process of decision making. Hence, practitioners and academics in the field of management accounting are adopting several tools in the last two decades; such as Lean Accounting, ,ABC, ABM, ABB, and TOC, but none of these have been broadly accepted to support the decision making process. RCA is a developing technique that merges the most essential practices that can accomplish numerous aims instantaneously, it is our research scheme.

Several contemporary studies have reviewed the unique features of RCA (Rahimi et al 2014, Perkins and Stovall 2011, Grasso 2005, Tse and Gong 2009, Bhatt 2014, Inanlou et al 2014, Polejewski 2009, Clinton and Webber 2004). Consistent with Rahimi et al (2014), RCA commences in German cost approach known as GPK (GrenzPlanKostenrechnung) which focuses on identifying resources in an organization and real stream among resources for accurate cost finding of products. RCA merges the benefits of ABC and GPK. Moreover, RCA is described as an energetic, combined, thorough management accounting technique that provides accountants and managers with useful information for achieving organizational targets. GPK has been applied to control the operations in 3000 German firms, and it emphasizes on actual flow of product, and in this way tries as far as possible to recognize the actual flow between resources and products, and to avoid any unreasonable allocation. Also, Bhatt (2014) pointed out that RCA is a system that can support the decision making process which eases the product cost calculation by merging the notions of GPK with broadly accepted ABC system, it picked up force after emersion of ERP (Enterprise Resource Planning) systems which operate with the help of latest computer languages and have composite module working facilities to capture and process data in all functions of an organization. In addition, Bhatt (2014) drew attention to fourteen features of RCA method, for example; a product does not accept a share of cost from support functions which was commonly incurred for various products, it recognizes causal relationship between support functions and the objects which consume the services of such support functions, the innate nature of cost elements recorded in resource pool may be fixed or proportional or both, theoretical capacity (installed capacity) of plant is considered as a basis for fixed cost assignment to the products, and variable cost as known in conventional cost accounting system is termed as proportional cost in RCA (for additional details about the remaining of RCA features, Bhatt (2014, pp.3-4). Additionally, Perkins and Stovall (2011, p.47) said that *"classification of resource*

consumption as fixed or proportional may require a significant amount of judgment, but once a cost is classified as fixed, it remains fixed for monitoring purposes. However, resource costs that behave proportionally to the output of a supplying resource may be reclassified if consumed in a fixed manner. For instance, while labor may typically be viewed as a proportional cost, labor that is consumed in a fixed quantity for training should be classified as fixed". In other studies, Tse and Gong (2009) and Van Der Merwe and Keys (2002) explained that identifying the waste resources in RCA models simplifies improvements and preservation of cost management systems through streamlining the analysis of cost analysis.

As revealed previously, RCA could amalgamate the advantages of GPK with the benefits of ABC. Grasso (2005) cited that ABC starts with the basis that companies use resources and sets up the costs to carry out activities through particular steps; recognize the firm's activities, allocate the costs of resources used to execute the activity to the activity cost pool either by direct attribution or indirectly using a resource driver, and allot costs from the activity cost pool to products based on an activity cost driver. On the other hand, Mackie (2006, p. 35) pointed out that "*GPK has resources consumed as the focal point of the analysis. Capacity, consumption, planning, and control all focus on the firm's resources – not the activities performed. Correspondingly, resource pools are created based on resource features, and then these resource pools are driven to cost objects based typically on very distinct units, such as hours or minutes spent*". Figure 1 displays the merge between ABC and GPK so as to construct a new technique (RCA) which can capture the advantages of resource perspective and activity perspective.

Figure 1
Philosophy of RCA



Resource: Rahimi (2014)

In the same context, Wegmann (2010) argued that the ABC method is not abundant so there is a crucial need for another approach to allocate the resources; RCA helps the firm provide a deeper analysis of resources which fulfill the ABC targets. Moreover, there are a variety of resources in the complex organizations, so resources created from various divisions from the firm are grouped in many resources pools. In this way, RCA leads to allocating the resources to the firm's activities easily and efficiently. Wegmann (2010) has concluded that RCA allows an in-depth recognition of the processes' allocation which assists managers obtain a good understanding of the consequences of their regular and strategic decisions. Further, Bhatt (2014) pointed out that the basic assumption of RCA is like ABC to analyze activities and measure

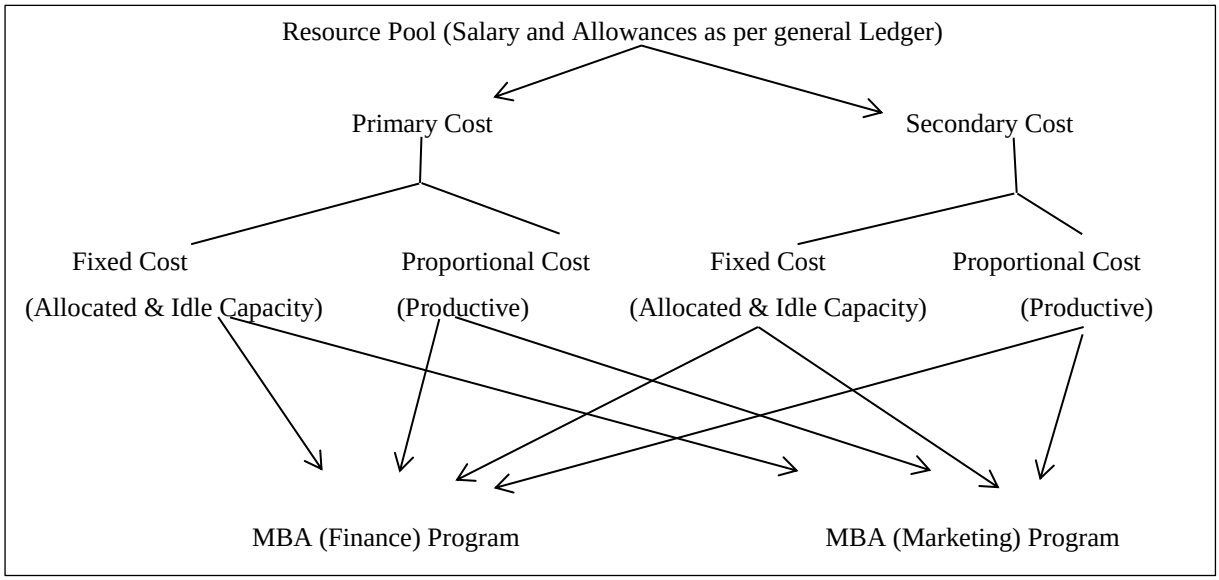
resource consumption in those activities, yet it goes further by modifying existing concepts in that it considers replacement value of assets resources for depreciating them; also it relates all fixed nature costs to installed capacity rather than absorbing them on actual production quantity as it considers fixed costs as capacity costs. As well, Bhatt (2014) indicted that there are similarities between ABC and RCA but the fundamental difference between the two is the identification of useless and inactive resources (generally called: idle resources). Also, Tse and Gong (2009) have revealed while ABC help managers eradicate the activities that do not add value to the firm through using the useful information of resources, it provides little insights on how value-added activities can be controlled. TDABC and RCA techniques provide indispensable and helpful information concerning the idle resources.

