



## The Integrating Effect Resource Consumption Accounting (RCA) and Enterprise Resource Planning (ERP) On Cost Reduction and Quality Improvement

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**Abstract:** The research aims to examine the integration effect among resource consumption accounting (RCA) system and the enterprise resource planning (ERP) on both costs reduction and quality improvement. The study questioner form distributed to two different respondents as the unit of analysis. The research reached various conclusions most important of which is the integration relationship can help solve the special difficulties in managing the economic unit data. Moreover, the integration provides a clear picture of the causal relationships between resources, resource quantities, and associated costs.

**Keywords:** Resource Consumption Accounting, Enterprise Resource Planning, Cost reduction, Quality improvement.

**Introduction**

The modern business environment today is witnessing rapid changes in all fields, including economic and technological ones, which necessitates the necessity of economic units to produce products with low costs and high quality, which called on economic units to search for modern methods and techniques to confront these rapid changes, as accounting for resource consumption is one of these methods designed to provide Accurate information that contributes to making important decisions about reducing costs and improving quality in a highly competitive market, It is one of the accounting tools to provide appropriate information on how to exploit the available resources and employ idle energies, which contributes to reducing costs, improving quality and supporting its competitive position in an environment characterized by openness to all markets. The enterprise resource system planning is one of the most important systems provided by information technology in order to reach an integrated automated information system that includes all activities within the economic unit.

**Research problem**

Today's business environment is witnessing intense competition between economic units as a result of rapid changes that have become a pressure and threat to all economic units, which requires them to search for new methods and technologies to maintain their competitive position and market share in the local and global markets. The research problem can be formulated with the following questions:

- 1- Does the integration between the resource consumption accounting (RCA) system and the enterprise resource planning (ERP) reduce costs (CR)?
- 2- Does the integration between RCA and ERP improve quality (QI)?

**Research objective**

- 1- A statement of the knowledge bases for resource consumption accounting and enterprise resource planning
- 2- Demonstrate the effect of the integration between the resource consumption accounting (RCA) system and the enterprise resource planning (ERP) system on reducing costs
- 3- Demonstrate the effect of the integration between the resource consumption accounting (RCA) system and enterprise resource planning (ERP) on improving quality

**Research significance**

This research helps in:

- 1- Identifying methods for reducing costs and improving quality through the integration between the application of resource consumption accounting with the enterprise resource planning system in economic units in order to achieve the optimal exploitation of resources as a driver of economic activity.
- 2- It enables economic units to develop management accounting methods to keep pace with changes in the surrounding environment, in a way that enables them to maintain their competitive position by reducing costs and improving quality.

**Research hypothesis**

To achieve the research objectives, the research hypotheses can be formulated as follows:

The first hypothesis: The integration between the resource consumption accounting (RCA) system and enterprise resource planning (ERP) helps reduce costs.

The second hypothesis: The integration between the resource consumption accounting (RCA) system and the enterprise resource planning (ERP) system contributes to improving quality.

**Resource consumption accounting**

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**The concept of resource consumption accounting**

Resource consumption accounting (RCA) originates under the German cost accounting approach known as (GPK). It focuses on accurately measuring the cost of products by identifying the resources in the economic unit and the actual flow of costs between these resources. It not only maintains the resource perspective of German cost accounting, but also makes the best use of the advantages of ABC and when the actual flow of costs between the resources of the economic unit is not directly determined to determine the activities and resources (Rahimi et al,2014:533)

The resource consumption accounting system (RCA) has been defined as one of the comprehensive cost management approaches that depends on providing accurate information on the activities of the operational and financial economic unit towards the optimal and efficient use of available resources, enhancing the exploitation of idle energy, supporting enterprise resource planning systems and supporting their competitiveness ( Al-Qady& and El-Helbawy, 2019:145)

It is a comprehensive management approach to cost, based on providing reliable information to the economic unit that helps reduce costs and increase revenues and production capacity through the exploitation of idle energy with the aim of the success of the economic unit in light of the intense competition market (Ahmed & Moosa, 2011:755). The management accounting system is based on quantitative and agrees that the cause of costs are faithful resources, the distribution of costs on the basis of resource consumption and thus supports management in the decision-making process (Okutmus, 2015:46). It is a comprehensive and integrated approach to cost management, which focuses mainly on creating information to make the optimal decision for the economic unit, and divides resources with productive capacity, resources with non-productive energy, and resources with idle energy, and it follows the principles of (causality, response and action) for the purpose of resource consumption and cost modeling. (Dey & Kumar, 2014: 5)

Through the above, the researcher can define resource consumption accounting as one of the cost management tools that focus on providing appropriate and appropriate information that helps the administration in making appropriate decisions regarding the optimal use of resources and thus seeks to support the competitive capabilities of the economic unit.

