"Using Material Flow Cost Accounting Approach For Enhancing Sustainability In The Light Of Value Chain Requirements"

Extract from a PhD thesis entitled

"Using material flow cost accounting approach for numerical control on the product life cycle costs to enhance sustainability in the light of value chain requirements"

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الملخص

تهدف هذة الدراسة الي استخدام مدخل محاسبة تكاليف تدفق المواد في تعزيز الاستدامة في ضوء متطلبات سلسلة القيمة، وذلك من خلال تحسين الاداء البيئ والإقتصادي للشركات الصناعية، وقد توصلت الدراسة في جانبها النظري والعملي من خلال إجراء دراسة ميدانية الي إن قصور الأساليب التقليدية للمحاسبة الإدارية في توفير المعلومات المالية وغير المالية وفي التوقيت المناسب حول الفاقد في جميع مراحل دورة حياة المنتج يوفر فرصاً محدودة في ترشيد القرارات الادارية التي تحقق الاستدامة للشركات، وأن محاسبة تكاليف تدفق المواد تعتبر أسلوب إداري يوفر المعلومات الإقتصادية والبيئية الضرورية التي تعزز من استدامة الموارد وزيادة الربحية، وتوصي الدراسة بضرورة دراسة المعوقات التي تتسبب في عدم إمكانية تطبيق أسلوب محاسبة تكاليف تدفق المواد في البيئة المصرية، بالأضافة الي دراسة العلاقات التكاملية بين مداخل المحاسبة الإدارية الحديثة.

الكلمات المفتاحية: محاسبة تكاليف تدفق المواد_الاستدامة_سلسلة القيمة

Abstract

This study aims to use the material flow cost accounting approach to enhance sustainability in light of the value chain requirements, by improving the environmental and economic performance of industrial companies. The study conducting through the empirical study that shortcomings of traditional methods in providing Financial and non-financial information in a timely manner about losses at all stages of the product life cycle provides limited opportunities in rationalizing administrative decisions that achieve sustainability for companies, and that accounting for material flow costs is a management method that provides the necessary economic and environmental information that enhances the sustainability of resources and increases profitability, and the study recommends It is necessary to study the obstacles that cause the inability to apply the method of accounting for material flow costs in the Egyptian environment, in addition to studying the integrative relations between the entrances of modern management accounting.

Key words: material flow cost accounting_ sustainability_ value chain

Introduction

Our consumption and production patterns impact our planet such that we are reaching the limits of growth with the planet being unable to indefinitely assimilate the effects of anthropic activities However, natural resources are vital to industrial production, without which value creation is impossible (Ramona,2018).

Nowadays, a modern, competitive and environmental concerned society are pressuring companies to achieve higher productivities with the lowest possible environmental impact Thus, few alternative methods have been emerging, to support management decisions in terms of economic performances and simultaneously consider the environmental impact and production volumes (cecilio,2017).

1/1 Research Problem

Sustainability management is becoming increasingly important for companies, there is an additional need for information regarding the ecological consequences of their business activities (Dierkes and Siepelmeyer, 2019). Resources are essential for the existence of corporations. Thus, corporations are increasingly motivated to enhance resource efficiency, that is, a more efficient and sustainable use of natural resources (Rieckhof,2015).

Since the material costs are commonly the largest share of industry's production costs, this is a quite obvious priority setting. But, due to rising prices, the scarcity of primary energy sources, and the accompanying economic, ecological, and social problem areas, the resource energy is of growing relevance and the efficiency of energy use must be scrutinized, too. Thus, methods for supporting energy management are necessary. Therefore and due to the close relationship between energy and material, it suggests itself that Material Flow Cost Accounting (MFCA) also covers energy and its flows in an integrated way (Bierer, 2015).

1/2 Research objective

The Study focuses on the development of a model that helps the administration in tracing the flow of raw materials, energy and water within the production process in order to help in definition and specification the places of waste costs, which resultant from the waste and inefficiency usage for resources, and assist the management to make managerial decisions related with economics and environmental performance, and definition the opportunity of cost reducing and efficiency improvement over the product life cycle.

1/3 Research importance

The importance of research in the presence of a dearth of topics dealt with this problem and research through the study, which can be reached on the results benefit the community through the use of an objective in the environment of industrial.