To fully grasp of the RCA philosophy, Polejewski (2009) addressed three major principles; the first principle is view of resources. RCA emphasizes on operative costs and resource utilization, and selected cost centers which can reflect this, RCA technique uses additional cost centers than conventional cost and managerial accounting systems. The second principle of RCA is the quantity-based model; RCA creates more precise consequences as an analytical model by manipulating quantitative relations based on causality. Lastly, the last fundamental basis in grasping RCA is the nature of costs. RCA divides costs in accordance with the behavior of such costs, while the traditional costing approach (namely: normal costing system) considers all costs are variable. Subsequently, splitting the variable costs from the fixed costs helps point out idle capacity and provides managers with such information in order to consume unemployed resources which enhances the decision making process.

In the accounting literature, there are some studies that have been conducted in order to address the degree of implementing RCA and other cost systems. For instance, Abbas (2015) carried out a study in a number of manufacturing businesses in Egypt; there are 385 questionnaires have been received. The consequences of this study revealed that the existing cost systems in manufacturing companies in Egypt may be organized in descendent like this: ABC, target costing approach, RCA, ABM, other systems, TOC and value chain analysis. In another study, Abbas and Wagdi (2014) have performed a survey to imply the competitive study between ABC and RCA systems. They demonstrated that RCA can achieve various advantages: it provides an obvious vision about the causal relationships among resources, it also answers the perpetual debate about variable and fixed costs and their usage in the decision making process and it also highlights direct insight into resource capacity management. Likewise, they explained the contrast between ABC and RCA from numerous perspectives encompassing: objective, causality in cost assignment, resource interrelationships, dealing with variability, changing nature of cost, capturing complexity, isolation of unused capacity, and finally cost assignment and capacity cost rates. To conclude, this study settled that there is a considerable distinction amongst adopting cost systems (ABC, RCA, and more systems) in the manufacturing businesses in Egypt, the application percentage of RCA (5.3%) is less than the application percentage of ABC (56.7%) and other costing systems (38%) in the Egyptian manufacturing firms.

Moreover, there are several studies attempted to adopt and put into practice RCA in a variety of businesses. Okutmus (2015) has scrutinized the functioning of RCA with cost dimension and an application in a Glass Factory, this study introduced the application of RCA in a glass production management through determining the main resources: salary & prices, amortizations, electricity & water, and indirect material & equipment, and then collecting the resources in three cost pools: labor resource pool, machine resource pool, and indirect material & equipment pool. Then, the costs assigned in the resource pools are distributed to the activities of clipping, montage, disinfection, and quality control. The costs assigned in the activity pools are loaded on cost objects with production amount and time clock factors. Other studies have argued the application of RCA in the educational institutes (Ahmed and Moosa, 2011; Wang et al, 2009). The latter study found out that RCA merges the theoretic benefits of ABC and empirical gains of GPK, but the practical meaning should be stressed. Besides, the application of RCA in college education cost accounting can more exactly account the indirect cost of college, and RCA could adapt to the features of college such as several "product" sorts and complex "production and management" activity, and fulfill the multi-layered demands of financial information for college, and offer a broader road for the college accounting. Even though, the execution of RCA is still in the initial stage, but because of the advantages of RCA, it will certain acquire abundant outcomes for the college education cost accounting. Alternatively, Ahmed and Moosa (2011) depicted the process of allocation of costs under RCA in an educational institute as illustrated in Figure 2.

Figure 2
Cost Allocation through RCA



Source: Ahmed and Moosa (2011)

Alternatively, Elmaci (2014) attempted to scrutinize the Balanced Scorecard (BSC) model integrated with RCA which assists in evaluating the firm as matrix structure in its all divisions. This model intends to measure how much tangible and intangible assets

contribute to the firm, how effectively, actively, and efficiently these assets are used, and it measures viable competency of the company. Moreover, because of the effect of tangible and intangible assets of the firm on the performance in mathematical statistical methods is unsatisfactory, the proposed model is targeted that RCA method integrated with BSC model is based on matrix structure and control models. Webber and Clinton (2004) have tried to apply RCA at Clopay Plastic Products Company which started with the construction of flowchart that maps the interrelationships among production and support departments, product costs, and common fixed costs. During this process, RCA principles are used to determine costs attributable to specific resource pool. To construct an RCA model appropriately, managers must understand all resource interrelationships. Resource-pool construction focuses on grouping the costs of similar resources in a certain area of responsibility. GPK commonly refer to such an area of responsibility as a cost center, which could comprise one or more resource pools. Besides, this study also stated several RCA benefits including: product costs included only the cost of resources used, the amount of idle capacity was made visible to mangers based on unconsumed theoretical capacity, and cost assignment based only on causality eradicated costs that were formerly assigned based on unrelated changes to other products. (For additional RCA benefits, Webber and Clinton (2004), p. 12).