**Principles of accounting for resource consumption**

There are three principles for the accounting approach for resource consumption, as follows:

1-: The Principle of Causality: It is the most important concept that explains the cause-effect relationship and requires modeling resource flows and the costs associated with them so that they reflect cause-effect relationships, and this means eliminating unrealistic allocations between resource pools (White, 2009: 69), if the resource pool does not require units from another resource pool, it does not carry any costs from this pool, and the resource flows and costs are explained through the resources consumed directly through the value chain on a cause-effect basis (Ahmed & Moosa, 2011:756).

2- The principle of response: The principle of response has been added to ensure the principle of causality in resource consumption and cost behavior in terms of fixed and variable relationships between resource pools, where the principle also determines the nature of costs within the resource pool, where some of these costs are fixed and others are variable. The information resulting from the principle of response allows managers to make improvement decisions at all levels of the economic unit and allows linking and coordination between resource pools and production to support the achievement of the objectives of the economic unit. Based on the principle of response, it supports planning and forecasting costs in the economic unit, because it enables the economic unit to respond to the output changes that result from decisions. The principle of response allows the flow of fixed and variable resources between resource pools, and resource flows must be based on a quantitative

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basis and not based on percentages or in the form of allocations, and resource pools must be homogeneous, and the resources that go into producing a product or service are determined within each resource pool. Separately from other pools of resources, and when these resources are designed in a way that reflects a cause-effect relationship, the flows will clearly provide information that enables costs to be apportioned at the level of units, batches, products, or services (White, 2009:69), (Ahmed & Moosa, 2011:756) believes that the principle of response helps to:

A- Allow for an inverse relationship between total cost and total volume when manufacturing more complex products.

B- It provides managers with specific insights into resources when they are linked to changes in product output.

C- It enables accurate modeling of the economic unit of the economy of the flow of goods and services, regardless of their complexity.

3- Work: It is not a universal principle such as causation and response, but it is necessary because the succession of resource flows between cost objectives sometimes does not lead to the provision of sufficient information to make administrative decisions, but it is necessary periodically or continuously to know the activity that is being implemented in the consumption Resources between resource pools. The principle of work is the guiding principle of activity-based costing that produces highly complex activities that cannot be supported in the long run, and resource consumption accounting applies the principle of work in a more limited and disciplined manner, where no activities are included in any model except when you add critical and continuous information needed Managers Often (White, 2009:70)

**Components of accounting for resource consumption**

Resource consumption accounting consists of the following components:

1- Resources:

The basic concept of resource consumption accounting is based on resources, and the focus is on resources rather than activities. Resources in accounting for resource consumption do not include only resources consumed by activities, but include resources consumed by the resources themselves, including the number of hours of operation of machines, hours of workers and raw materials and depreciation of fixed assets by means of measurement subjects costs (Wang, et al., 2009: 84). It has the following characteristics: - White, 2009:66).

- Resource capacity: It means the ability to find value, whether each resource individually or in interaction with other resources, and it is a descriptive property of resources in how desertion can be trained, and what is the quality of machines to provide and deliver service, so every resource pool contains resources with the same characteristics and specifications.

- Resource energy: it represents the amount of resources that you can contribute to the performance of services, especially since the potential energy is in the resource and not in activities, and energy may be productive capacity in the sense of producing or providing services that are found in order to provide them, or it may be non-productive energy such as allocated resources To equip machines designated for administrative activities and may be idle due to lack of demand.

- The structure and behavior of costs: As resource costs reflect the characteristics of resources, for example, individuals as a resource have paid wages, vacations, benefits and cash benefits, and machines as a resource need maintenance, spare parts and energy.

2- Resource Pools:

Resource pools are measured by the output of a homogeneous group of resources and collect information about their inputs and the costs of these inputs needed to produce the outputs of resources in particular. In resource consumption accounting, resource pools are used to allocate their costs based on the amount of resources consumed by cost targets or other resource pools (Altavia, 2011:4).