Material flow cost accounting provides new information of its kind on the important aspect of production, which is determining the amount of waste material and energy, to form a more objective picture of the management of the facility on the size of these wastes in order to minimize and reduce them to reach products characterized by low cost and high quality as well.

1/4 Research methods

The research used;

- **The deductive** approach through reviewing previous literature related to the research variable to benefit from them in achieving the research objectives.
- **The inductive approach** through carrying an applied study to test the research hypotheses.

1/5 Research question

Material flow cost accounting (MFCA), a promising environmental management accounting (EMA) tool can help industrial companies improve their environmental and profitability performance?

1/6 Theoretical Framework of Material Flow Cost Accounting

Environmental management accounting (EMA) has been rapidly expanding over the last decade. The United Nations Division for Sustainable Development (UNDSD) released two workbooks on environmental management accounting (UNDSD, 2001; 2002), and the International Federation of Accountants (IFAC) published its International Guidance on EMA (IFAC, 2005) as cited in (Kokubu and Kitada, 2015).

The intended users of these EMA principles and procedures are accountants, environmental and production managers interested in installing corporate EMA guidelines appropriate to their own organizations. Such an EMA system will be useful for better controlling and benchmarking purposes and facilitate several external disclosure needs. It is thus also of interest for persons in charge of developing disclosure requirements (such as statistical and other national agencies), auditing the

data submitted and consulting on the establishment of such an information system (jasch, 2009).

1/6/1 Definition of Material Flow Cost Accounting

MFCA is one of the major tools for environmental management accounting and promotes increased transparency of material use practices through the development of a material flow model that traces and quantifies the flows and stocks of materials within an organization in physical and monetary units (ISO 14051). In addition, MFCA is also a tool used in organizations decision-making which is aimed at improving their business productivity by reducing costs through waste reduction (Doorasamy, 2014). MFCA measures the flow of raw materials in both physical and monetary units. Cost categories are material cost, energy cost, system cost, and waste management cost states (Schmidt and Nakajima 2013).

Also Behanami (2019) indicate that as one of the most basic and effective EMA tools, MFCA helps industrial organizations establish a cleaner production approach.

This method, in addition to considering the waste and emissions to the environment, takes into account the actual costs associated with them; thus, it shows the importance of reducing waste and environmental emissions to the producers in tangible terms (Dekamin and Barmaki, 2017).

Also MFCA is an accounting method that directly connects to resource efficiency and can bring cost reduction. Expanding the use of MFCA is an important issue for sustainability, improving resource efficiency at the corporate and even the country level (Yagi and Kokubu, 2019). In the same manner (Zou, et al, 2019) state that MFCA can be used to track and quantify the material flow and inventory of the respective physical units of organizations, and it may further be used to improve the transparency of corporate consumption of materials and energy

1/6/2 Difference Between Material Flow Cost Accounting and Conventional Cost Accounting:

The MFCA is a method which was firstly designed to be applied as an evaluation tool to improving the resources efficiency, Moreover, when it is compared to the Traditional Cost Accounting (TCA) it can be recognized as a preferable tool, It presents not only the overall accounting performance, but also points the real value of the material wasted which is commonly assumed as a necessary product loss by the traditional methods. Consequently, the deep comprehension of their differences can support the MFCA implementation, presenting its benefits (Cecílio, 2017).

MFCA represents a different way of management accounting and it differs from conventional cost accounting in the following points (ISO 14051& Doorasamy, 2014& Kasemset, et al, 2015& Kokubu and Kitada, 2015& Guenther, et al, 2015& Rieckhof, et al, 2015):

1) In conventional cost accounting, the data are used to determine whether the incurred costs are recovered from sales. It does not require determining whether material is transformed into products, or disposed of as waste.

2) In conventional cost accounting, even if waste is recognized in terms of quantity, the costs to produce "material losses" are included as part of the total output cost.

3) On the other hand, MFCA, as explained before, focuses on identifying and differentiating between the costs associated with "products" and "material losses." In this way material loss is evaluated as an economic loss, which encourages the management to search for ways to reduce material losses and improve business efficiency.