3 - The Automotive Industry in Egypt

According to Hamza and Zaher (2012), the Middle East is one of the regions with the highest request for vehicles with a high car per domestic ratio. This is primarily attributed to the high income standards and the economic prices of energy in the Gulf area where approximately all the demand is met through imports. Consequently, the market is open and highly competitive to capitalize on this demand and manufacture high standard cars that meet the quality required. So, numerous countries in the region already started to predict short term and long term opportunities in this sector; namely, Iran and Qatar. With regard to this sector in Egypt, the industry was already growing in the early 1980s and the automotive plants continued to augment to more than 15 assembly plants for cars, buses and trucks (Kara, 2015). Accordingly, this attracted investments that have now exceeded US 5 billion. In order to support the enormous auto component sector, there are over 250 factories that supply many of the parts required in the automotive industry for vehicles of all types, presently providing 70% of all components.

Additionally, Hamza and Zaher (2012) argued that the automotive sector in Egypt made an indispensable contribution to the economy. It makes up 3.7% of Egyptian manufacturing output and 1.8% of manufacturing employment. Hereafter, changes in trade policy in this sector can have a substantial influence on the entire economy. As a consequence, the government plays a pivotal function in deciding and organizing its enlargement as it possesses a great possibility of attractiveness. Similarly, the country should give support for local manufacturers to intensify local production. Finally, the auto industry in Egypt holds a highly professional competence of engineers and skilled labor. It has huge production facilities and plants, a big part of which is idle because of either the shortage of capital or the mismanagement. In order for the country to become a future image in the industry, Egypt should exploit its strengths and deliberately handle

its deficits. Because of the significance role of this sector in the Egyptian economy, the current study is addressing the likelihood of developing such sector through adopting and applying RCA technique as a contemporary management accounting trend in the Egyptian business environment along with drawing attention to the drawbacks and threats of carrying out this technique.

4 - Research Limitations

This study focuses on the possibility of adopting and applying RCA in the Egyptian automotive industry for numerous reasons: this technique – to a degree – is contemporary in the Egyptian business environment, it is focusing on cost reduction, stressing the idle resources, attaining continuous improvement which is very crucial in the Egyptian industries, and finally it is a comprehensive technique that achieves several objectives simultaneously. Besides, the current study is not focusing intensely on the organizational, behavioral, ethical, and regulatory features behind RCA rather it is emphasizing the accounting aspects of RCA due to time and resources restrictions**.**

5 – Research Hypotheses

There are a number of hypotheses that can be suggested in this research paper according to the literature review addressed above regarding to the main pillars of the research: view of resources, quantity-based modeling, and cost behavior.

H1: Firms that adopt a comprehensive view of resources are more likely to operate and fulfill RCA.

H2: Firms that apply the causality relationship between resource consumption and cost objects based on amounts are more likely to develop and apply RCA.

H3: Firms that recognize unused resources and determine the idle capacity are more likely to accomplish the philosophy of RCA.

H4: Firms that have a management support to the contemporary management accounting techniques are more likely to develop and achieve the objectives of RCA.

6 - Research Methodology

6.1 - Sample

In accordance with the research limitations, the current research is seeking to determine to what extent the automotive industry in Egypt be familiar with and applies RCA and what are the challenges and hindrances of applying such management accounting technique. Accordingly, the sample (thirty respondents) was selected from three segments of the automotive sector in Egypt which represent the target respondents; the production managers, the management accountants, and one member from the senior management (if available). Moreover, there are two criteria that have been used to select such respondents: (1) they are working in a firm which its employees should be between 80 and 100. (2) Those respondents should have experience not less than five years in their fields.