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3- The interrelationships between resource pools:

The resource consumption accounting does not depend on the role of activities and cost objectives in resource consumption, because this approach goes beyond that to determine the relationships between resource pools and the extent to which each resource pool benefits from another resource pool and determine the outputs resulting from the use of one of the resource pools another resource pool such as the machinery and energy complex It only works in the presence of workers from the human resources complex:-

The characteristics of these relationships are represented in (Merwe & Keys, 2001:27):

- a. Network relationships are a function of the resources used.
- b. Synaptic relationships are reciprocal relationships.
- c. The interrelationships depend on the quantities of resource outputs.
- d. The interrelationships affect the nature of cost at the time of consumption

4- Resource cost drivers:

Identification of cost drivers is an important and vital component of system success as cost drivers have a cause-and-effect relationship with resource costs and cost drivers for activities or operations (Atrill&McLaney, 2009:138)

5- Topics of measurement costs (services):

The topics of cost measurement are the goal that costs are linked to, represented by the service unit, in order to calculate the cost of services without charging the idle energy costs on the cost measurement in a way that leads to an accurate cost calculation.

**Elements of a resource consumption accounting application**

One of the most important components of the application of resource consumption accounting is the following: (Balakrishnan.r etal, 2012:26)

- 1- The existence of an ERP system within the economic unit or at least a simplified automated system that facilitates the process of applying the material consumption calculator system to provide the necessary information for this application.
- 2- The presence of a department specialized in measuring and determining the cost of products.
- 3- Availability of scientific and practical qualifications for employees to enable them to understand the application of the resource consumption accounting system
- 4- The expertise and efficiency of the heads of the production departments and those responsible for determining the production mechanism and communicating with the relevant department to provide the necessary information about production resources, activities and costs in order to achieve better and more accurate application of the resource consumption accounting system

**Enterprise resource planning concept**

Many researchers have presented different and multiple definitions of enterprise resource planning, where it has been defined as a system that works to manage the flow of information within the economic unit, allowing managers to make decisions on the basis of information that reflects the current status of the unit and works to automate economic operations and transactions, and thus contribute to reducing costs (Davenport, 2004: 16)

It has also been defined as an integrated computerized system that manages the internal and external resources of the economic unit, and among these resources are tangible assets, financial and human resources aimed at facilitating the flow of information between the various functions within the economic unit. (Bidgoli, 2004: 707).

It has also been defined as an integrated set of software that covers accounting, distribution, manufacturing, purchasing, resources, as well as other functions. If a unified database is used to collect and distribute data and information for all applications, the programs share information in an

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integrated and timely manner, as well as provide a comprehensive view of the unit. Economic (Horngren, 2012: 716)

Based on the above, the researcher believes that the enterprise resource planning system is the process of facilitating the flow of data and information and its exchange between the departments of the economic unit, which facilitates the decision-making process.

**Advantages of Enterprise Resource Planning (Mohammed, 2018: 491)**

- 1- Reducing operating costs (lower inventory control costs, lower production costs, lower marketing costs, and lower cost of support and assistance, as there are no boundaries between units and processor synchronization.
- 2- Increasing the return on financial assets, and enabling the economic unit to respond more quickly to change.
- 3- Improving relationships with customers and enhancing competitiveness.
- 4- Dealing with a single database in which all the data of the economic unit is poured, to be the main and only resource for the data and then processed to obtain the dependencies of the economic unit and those who deal with it.
- 5- Providing real-time and accurate information to the administration and organizational divisions, as well as to those who are related to it from outside.
- 6- The ability to make a quick and secure decision based on correct and up-to-date information.

**Benefits of Enterprise Resource Planning:**

**Studies (spathis, 2006:12) dealt with five benefits arising from enterprise resource planning:**

The first: the level of strategic benefits: where enterprise resource planning systems provide information that helps companies achieve competitive advantages resulting from the production of products and services at low cost, in addition to strengthening the link with customers, suppliers and all parties related to the economic unit. Given the ability of these systems to conduct internal and external integration, the successful implementation of them can support current growth plans through standard business practices that they provide, in addition to encouraging innovation, achieving cost leadership, providing diverse products according to customer needs, and building external links with suppliers, distributors and owners Different interests and the possibility of expansion across the world and enabled electronic business.

Second: Operational benefits: making fundamental changes in the economic unit, which leads to reducing costs, speeding up operations, improving productivity and improving quality by reducing the rate of errors and repetition of data entry.

Third: Administrative Benefits: The application of the enterprise resource planning system and its centralization of the database along with the mechanisms it possesses to analyze data leads to improving the planning process and making strategic and operational decisions and improving the performance of various departments through better performance of resources as well as achieving performance control financial.

Fourth: The benefits of infrastructure and information technology: it helps the economic unit to keep pace with and adapt to future changes in the work environment, as well as increasing flexibility in responding to changes in the internal and external environment.