From the previous comparison it become clear that the most important difference is that during the process of MFCA, material, energy, and system costs are analyzed and classified as costs of positive and negative products. The operations with high negative product cost are identified, and improved solutions are provided and implemented to reduce negative product costs. The results from the improvement in terms of cost reduction can be more easily understood by the management personnel (Kasemset, et al, 2015).

1/6/3 Material Flow Cost Accounting Dimensions:

Engineers see the functioning of technical processes and products. Managers see the cost and profit side. Environmental officers see emissions, effluents and waste. All three tend to improve the corporate reality they see. This does not necessarily lead to an overall optimization of corporate goals as conflicts occur. Technical improvements focus in the first instance on the technical functioning, and might neglect costs and environmental aspects. Cost saving procedures might lead to staff reduction, not considering that this might produce new environmental burdens. Environmental considerations might request a new product design (of decomposability), leading to conflicts with production engineers (Guenther, et al, 2015).

1) Economic dimension:

Scavone (2006) argue that flow cost accounting is an adequate methodology to achieve better data and improve efficiency of production systems which lead to not only lower costs of actual material used but also to lower costs in material handling and waste disposal. Thus, material flows become more transparent, as explained previously by other authors.

2) Environmental dimension:

Abdel-Kader (2011) claims that MFCA is a powerful method of environmental management and was being disseminated to industries because of its potential to help organizations realize that by increasing the transparency of material losses, companies can reduce environmental impacts and improve business efficiency.

1/6/4 Benefits Material flow cost accounting

The extra effort and expense involved in implementing flow cost accounting is thus not so much the continuous tracing of additional data but rather the system's one-time installation represent more benefits (jasch, 2009). The benefits which are expected from applying MFCA are represented as follows (jasch, 2009& Doorasamy, 2014& Kokubu and Kitada, 2015):

1) Identifying problems - Realization of the existence of economic loss which is hidden under conventional cost accounting; highlights conventionally uncontrolled material losses which only on-site operators are normally aware of; and assists in identifying material loss reduction options.

2) Recognizing points for improvement - No appropriate improvement measures in place even though the company is aware of material losses; and reasons for not taking improvement actions.

3) Increasing the transparency of material flows and energy use, the associated costs and environmental aspects

4) Supporting organizational decisions in areas such as process engineering, production planning, quality control, product design and supply chain management; and

5) Improving coordination and communication on material and energy within an organization.

1/6/5 Fundamental Elements of Material Flow Cost Accounting:

MFCA brings about both environmental and cost-reduction impacts on the organization. In order to apply MFCA to an organization effectively, the concepts of quantity center, material balance, cost calculation, and material flow model (ISO, 14051, 2014).

1) Quantity center

"Quantity centers", marking locations, where materials were transformed or stored, functioned like cost centers in financial management, but instead of tracing cash flows, physical inputs and outputs and changes of stocks were used for balancing (Wagner, 2015). So that the material flow model was divided into different quantity centers according to production operation units, and the total cost of each quantity center was assigned between the positive and negative products (Zou, et al, 2019).

2) Material balance

The introduction of a corporate mass balance was based on the laws of thermo-dynamics and posited that material or energy in a company can neither be created nor destroyed, just transformed. In principle, this means that materials or energies that enter a company can be traced in exact (stoichiometric) amounts, either increasing stocks or leaving a company as outputs (Wagner, 2015).

3) Cost Calculation

Through MFCA, the material balance of inputs and outputs is linked to monetary units by assigning and/or allocating costs to all products and material losses. MFCA considers four types of cost, all of which are allocated to both products and material losses (ISO, 14051, 2014):

- Material costs;
- Energy costs;
- System costs; and
- Waste management costs

4) Material Flow Model

Now material flows provided the common denominator between the various groups and perceptions, looking at the same subject from two angles. By following the entire material flows, it became clear that management and production did neither have a clear picture of all physical

amounts of materials being processed, stored or lost along the material flow. Nor did management know the "true" or "full costs" accumulating and hiding along the flow of material. By commonly posting material costs as direct cost to the products, the amount and value of material being processed was not known precisely at the workshop level (Wagner, 2015).