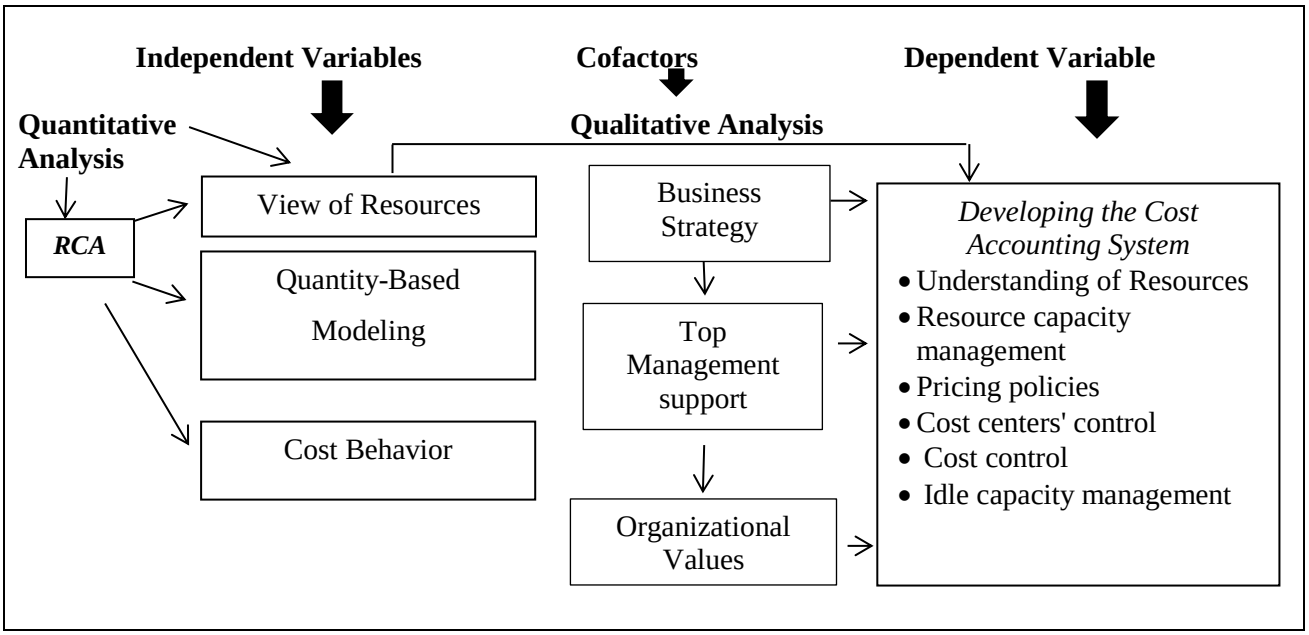
6.2- Method

The fundamental research idea is "*Has RCA been understood and applied in the automotive industry in Egypt along with to what extent adopting RCA could contribute in augmenting the cost accounting system in such sector*". Consequently, the research approach is a combination between deductive and inductive approaches; (1) the research is attempting to scrutinize the extent of understanding the RCA principles through conducting a survey as a research strategy in the automotive industry in Egypt (*Deductive Perspective*). Alternatively, (2) the study is seeking to determine the pivotal influence of adopting and applying RCA on the cost accounting system (*Inductive Perspective*). Besides, the survey depends on a questionnaire that was developed to collect data from the sample stated above. To develop the questionnaire, a pilot study was planned to revise and/or eliminate the number of variables and questions, the comments and feedback were collected from academics (especially managerial accountants and financial accountants) and few specific managers. As a result, minor modifications were fulfilled on the questionnaire such as deleting a number of variables (principally related to reducing the cofactors to become three) and reducing some unessential questions so as to focus on the basic idea instead of collecting excessive and unnecessary data. Furthermore, the questionnaire contained six sections; three for the RCA principles (view of resources (VR), quantity-based modeling (QBM), and cost behavior (CB) along with three sections for the cofactors; business strategy (BS), top management support (TMS), and organizational values (OV). The questionnaire is also constructed based on a five-point Likert scale to assess the degree of application for each item. The scale was ranged from 1 to 5 where 1= strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree. Moreover, designing the questionnaire avoided direct and superficial questions such as "Do you know RCA? Do you apply RCA? , Or do you have problems in adopting RCA?" Instead it recorded the characteristics that portray the technique because the firms could possibly apply the technique partially or indirectly without being aware of that. In addition, there are a few informal interviews that have been conducted with some accountants and managers on the sidelines of questionnaire data collection.

6.3- Model

Figure 3 portrays the basic conceptual research model which incorporates the independent research variables (three principles of RCA), the dependent research variable (Advancing the cost accounting system), and a number of selected cofactors that should be taken into concern when scrutinizing the influence of adopting and applying RCA on the cost accounting system as they have an enormous influence on the success or failure of the main research relationship (business strategy, top management support, organizational values). Finally, SPSS program is used to analyze the relationships between variables. As illustrated in figure 3, the model has two perspectives; the study examines the principles and pillars of RCA quantitatively through studying the mean ranks and Friedman tests. On the other hand, the study highlights qualitatively the impact of RCA principles on developing and intensifying the cost accounting system.

Figure 3
The Conceptual Research Model



7 - Analysis and Discussions

This section argues the empirical research results through enlightening the results focusing on mean ranks and Friedman test that were used to measure the relative significance for each item from the basic research variables along with scrutinizing the influence of cofactors on the major research relationships (*quantitative perspective*). Besides, this section undertakes the impact of emphasizing and manipulating the fundamental pillars of RCA on developing the cost accounting system (*qualitative perspective*) from various viewpoints.

7.1 - View of Resources (VR)

Numerous questions were offered to the respondents in the chosen sample from VR1 to VR5 regarding the view of resources as exhibited in table 1. So, the mean ranks and Friedman test concerning VR are displayed in table 1.

Table 1
Empirical Results: View of Resources (Ranks and Friedman Test)

Ranks			
Symbol	***Element***	***Mean Rank***	***Std. Deviation***
VR 1	Your firm identifies a comprehensive view of resources (Equipment – Material – Employees ……etc.).	**2.43**	**.626**
VR 2	In your firm, the cost accounting system uses limited cost centers.	**2.10**	**.507**
VR 3	There is a classification of activities in your firm into three sorts; productive, non-productive, and idle.	**1.87**	**.498**
VR4	In your firm's accounting system, there is a relation between the resources and the cost objects which consume the resources.	**3.63**	**.571**
VR5	The managers of your firm could obtain a better understanding of their strategic decisions according to the detailed analysis of firm's resources.	**4.97**	**.556**

Test Statistics (Friedman Test)				
N	***df***	***Chi-Square***	***Asymp.sig***	
30	4	93.271	.002	

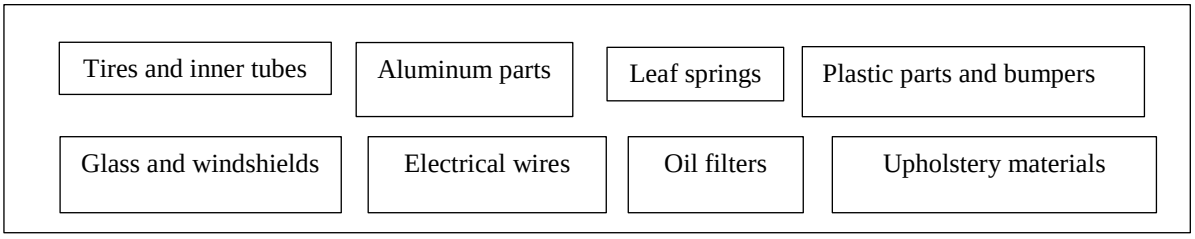
As exhibited in table 1, the significance level is (*0.002*) which means that there are meaningful variations in the relative importance regarding the questions that were presented to the respondents. In table 1 it can be seen that the respondents awarded an indispensable emphasis on acquiring the detailed information about the firm's resources which leads to a better understanding of the decision making process (*highest mean rank 4.97*), Cokins et al (2012) indicated that management accountants should consider only those estimates and approximations of the costs that are appropriate to the process of decision making. So that managers could have an improved grasping of the outcomes of the short-run and long-run decisions. In addition, the outcomes drawn attention to the crucial role of articulating a wide-ranging view or resources (*mean rank 2.43*) as it considered foundational to RCA, resources (for instance: the human resources, financial resources, material resources) generate the firm's processes/activities and supplementary productions in the firm (which proves – to some extent- hypothesis 1). Consequently, resources serve as the primary source of costs and provide mangers with a vision into capacity, utilization and resource efficiency. In the same context, Rahimi (2014) emphasized that there is a pivotal necessity for obtaining a broad understanding of the different resources available in an organization and the relationship between their consumption together with constructing a framework for resource capacity management. Otherwise, the selected sample should perform enormous efforts so as to classify the activities in the company into three groupings; productive, non-productive, and idle as it took lowest mean rank (*this item has taken the lowest mean rank 1.87*).