Fifth: Organizational Benefits: Contributes to supporting the company’s organizational changes in the organizational structure, operations, or coordination between administrative levels

**Integration between resource consumption accounting and the enterprise resource planning system and its impact on cost reduction and quality improvement**

The ERP system is an integrated system that focuses on the use of the computer and consists of a group of applications or models that implement a set of functions such as accounting and aims to

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automate all the operations of the organization and with the participation of all departments in a single database and the production of instant information.

As the integration between the resource consumption accounting and the enterprise resource planning system allows the creation of an automated system and the building of relationships between operational and financial data in a comprehensive system in terms of relationships between resources and cost causes and purposes that are updated automatically during work (Ahmed & Moosa, 2011: 759).

In addition, the use of resource consumption accounting has helped to get rid of many of the criticisms leveled at other cost systems through optimal exploitation of available resources, management of reciprocal relationships between resources and each other, and overcoming the complexities of cost systems within the economic unit through integration with strategic systems. For management accounting, such as enterprise resource planning systems. (Mohamed, 2018: 498).

Given that the application of the resource consumption accounting system requires huge detailed information of data and is impossible to provide under manual systems, it requires integration with the enterprise resource planning system to overcome the complications when implementing and benefiting from the data produced by the most detailed.

The integration between resource consumption accounting and the enterprise resource planning system allows to reduce costs by providing financial and non-financial information that helps in determining costs accurately and knowing the factors causing their occurrence, and this is by studying and analyzing idle and unused energies, as well as studying activities and identifying value-adding and non-value-adding activities Adding value and working to reduce or eliminate the costs of non-value-adding activities. As for value-adding activities, working to improve them contributes to improving the quality of the product, as these activities contribute to increasing the perceived value of the customer.

In addition to reducing costs, quality is a very important competitive weapon and the key to success that the economic unit seeks to improve and achieve by developing the perceived value that the product provides to the customer while controlling the cost to enhance its strategic position

**Methodology**

**Research Design:**

The present research aims to examine the causal relationships among the antecedents RCA-ERP and its effect on both Cr and QI. In the context of the present study, individuals (Accountants) are considered the unit of analysis along with (University lecturers’).

**Research population:**

In the context of the present research Corporate Accountants were targeted through online questioner located across Iraq who are considered the first unit of analysis, also, a paper-form questioner was distributed to target university lecturers located in Baghdad who are considered as the second unit of analysis.

**Sample Size**

This research targeted two unites for hypothesis testing, the first are corporate accountants who were given online questioner for the period of 2 weeks for data collection, of which 112 responses were collected all of which are suitable for analysis as no empty fields were left in the questioner (all required fields). Second, university lecturers were targeted through paper-form questioner for the period of 3 weeks, 110 forms were distributed of which 98 forms were collected and 87 forms were suitable for data analysis.

**Results and analysis**

**Table 1 Age distribution of respondents \ Corporate Accountants**

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N	Age	Redundancy	Percentage
1	29 – 18	10	9%
2	39 – 30	34	30%
3	49 – 40	42	38%
4	50 – more	26	23%
total		112	100%

**Table 1 Age distribution of respondents \ University lecturers**

N	Age	Redundancy	Percentage
1	29 – 18	3	3.4%
2	39 – 30	20	23%
3	49 – 40	33	38%
4	50 – more	31	35.6%
		87	100%

**Assessment of PLS-SEM Path Model Results**

➤ In this section, the second level of analysis is conducted which includes the first hypothesis analysis.

H1: RCA-ERP has a significant impact on CR

**1. Assessing the Measurement Model (Outer Model Testing)**

The reliability and measurements consistency can be examined using factor loading or composite reliability to test and confirm factors consistency. in order for the

• **Composite Reliability (CR)**

Hair, Sarstedt, Hopkins, & Kuppelwieser (2014) variable value to be considered confirmative and indicators reflect the latent variable construct, the CR value should be greater than 0.70.

item	CR
RCIA-ERP	0.918
CR	0.938

• **Factor Loading (Outer Loading)**

According to Hair,etal (2014), factor loading “Reflects the level to which the items of the same construct are consistent with each other” the favorable factor loading value ought to be equal to the typical value of 0.70 or more

Item	FL
RCA-ERP 1	0.909
RCA-ERP 2	0.725
RCA-ERP 3	0.886
RCA-ERP 4	0.871
CR 1	0.904
CR 2	0.894



CR 3	0.881
CR 4	0.878

**Average Variance Extracted (AVE)**

According to Hair et al. (2010), the AVE is “A statistical assessment that measures the average percentage of the variance extracted commonly amongst the observed variables” The prescribed standard estimation of AVE should be more than 0.50.