1/6/6 Implementation Steps of Material Flow Cost Accounting:

The MFCA application method must be considered as a step by step procedure from the knowledge about the method and its concept, pass through the recognition of the MFCA necessity for the company and its implementation to evaluate the production system performance. Moreover, decision-making in companies are typically associated with economic considerations. Regarding that, the MFCA can support this point by calculating the financial impact of wastes and becoming a useful tool for decision-making (Cecílio, 2017).

The level of detail and complexity of the analysis will depend on the size of the organization, nature of the organization's activities and products, number of processes, and quantity centers chosen for analysis, among other factors. These conditions make MFCA a flexible tool that can be applied in a wide range of organizations, regardless of size or the existence of an environmental management system (EMS). In fact, the implementation process of MFCA is considered to move more smoothly and faster if the organization has an existing EMS as it is probable that material- and waste-related data EW already being collected for analysis (ISO, 14051, 2014).

Steps for implementing MFCA can be divided into three steps concerning flow structure modeling, quantification of flows and evaluation of material flows as follows (Kawalla, et al, 2018):

The First step: the material flow model describing the considered system is the outcome of.

The Second step: the material and energy streams are quantified in physical units for the underlying time period creating input-output balances for each quantity center.

The Third step: the material and energy flows are quantified in monetary units.

According to the ISO, 14051 (2014) for achieving MFCA objectives Steps required for implementing a material flow cost accounting analysis are building up in accordance with the Plan-Do-Check-Act cycle as follows (Cecilio, 2017& ISO, 14051, 2014& 2020،نصير& Sygulla, et al., 2011):

1) Plan phase

Firstly, the management level personnel should understand the practicability, advantages and value of the MFCA. The MFCA application effectiveness is strongly dependent of its management support level.

Secondly, the necessary expertise should be determined. The MFCA **requires** a deep knowledge of the method and the collaboration of multiple departments as quality, logistic and engineering.

Thirdly, Then, the boundary and the time period of analysis should be determined, the scope of **analysis** can include a single or multiple process, an entire facility or even a supply chain. Nevertheless, in a first approach it is recommended the selection of a single process, processes or products with a potential significant economic and environmental impact within the organization.

Fourthly, subsequently, the QCs must be carefully selected and defined, The QCs are theoretical units of MFCA calculation: if the QC is selected too roughly some relevant information about material losses' location and negative products' costs may become unclear; reversely, if the QCs are established too precisely, the MFCA data compilation may be too complex and difficult, Therefore, before proceeding to the MFCA's next phase a macro analysis of the system is recommended to assess the authentication of the defined QC.

2) Do phase

Firstly, the inputs and outputs of each QC must be identified. Typically, the inputs are raw materials, operating materials and energy, and the outputs are products, material and energy losses. The energy and energy loss identification can be estimated separately or included under the material and material loss, depending of the companies preferences.

Secondly, the identified input and output flows of each QC should be used to interconnect all the quantity centers within the MFCA boundary of analysis in order to achieve a clear characterization of the production system flow. Thereafter, each input and output should be quantified in physical units. It is important to note that to perform the mass balance the quantification of the flows must be convertible into a single standardized

unit. Moreover, the inventory changes cannot be omitted from the balance and should also be quantified in the same standardized unit as well as all the materials within the MFCA boundary, The MFCA requires the quantification of all the involved materials in the production process; however, some materials that represents a minimal environmental or economical contribution can be neglected.

Thirdly, consequently, the next step of the MFCA application is the conversion of the physical quantification into monetary.

3) Check

Firstly, the review and interpretation of summarized data will allow the organization to identify quantity centers with material losses that have a significant environmental or financial impact. The physical and monetary quantification of the material flow can be summarized in a format that is suitable for further interpretation, for example, (in a material flow cost matrix). The data should first be summarized for each quantity center separately. These quantity centers can be analyzed in more detail. Data from individual quantity centers can also be aggregated for the entire target process being analyzed.

Secondly, After the MFCA analysis is completed; the results should be communicated to all relevant stakeholders. In addition, management can use MFCA information to support many different types of decisions aimed at improving both environmental and financial performance. Communicating the results to the organization's employees can be useful in explaining any process or organizational changes and gain full commitment from all members of the organization.

4) Act

Once MFCA analysis has assisted an organization to understand the magnitude, consequences, and drivers of material use and loss, the organization may review the MFCA data and seek opportunities to improve environmental and financial performance. The measures taken to achieve these improvements can include substitution of materials; modification of processes, production lines, or products; and intensified research and development activities related to material and energy efficiency.