The impact of VR on developing the cost accounting system

Establishing a comprehensive view of resources helps provide the cost accounting system with all available resources and their relationship with the activities/processes which result in setting up an apparent image about the resource structure in the company. Besides, Polejewski (2009) pointed out the RCA approach develops several cost centers than conventional accounting methods and each cost center's resources must be identical and must be the responsibility of only one manager which upgrades the responsibility accounting philosophy within the firm. In addition, RCA could provide information about firm's resources, marginal cost information, surplus unused ability, and departmental resource use rate for the decision-making such as cost management or higher layer policies. Lastly, the firm should perform enormous efforts to categorize its activities into productive, non-productive, and idle. This sorting assists recognize the resources that are not involved in the production process so no idle resources/costs could be assigned to the final products.

In Egypt, the significance of the auto industry stems from its support of a huge base of labor-intensive feeder industries that embrace almost every sector in economy. By law (a Ministry of Industry Decree 192), the local content in assembled vehicles must be at least 45% for passenger cars and 70% for trucks and buses (Yehya, 2013). To meet with domestic substance conditions, there are several vehicle elements were progressed in the domestic marketplace and are now being produced in Egypt at close to the global criterions. These components are exhibited in figure 4. Subsequently, view of resources (VR) has become very indispensable in the Egyptian automotive industry particularly after taking the responsibility of manufacturing various components in the local market. Thus, Egyptian automotive firms should depict a comprehensive vision of their resources (*including financial resources, material resources, and human resources*) and classify such resources into three groups; productive, nonproductive, and idle in order to facilitate augmenting the effectiveness of productive resources, restructuring the nonproductive resources, and decreasing/ignoring the idle resources.

Figure 4
New Components Made in the Egyptian Local Automotive Market



Resource: Yehya (2013)

7.2- Quantity-Based Modeling (QBM)

Four questions were proposed to the respondents in the selected sample from QBM1 to QBM4 concerning the quantity-based modeling (QBM) as explained in table 2. Accordingly, the mean ranks and Friedman test regarding QBM are illustrated in table 2.

Table 2
Empirical Results: Quantity-Based Modeling (Ranks and Friedman Test)

Ranks			
Symbol	***Element***	***Mean Rank***	***Std. Deviation***
QBM1	Your cost structure is constructed using operational quantities.	**1.50**	**.479**
QBM2	The causality between resource consumption and cost distribution is determined according to amounts.	**1.65**	**.547**
QBM3	In your firm, there is a clear distinction between primary costs and secondary costs.	**3.17**	**.466**
QBM4	Your cost accounting system provides resource capacity management.	**2.83**	**.504**

Test Statistics (Friedman Test)				
N	***df***	***Chi-Square***	***Asymp.sig***	
30	3	82.609	.023	

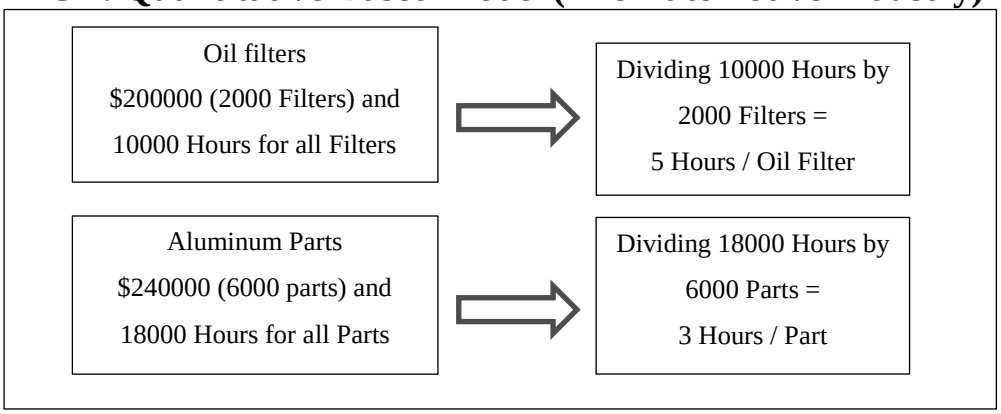
As exposed in table 2, the significance level is (*0.023*) which means that there are imperative variations in the relative importance regarding the questions that were presented to the respondents. In table 2 it can be observed that the respondents did not focus on the causality principle which formulates the relationship between resource consumption and cost objects based on amounts (*this outcome is exposed in table 2 in QBM1 and QBM2, which took mean rank 1.50 and 1.65* respectively). Furthermore, the outcomes in QBM1 and QBM2 are much synchronized with the outcome in QBM4 (*mean rank is also not high 2.83*). These consequences go against the crucial pillar of RCA (and also do not support hypothesis 2) as it is constructed in accordance with quantities that allow managers to motivate input price changes independently, attain predictive consequences that merge projects utilization factors and anticipated input prices, and support resource capacity management. In this context, Ahmed (2010) and other studies have pointed out that RCA approach is structured by using operating amounts, operating information is the basis to create value and the prominent needle of economic consequences. Moreover, this principle - causality principle - requires the modeling of flow of funds and costs which the resources are related in a way that reflects cause and effect relationship in producing cost and effect relationships of tangible and intangible values (Elmaci, 2014).