Item	AVE
RCA-ERP	0.692
CR	0.791

**2. Structural Model Assessments (Inner Model Testing)**

Several tests need to be carried out in order to assess the significance of hypothesized relationships and the predictive power of the proposed model in the inner model, the tests include Predictive Relevance (Q2), Coefficient of Determination (R2)

**The Coefficient of Determination (R2)**

The R2 value signifies that one or more exogenous variables can clarify the variance percentage in the endogenous variable(s) (Fernandes, 2012). Chin (1998) characterised the R2 values into four groups

Level	Value
High	0.67 and more
Moderate	0.33 – 0.66
Weak	0.19 – 0.33
Unacceptable	0 – 0.18

Item	R <sup>2</sup>	Result
CR	0.624	Moderate

**Predictive Relevance (Q2)**

the Q2 criterion attempts to measure how well an endogenous construct’s can be reconstructed depending on the model and its estimates. According to Bagozzi (1994), if the value excess zero (Q2 > 0) show predictive relevance, while, a value of Q2 under zero implies that the model deficit predictive relevance.

Item	Q <sup>2</sup>	Result
CR	0.449	Q2 > 0 Explanatory variable provides predictive relevance

➤ **In this section, the second level of analysis is conducted which includes the second hypothesis analysis.**

H2: RCA-ERP has a significant impact on QI

**3. Assessing the Measurement Model (Outer Model Testing)**

The reliability and measurements consistency can be examined using factor loading or composite reliability to test and confirm factors consistency. in order for the

**Composite Reliability (CR)**

Hair, Sarstedt, Hopkins, & Kuppelwieser (2014) variable value to be considered confirmative and indicators reflect the latent variable construct, the CR value should be greater than 0.70.

Item	CR
RCA-ERP	0.894
QI	0.938

**Factor Loading (Outer Loading)**

According to Hair,etal (2014), factor loading “Reflects the level to which the items of the same construct are consistent with each other” the favorable factor loading value ought to be equal to the typical value of 0.70 or more

Item	FL
RCA-ERP 1	0.908
RCA-ERP 2	0.732
RCA-ERP 3	0.882
RCA-ERP 4	0.870
QI 1	0.902
QI 2	0.892
QI 3	0.875
QI 4	0.877

**Average Variance Extracted (AVE)**

According to Hair et al. (2010), the AVE is “A statistical assessment that measures the average percentage of the variance extracted commonly amongst the observed variables” The prescribed standard estimation of AVE should be more than 0.50.

Item	AVE
RCA-ERP	0.724
QI	0.786

**4. Structural Model Assessments (Inner Model Testing)**

Several tests need to be carried out in order to assess the significance of hypothesized relationships and the predictive power of the proposed model in the inner model, the tests include Predictive Relevance (Q2), Coefficient of Determination (R2)

**The Coefficient of Determination (R2)**

The R2 value signifies those one or more exogenous variables can clarify the variance percentage in the endogenous variable(s) (Fernandes, 2012). Chin (1998) characterised the R2 values into four groups

Level	Value
High	0.67 and more
Moderate	0.33 – 0.66
Weak	0.19 – 0.33
Unacceptable	0 – 0.18

Item	R <sup>2</sup>	Result
QI	0.64	Moderate

• **Predictive Relevance (Q2)**

The Q2 criterion attempts to measure how well an endogenous construct's can be reconstructed depending on the model and its estimates. According to Bagozzi (1994), if the value excess zero ( $Q2 > 0$ ) show predictive relevance, while, a value of Q2 under zero implies that the model deficit predictive relevance.

Item	$Q^2$	Result
QI	0.448	$Q2 > 0$ Explanatory variable provides predictive relevance

**Conclusions and Recommendations**

**Conclusions**

- 1- The integration between the resource consumption accounting system and the enterprise resource planning system works to solve the special difficulties in managing the economic unit data.
- 2- The integration between resource consumption accounting and enterprise resource planning provides a clear picture of the causal relationships between resources, resource quantities, and associated costs.
- 3- Applying resource consumption accounting system and the enterprise resource planning system integration help reduce costs by deleting activities that do not add value, as well as identifying idle and unused energy and reducing the damage.
- 4- The application of integration between the resource consumption accounting system and the enterprise resource planning system contributes to the production of high quality, accurate and appropriate products that meet the desires of customers and are free from defects.

**Recommendations**

- 1- Attention to the application of modern methods of cost accounting to keep pace with modern environmental requirements.
- 2- The link to reduce costs with the vision of the economic unit.
- 3- Paying attention to the research of customer reactions regarding its products.

**Resources**

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