1/7 Constructing empirical study

This section is concerned with an empirical study that focuses on testing the validity of using material flow cost accounting, a promising environmental management accounting tool, which can help industrial companies improve their environmental and profitability performance.

Research hypothesis shall be evaluated through survey study applied using Statistical Package for the Social Sciences program (SPSS) to analyze the data gathered about the sample as to decide whether to accept or reject the hypothesis.

1/7/1 Sample of the study

The researcher had taken a random sample of academicians who had accepted to cooperate with the researcher and to answer the questions of the survey in order to get reliable information about the credibility of the using life cycle costing on enhancing companies sustainability. the researcher distributed 100 surveys to academicians and collected 69 answered surveys with a response rate of 69%.

- **Experience**:

Table (1/1) Frequency distribution of the variable Experience

Expert					
Serial	**Item**	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
1	**Less than 5 year**	11	15.9	15.9	15.9
2	**From 5-10 years**	25	36.2	36.2	52.2
3	**From 11-15 years**	22	31.9	31.9	84.1
4	**More than 15 years**	11	15.9	15.9	100.0
5	**Total**	**69**	**100.0**	**100.0**	

From the above table it is clear:

A sample study according to the variable of " Experience " that most of the respondents in the category group (from 5-10 years) which accounted for a percentage (36.2%), came in the first place, then category group (From 11-15 years) which accounted for present (31.9%), and finally the category group (less than 5 year), (More than 15 years) by present (15.9%), According to the responses of the sample, implying that the majority of the sample is the category group (from 5-10 10 years), this category is considered to be of high experience.

- **Education:**

Table (1/2) Frequency distribution of the variable Education

Education					
Serial	**Item**	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
1	**BA**	19	27.5	27.5	27.5
2	**M.A**	21	30.4	30.4	58.0
3	**PH.D**	29	42.0	42.0	100.0
5	**Total**	**69**	**100.0**	**100.0**	

From the above table it is clear:

A sample study according to the variable of "Education" that most of the respondents in the category group (PH.D) which accounted for a percentage (42%), came in the first place, then category group (M.A) which accounted for present (30.4%), and finally the category group (BA), by present (27.5%), According to the responses of the sample.

- **JOP**

Table (1/3) Frequency distribution of the variable Job

JOP					
Serial	**Item**	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
1	**Demonstrator**	19	27.5	27.5	27.5
2	**Teaching Assistant**	21	30.4	30.4	57.9
3	**Teacher**	24	34.8	34.8	92.7
4	**Professor**	5	7.3	7.3	100.0
5	**Total**	**69**	**100.0**	**100.0**	

From the above table it is clear:

A sample study according to the variable of "Job" that most of the respondents in the category group (Teacher) which accounted for a percentage (34.8%), came in the first place, then category group (Teaching Assistant) which accounted for present (30.4%), and the category group (demonstrator), by present (27.5%), and the category group (Professor) , by present (7.3%), According to the responses of the sample.

1/7/2 Descriptive statistics

The following part deal with descriptive statistics for the variables of the research by showing data from the tables and determining phrase with the highest level of agree and the lowest level of agree in accordance with the response of the research sample and then showing the general trend of the research items by looking at the at the percentage coefficient of variation.

Survey questions was a five levels (likert scale), starting with strongly disagree, disagree taking the value of 2, neither agree nor disagree, then agree, and strongly agree.

Table (1/4) likert scale

Scale	Interval
1 - 1.79	**(Strong disagree)**
1.80 - 2.59	**(Disagree)**
2.60 - 3.29	**(Entirely)**
3.30 – 4.19	**(Agree)**
4.20 – 5	**(Strong agree)**

1/7/2/1 Research variable:

using material flow cost accounting , as a promising environmental management accounting tool, on enhancing companies sustainability through improving their environmental and profitability performance.

1/7/2/2 Reliability and validity of the study:

The researcher used to check the reliability coefficient Alpha cronbach, to measure the stability of the content variables of the study, it was found that coefficient to check the total of the axes of the research "**Using Material Flow Cost Accounting Approach For Enhancing Sustainability In The Light Of Value Chain Requirements**" has reached stability coefficient for the total sample size (0. .857), which indicates that the high degree of persistence of the study sample, and it effect has been reflected Validity (Which represents the square root) was (0. 925).