The impact of QBM on developing the cost accounting system

Creating the relationship between resource and cost object on the basis of quantity which is consumed by the cost object or product assists develop the cost accounting system from an assortment of perspectives; predicting the cost of future jobs, identifying the idle capacity in the firm in order to avoid it when calculating the product

cost, providing managers with precise and helpful information for pricing decisions, managing the cost center effectively, avoiding the weaknesses of normal costing system which focuses on the value relationships, and facilitating the comparison between planned and standard quantities. Also, quantity based modeling in RCA could assist managers in ascertaining and manipulating the principles of resource capacity management throughout supporting accurate, useful, dependable, and applicable information regarding the outcomes of each stage in the value stream. Likewise, quantity based modeling plays an essential role in the planning process through smoothing the formulation of numerous budgets such as raw material budget, labor budget, and overhead budget. Lastly, Wang et al (2009; p. 84) said that *"RCA is the cost distribution method based on measurement, and all resource consumption and activity consumption in RCA have quantitative standards which can be measured only, that can qualitatively illustrate the causality between resource consumption and cost distribution"*. In the Egyptian automotive sector as stated previously, there are various components that should be locally manufactured in accordance with the governmental policies and decrees (*as revealed in figure 4*). By using quantitative relationships based on causality, RCA yields more accurate outcomes as an analytical paradigm. The current research is attempting to apply the quantitative-based model principle on some new components made in the Egyptian local automotive market as illustrated in Figure 5. (*Hypothetical amounts*)

Figure 5
RCA: Quantitative-Based Model (The Automotive Industry)



This idea of this figure has been obtained from Polejewski (2009)

If the firm uses normal costing system, the total cost of oil filters are $200000, and then divided this cost by 2000 filters, the end result is $100 per oil filter. The same with the aluminum parts, the end result is $40 per part. These dollar relationships will be used to contrast tasks and cost forthcoming tasks, these dollar relationships are not precise and can lead to undependable and erroneous decisions (Polejewski, 2009). In contrast, adopting and applying RCA quantitative based model permits firms to calculate how many hours required for producing one oil filter and one aluminum part as suggested in figure 5. For the oil filter, dividing 10000 hours by 2000 oil filters, this computation yields 5 hours / oil filter. Similarly, dividing 18000 hours by 6000 aluminum parts, this leads to 3 hours / part. The same calculations can be executed not

only on components stated in figure 4 but also on all components in the Egyptian automotive industry. To conclude, applying quantitative based model could achieve quite a lot of gains; reliable information for a decision making process, accurate control on cost centers, constant practice for responsibility accounting, precise computation for the job order / process costs, and explicit prediction for identical future jobs.

7.3 - Cost Behavior (CB)

Various questions were offered to the respondents in the chosen sample from CB1 to CB5 regarding the cost behavior as shown in table 3. Hence, the mean ranks and Friedman test concerning CB are offered in table 3.

Table 3
Empirical Results: Cost Behavior (Ranks and Friedman Test)

Ranks			
Symbol	***Element***	***Mean Rank***	***Std. Deviation***
CB 1	Your firm adopts the normal costing system instead of actual costing system.	**4.98**	**.5632**
CB 2	There is an accurate distinction between variable and fixed costs and their use in decision-making process.	**3.43**	**.5713**
CB 3	Your accounting system uses a replacement cost rather than historical cost to calculate amortization.	**1.88**	**.5040**
CB4	The accounting system in your firm adopts a multiple margin P&L.	**2.18**	**.8366**
CB5	Your accounting system identifies unused resources and calculates precisely the idle capacity.	**2.52**	**.7119**

Test Statistics (Friedman Test)				
N	***df***	***Chi-Square***	***Asymp.sig***	
30	4	84.683	.012	

As portrayed in table 3, the significance level is (*0.012*) which means that there are imperative variances in the relative significance concerning the questions that were given to the respondents. In table 3 it can be remarked that the respondents have highlighted the vital role of normal costing system on administering costs in the sample (*highest mean rank 4.98*) which contradicts with the RCA approach. RCA separates costs into variable and fixed and states that nature of cost items may change in various resource levels, in other approaches the pattern of cost items is not investigated in resource level (Rahimi et al, 2014). What's more, in RCA model costs are broken out at each resource pool into fixed and proportional, and separate rates and drivers are used to assign costs from each resource pool. Instead, the respondents gave adequate significance to the role of RCA in recognizing and coping with the unused capacity (*mean rank 2.52, which verifies slightly hypothesis 3*), in RCA the cost of idle capacity is in the area of responsibility of a person or a particular level and is not assigned to products. But in other techniques because of lack of capacity identification this cost is

not assigned to a specific person or level and is divided between products or other cost objects. So, as capacity analysis in this method is easier than other methods and due to the visibility of idle capacity in RCA, there is the possibility of accounting for unused capacity (Rahimi, 2104; White, 2015; Polejewski, 2009*).*

The impact of CB on developing the cost accounting system

Classifying costs into variable and fixed helps managers in the process of cost management that can explain activities in the short-run and long-run planning and control of costs. Also, cost behavior is based on theoretical capacity of resources, which provides insight to make the unused capacity visible. RCA can assist managers in eliminating fixed cost distortions due to the distinction between variable cost and fixed cost. Additionally, establishing cost behavior structure in a firm assists managers to simply highlight various types of variances and carry out corrective actions to manage such variances. Further, a detailed cost behavior provides managers with reliable, useful, relevant, and accurate information to help managers undertake a number of decisions including accepting or rejecting special orders, make or buy decisions, pricing decisions, and other short-run or long-run decisions.

8 - The Vital Role of Cofactors in the Success of RCA Application

8.1 - Business Strategy (BS)

A few questions were presented to the respondents from BS1 to BS3 to measure the type of business strategy that fulfilled in the selected sample as shown in table 4 which indicates the mean rank and Friedman test.

Table 4
Empirical Results: Business Strategy (Ranks and Friedman Test)

Ranks				
Symbol	***Element***		***Mean Rank***	***Std. Deviation***
BS 1	Your business strategy depends on balancing between the product benefits and product costs for the customer.		**1.35**	**.4611**
BS 2	Your company focuses on design or brand image, technology, features, customer services.		**3.00**	**.6064**
BS 3	Your company depends on a cost reduction strategy.		**1.65**	**.7914**
Test Statistics (Friedman Test)				
N	***df***	***Chi-Square***	***Asymp.sig***	
30	2	50.108	.003	

As illustrated in table 4, the significance level is (*0.003*) which means that there are imperative variances in the relative significance concerning the questions related to the business strategy. Consequently, the section of mean ranks confirmed this outcome which exhibits the mean ranks for the listed questions are different; from the table 4 it can be noticed that the respondents are stimulating the differentiation strategy as a

business strategy that will be very appropriate with the trend of adopting and applying RCA approach (*as shown in table 4, the highest mean rank is for BS2, 3.00).* Accordingly, the differentiation strategy is a proper strategy for the firms that adopt and apply the principles of RCA because it concentrates on the cost value of the product against other comparable products on the market; it generates a distinguished value amongst customers and potential customers. Also, RCA depends on the perfect handling of resources to save costs and introduce products without idle resources, so RCA is very adequate with the differentiation strategy that emphasizes on value highpoints the cost savings or durability of a product in comparison to other products.

8.2 - Top Management Support (TMS)

Various questions were offered to the respondents from TMS1 to TMS3 as displayed in table 5 which shows the mean ranks and Friedman test.

Table 5
Empirical Results: TMS (Ranks and Friedman Test)

Ranks				
Symbol	***Element***		***Mean Rank***	***Std. Deviation***
TMS 1	The top management in your company tries to adopt and promote a culture of wise consuming of resources		**1.98**	**.5085**
TMS 2	The top management in your company prepares training courses for the workforce about the new technique of RCA.		**2.30**	**.3741**
TMS 3	The top management in your company takes the feedback information from the workforce and tries to involve it in the decision making process.		**1.72**	**.8051**
Test Statistics (Friedman Test)				
N	***df***	***Chi-Square***	***Asymp.sig***	
30	2	8.411	.015	

As revealed in table 5, the significance level is (*0.015*) which means that there are vital variations in the relative importance regarding the questions that were presented to the respondents. Thus, the section of mean ranks evidenced such result which shows the mean ranks for such questions are different; it can be perceived that the mean ranks for TMS2 (*2.30*), this outcome emphasized the fundamental role of top management in reinforcing the application RCA through conducting a number of training sessions regarding the pillars of RCA inside the company and outside it (*which proves slightly hypothesis 4*). So, such training sessions provide the importance of establishing a specific database for all resources in the company, underlining the benefits of quantity – based modeling when generating the relationship between the resources and outputs, and sorting the major cost types in the company. Besides, Table 5 reveals that the selected sample requires further efforts in order to widespread the culture of a wise resource consuming which leads to a practical application of RCA (*mean rank of TMS1 is 1.98*). Finally, the firms should persuade labor force to contribute in the decision

making process throughout taking their feedback information into concern (*the lowest mean rank is TMS3, 1.72*).

8.3 - Organizational Values (OV)

Three questions were suggested to the respondents from OV1 to OV3 to measure what is the influence of organizational values on adopting and employing RCA as displayed in table 6 which depicts the mean ranks and Friedman test.

Table 6
Empirical Results: Organizational Values (Ranks and Friedman Test)

Ranks				
Symbol	***Element***		***Mean Rank***	***Std. Deviation***
OV 1	The company makes briefings and awareness for workers about modern management accounting tools.		**1.82**	**.5920**
OV 2	Your company's organizational structure indicated that organizational values and beliefs have a positive impact on the successful implementation of the contemporary management accounting techniques.		**3.00**	**.4982**
OV 3	Employees in your company are accepting the advanced developments in the company.		**1.18**	**.4901**
Test Statistics (Friedman Test)				
N	***df***	***Chi-Square***	***Asymp.sig***	
30	2	55.153	.004	

As explained in table 6, the significance level is (*0.004*) which means that there are substantial variations in the relative importance about the questions that associated with the organizational values (*OV*). So, the section of mean ranks confirmed these results which clarify the mean ranks are dissimilar; it can be seen that there is a resistance from the personnel towards the advanced developments in the firm (*as shown in OV3 that has the lowest mean rank 1.18).* This resistance could be existent due to several reasons; lack of information regarding the new practice, shortage of experts who can deliver the philosophy of up-to-date practices in this area, worry from failure on employing contemporary management accounting techniques, absence of facilitates to adopt the new tools especially the qualified staff in the Egyptian business environment, and scarcity of practical research in this field. Furthermore, table 6 displays that there is also an insignificant importance from the selected sample concerning the sessions and awareness for workers about the modern management accounting practices including ABC, ABM, ABB, BSC, CPA, and RCA (*as indicated in OV1 that has got mean rank 1.82*). Subsequently, the firms should devote a particular consideration to undertake further efforts to establish the pillars and foundations of the contemporary management accounting techniques.

9 - Concluding Remarks and Future Research

This study discussed the possibility of adopting and applying resource consumption accounting (RCA) approach in the Egyptian Automotive Industry. The study addressed an appropriate background concerning the aforementioned recent studies in RCA and various studies related to the application of RCA in different industries with the purpose of introducing a brief introduction for the fundamental research idea. Also, the study addressed the three pillars of RCA that comprise; view of resources, quantity-based modeling, and cost behavior. The study shifts attention to a brief overview about the Automotive sector in Egypt which was already growing in the early 1980s and the automotive plants continued to augment to more than 15 assembly plants for cars, buses, and trucks. As a result of the increased number of dimensions that can be handled in the subject of RCA, the current study established a number of limitations by not focusing on the organizational, behavioral, ethical, and regulatory sides behind RCA and the study also did not address all accounting dimensions of RCA because of time and resources limits. In addition, the research approach is a combination between deductive and inductive; (1) the research is attempting to scrutinize the extent of understanding the RCA principles through conducting a survey as a research strategy in the automotive industry in Egypt (*Deductive Perspective*). Alternatively, (2) the study is seeking to determine the pivotal influence of adopting and applying RCA on the cost accounting system (*Inductive Perspective*). Additionally, the section of analysis and discussions showed the empirical research results through enlightening the results focusing on Friedman test that was used to measure the relative significance for each item from the basic research variables along with scrutinizing the influence of cofactors on the major research relationships.