1/7/2/3 Descriptive statistics for the research variable:

- Material flow cost accounting

Table (1/5) Descriptive Statistical (Arithmetic mean, standard deviation and coefficient of variation) of the " Material flow cost accounting"

Items	Mean	Std.	CV
1- Accurate tracking of the main and subsidiary materials of the product to increase the accuracy of measuring the costs of those materials and improve the performance of the companies through accurate tracking of energy during the production process.	4.08	.61	14.97
2- Information provided by material and energy flows supports organizational decisions about quality control and removes communication barriers between management and worksite workers.	3.94	.72	18.39
3- Accurately identifying the size of the product of its two types (good and defective) by obtaining accurate information about the flow of its constituent materials.	4.10	.62	15.16
4- Assist the facility in reducing the amount of waste by providing accurate information on the flow of materials as well as measuring the material losses by the difference between the input and output of materials and energy.	3.95	.84	21.42
5- The objective of controlling materials is achieved by equalizing the amount of inputs with the amount of outputs, and thus the cause of the gap that occurs between the inputs and the outputs can be determined through that control.	4.02	.70	17.53
6- Help in identifying the cause of material losses more clearly by allocating a special item for material losses of the product.	3.98	.77	19.47
7- Help in measuring costs more accurately by linking material quantitative data to financial data.	4.07	.64	15.93
8- Help in measuring environmental costs more accurately by allocating these costs at each material quantity center.	4.05	.53	13.28

9- The process of tracking the flow of materials and energy facilitates the measurement and reduction of gases emitted harmful to human health, as well as measuring environmental costs by providing more accurate information about the flow of materials and energy.	3.66	.76	20.73
10- Having a team to track the flow of materials and energy helps in reducing environmental waste, dealing with waste problems, identifying ways to reduce and control them, and then dispose of them.	4.13	.61	14.92
11- Assist in controlling environmental impacts through the process of material balance in the companies, as well as allocating environmental costs to the product unit by relying on material and energy flow information.	3.88	.79	20.49
12- Linking system costs, energy costs, and material costs to products only, without waste, leads to potential cost savings.	3.62	1.00	27.65
13- The total costs of the specified operations can be distributed to quantity centers (production processes) and then allocated to products and material losses.	3.84	.50	13.11
14- The use of quantitative centers during the production process does not affect the identification of the cause and source of any gap between material inputs and outputs.	3.53	.94	26.82
15- Linking material losses to monetary units of costs on the basis of quantitative balance between material inputs and outputs does not lead to knowing the real costs of the product.	3.43	.88	25.69
Total: dimensions	**3.88**	**.42**	**10.96**

From the above table it can be concluded that:

The trends in variables research sample had shown a general trend to the (agree) on variable of "material flow cost accounting" with a mean (3.88), coefficient of variation (10.96%), and differences in variance‘s ability (89.04%).

The high degree of agreement was about the following items, (The total costs of the specified operations can be distributed to quantity centers (production processes) and then allocated to products and material losses), (Help in measuring environmental costs more accurately by allocating these costs at each material quantity center), with a coefficient of variation, (13.11%), (13.28%), respectively.

The less degree of agreement was about, (Linking system costs, energy costs, and material costs to products only, without waste, leads to potential cost savings), with coefficient of variation calculation (27.65%) according to the total variables of the study sample, which indicate that it's important to take into consideration the cost of waste when allocating cost, for enhancing the economic performance and the efficient use of the resources.

1/7/3 One Sample T-Test:

The hypothesis tests, "Using Material Flow Cost Accounting Approach For Enhancing Sustainability In The Light Of Value Chain Requirements", the researcher used **One Sample T-Test** to confirm the credibility of this, hypothesis has been reformulated in the form of Null hypothesis as follows:

Null Hypothesis:

H1: there is no relationship between the application of material flow cost accounting approach and enhancing firm's profitability.