The research outcomes sketched that RCA could provide information about firm's resources, marginal cost information, surplus unused ability, and departmental resource use rate for the decision-making such as cost management or higher layer policies. Lastly, the firm should perform enormous efforts to categorize its activities into productive, non-productive, and idle. This sorting assists recognize the resources that are not involved in the production process so no idle resources/costs could be assigned to the final products. Also, the research results clarified that establishing the relationship between resource and cost object on the basis of quantity which is consumed by the cost object or product helps develop the cost accounting system from a variety of perspectives; predicting the cost of future jobs, identifying the idle capacity in the firm in order to avoid it when calculating the product cost, providing managers with precise and helpful information for pricing decisions, managing the cost center effectively, avoiding the weaknesses of normal costing system which focuses on the value relationships, and facilitating the comparison between planned and standard quantities. Also, quantity based modeling in RCA could assist managers in ascertaining and manipulating the principles of resource capacity management throughout supporting accurate, useful, dependable, and applicable information regarding the outcomes of each stage in the value stream. Besides, Classifying costs into variable and fixed helps managers in the process of cost management that can describe the activities in short-term and long-term planning and cost control. Also, cost behavior is based on theoretical capacity of resources, which provides insight to make the unused capacity

visible. RCA can assist managers in eliminating fixed cost distortions due to the distinction between variable cost and fixed cost.

With regard to the cofactors those have a great influence on adopting and operating RCA in the Egyptian automotive industry, the research consequences pointed out that the differentiation strategy is an appropriate strategy for the firms that adopt and apply the principles of RCA because it focuses on the cost value of the product versus other similar products on the market; it creates a perceived value among consumers and prospective consumers. Likewise, RCA depends on the perfect handling of resources to save costs and introduce products without idle resources, so RCA is very adequate with the differentiation strategy that focuses on value highlights the cost savings or durability of a product in comparison to other products. Furthermore, the analysis displayed the essential role of top management in reinforcing the RCA application through conducting several training sessions concerning the pillars of RCA inside the company and outside it. Consequently, such training sessions provide the importance of founding a certain database for all resources in the company, emphasizing the benefits of quantity – based modeling when generating the relationship between the resources and outputs, and sorting the major cost types in the company. To conclude, there is a resistance from the personnel towards the advanced developments in the firm. This resistance could be existent owing to numerous reasons; lack of information regarding the new practice, shortage of experts who can deliver the philosophy of up-to-date practices in this area, worry from failure on employing contemporary management accounting techniques, absence of facilitates to adopt the new tools especially the qualified staff in the Egyptian business environment, and scarcity of practical research in this field. There are a number of recommendations for future research can be suggested at the end of this study; there is a vital need for future research on the role of organizational values and beliefs on the adoption and application of RCA as such factor has a great effect on the achievement or failure of RCA approach. Additionally, most firms embarking on RCA soon find that their accounting procedures and policies are inefficient for RCA adjustments. Hence, there is an indispensable need for additional research on major changes on the accounting systems to become accustomed with RCA principles.

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11. Appendix: The Questionnaire

		Strongly disagree	Disagree	Undecided	Agree	Strongly Agree
	View of Resources (VR)					
1	Your firm identifies a comprehensive view of resources (equipment – material – employees ……etc.).					
2	In your firm, the cost accounting system uses limited cost centers.					
3	There is a classification of activities in your firm into three sorts; productive, non-productive, and idle.					
4	In your firm's accounting system, there is a relation between the resources and the cost objects which consume the resources.					
5	The managers of your firm could obtain a better understanding of their strategic decisions according to the detailed analysis of firm's resources.					
	Quantity-Based Modeling (QBM)					
1	Your cost structure is constructed using operational quantities.					
2	The causality between resource consumption and cost distribution is					

	determined according to amounts.					
3	In your firm, there is a clear distinction between primary costs and secondary costs.					
4	Your cost accounting system provides resource capacity management.					
	Cost Behavior (CB)					
1	Your firm adopts the normal costing system instead of actual costing system.					
2	There is an accurate distinction between variable and fixed costs and their use in decision-making process.					
3	Your accounting system uses a replacement cost rather than historical cost to calculate amortization.					
4	The accounting system in your firm adopts a multiple margin P&L.					
5	Your accounting system identifies unused resources and calculates precisely the idle capacity.					
	Cofactors					
	(1) Business Strategy (BS)					
1	Your business strategy depends on balancing between the product benefits and product costs for the customer.					
2	Your company focuses on design or brand image, technology, features, customer services.					
3	Your company depends on a cost reduction strategy.					
	(2) Top Management Support (TMS)					
1	The top management in your company tries to adopt and promote a					

	culture of wise consuming of resources					
2	The top management in your company prepares training courses for the workforce about the new technique of RCA.					
3	The top management in your company takes the feedback information from the workforce and tries to involve it in the decision making process.					
	(3) Organizational Values (OV)					
1	The company makes briefings and awareness for workers about modern management accounting tools.					
2	Your company's organizational structure indicated that organizational values and beliefs have a positive impact on the successful implementation of the contemporary management accounting techniques.					
3	Employees in your company are accepting the advanced developments in the company.					

12 - Statistical Results

Mean Ranks, Friedman Test, Std. Deviation

	Mean Rank		**Friedman Test**		**Std. Deviation**
VR	VR1	2.43	N	30	.626
	VR2	2.10	df	4	.507
	VR3	1.87	Chi-Square	93.271	.498
	VR4	3.63	Asymp. Sig.	.002	.571
	VR5	4.97			.556
QBM	QBM1	1.50	N	30	.479
	QBM2	1.65	df	3	.547
	QBM3	3.17	Chi-Square	82.609	.466
	QBM4	2.83	Asymp. Sig.	.023	.504

CB	CB1	4.98	N	30	.5632
	CB2	3.43	df	4	.5713
	CB3	1.88	Chi-Square	84.683	.5040
	CB4	2.18	Asymp. Sig.	.012	.8366
	CB5	2.52			.7119
BS	BS1	1.35	N	30	.4611
	BS2	3.00	df	50.108	.6064
	BS3	1.65	Chi-Square	2	.7914
			Asymp. Sig.	.003	
TMS	TMS1	1.98	N	30	.5085
	TMS2	2.30	df	2	.3714
	TMS3	1.72	Chi-Square	8.411	.8051
			Asymp. Sig.	.015	
OV	OV	1.82	N	30	.5920
	OV	3.00	df	2	.4982
	OV	1.18	Chi-Square	55.153	.4901
			Asymp. Sig.	.004	

13 - About the Author

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