Table (1/6) T.Test to measure the significant differences between study sample and study population to measure the relationship between the application of material flow cost accounting approach and firm's profitability. noting that population parameter is (3.3)

Items	Significance level			
	Mean	t-test	p-value	Sig
1- Accurate tracking of the main and subsidiary materials of the product to increase the accuracy of measuring the costs of those materials and improve the performance of the companies through accurate tracking of energy during the production process.	4.08	10.67	.000	**Sig**
2- Information provided by material and energy flows supports organizational decisions about quality control and removes communication barriers between management and worksite workers.	3.94	7.35	.000	**Sig**

3- Accurately identifying the size of the product of its two types (good and defective) by obtaining accurate information about the flow of its constituent materials.	4.10	10.70	.000	**Sig**
4- Assist the facility in reducing the amount of waste by providing accurate information on the flow of materials as well as measuring the material losses by the difference between the input and output of materials and energy.	3.95	6.43	.000	**Sig**
5- The objective of controlling materials is achieved by equalizing the amount of inputs with the amount of outputs, and thus the cause of the gap that occurs between the inputs and the outputs can be determined through that control.	4.02	8.57	.000	**Sig**
6- Help in identifying the cause of material losses more clearly by allocating a special item for material losses of the product.	3.98	7.33	.000	**Sig**
7- Help in measuring costs more accurately by linking material quantitative data to financial data.	4.07	9.88	.000	**Sig**
8- Help in measuring environmental costs more accurately by allocating these costs at each material quantity center.	4.05	11.67	.000	**Sig**
9- The process of tracking the flow of materials and energy facilitates the measurement and reduction of gases emitted harmful to human health, as well as measuring environmental costs by providing more accurate information about the flow of materials and energy.	3.66	4.00	.000	**Sig**
10- Having a team to track the flow of materials and energy helps in reducing environmental waste, dealing with waste problems, identifying ways to reduce and control them, and then dispose of them.	4.13	11.19	.000	**Sig**
11- Assist in controlling environmental impacts through the process of material balance in the companies, as well as allocating environmental costs to the product	3.88	6.09	.000	**Sig**

unit by relying on material and energy flow information.				
12- Linking system costs, energy costs, and material costs to products only, without waste, leads to potential cost savings.	3.62	2.68	.009	**Sig**
13- The total costs of the specified operations can be distributed to quantity centers (production processes) and then allocated to products and material losses.	3.84	8.91	.000	**Sig**
14- The use of quantitative centers during the production process does not affect the identification of the cause and source of any gap between material inputs and outputs.	3.53	2.06	.042	**Sig**
15- Linking material losses to monetary units of costs on the basis of quantitative balance between material inputs and outputs does not lead to knowing the real costs of the product.	3.43	1.26	.044	**Sig**
Total: dimensions	**3.88**	**11.48**	**.000**	**Sig**

From the above table it can be concluded that:

The agreement of the study sample upon that there are a relationship between the application of material flow cost accounting approach and enhancing firm's profitability, with a (**P.Value less than 5%)**, indicating the rejection of null hypothesis and the acceptance of alternative hypothesis which states that the **(mean of population study is 3.88 greater than 3.3)**, that supports there are a relationship between the application of material flow cost accounting approach and enhancing firm's profitability and means the importance of applicant of that approach then the validity of research hypothesis.

1/8 Results

- The shortcomings of traditional management accounting methods in providing financial and non-financial information, And timely handling of waste at all stages of the product life cycle provides limited opportunities, To rationalize the administrative decisions that achieve the sustainability of the company.
- The value of the information derived from the material flow cost accounting entry mainly stems from Philosophical differences

between this approach and other approaches of cost management.

- The use of material flow cost accounting approach in light of the requirements of the value chain works to address the shortcomings in the production process, which leads to increased competitiveness, improvement of the production process, more efficient management of resources and reduction of costs for each stage, and enhancing sustainability.

1/9 Recommendations

- Despite the emergence and use of many modern approaches to management accounting in countries advanced activities such as TDABC, the resource consumption accounting approach, And the approach to material flow costs accounting, but these approaches are not applied in the Egyptian environment. Hence, researching the reasons or obstacles to the application of these approaches in the Egyptian environment can to be of interest.
- The necessity of conducting several applied studies to integrate the, material flow cost accounting, and product life cycle costing through continuous improvement in order to achieve competitive advantages for companies.

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