

Engineering Accounting: Conceptual Framework and Future Outlook

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Abstract: This research paper aims to present the conceptual framework for Engineering Accounting, as one of the most important new topics that should be paid attention to in the accounting field.

In preparing this research paper, we relied on the inductive approach using the description tool, by presenting the conceptual framework for engineering accounting, based on our purely exploratory view, as the topic is new and has not been researched before, and on the exploratory approach.

An engineering accounting, project cannot accepted for completion, unless it is compared with other projects in terms of cost and the lowest cost is accepted. This makes it necessary to have estimated engineering accounting. It is considered a communication tool between the engineering project in its technical and practical stages, and its internal and external surroundings. Engineering Accounting is concerned with determining the financial result of the engineering project and tracking its financial status.

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Introduction:

It could be the relationship of accounting to other sciences, and the economic development that the world is witnessing, which had an impact on various economic projects and engineering designs in particular, it also creates a new concept for holding it accountable.

Starting from the statement that engineering projects and designs must not only be achievable from a physical standpoint, but must also be possible from a financial and economic standpoint. There are problems in how to deal with these projects from a financial standpoint, by comparing projects to choose the best and least expensive one, and determine the financial result, this make us think about a special type of accounting, that is specifically suited to the engineering field, which is Engineering Accounting.

I- Literature Review:

I.1. The Concept and importance of Engineering Accounting

I.1.1. Accounting and Engineering

Accounting has always expressed the process of recording, classifying and summarizing financial events and operation in monetary form, and interpreting the results related to them (AICPA, 1953), thus, it expresses the process of identifying, measuring and communicating economic information, in a way that allows users of this information to make decisions (AAA, 1966). Accounting works to provide relevant information in a timely manner.¹

Therefore, accounting performs both functions:²

- **Identifying** events of an economic nature, whether they are financial (selling goods and providing services, etc) or non-financial (such as the decision to appoint executive directors).
- **Measuring** financial transactions in monetary units.
- **Recording** financial transactions and recording them in accounting books by following scientific methods.

- **Delivering** the processes that have been identified, measured and recording their results to those interested in them, by repairing financial reports, the most important of which are financial statement, for making various decisions.

➤ Accounting is concerned with collecting, classifying and summarizing accounting data and information to serve relevant parties to make various decisions. Therefore, accounting is considered an important communication tool between the internal and external surrounding of the project.

As for engineering, it is defined as the process of creating, maintaining, designing, developing and applying things to society, but not anything in the universe, but things that did not exist in the natural world, which were created by the imagination of the human mind and the work of man.³ Here it is possible to distinguish between natural and artificial things (scientists discover the world that exists; engineers create the world that never was).

Hence, (Amer A. Moustafa, 1988, p 75) engineering becomes a profession or practice that leads, in whole or in part, to introducing new activities from those that previously existed, the results of which are new products. Thus, engineering becomes that human activity that deal with creative design or construction, manufacturing, deployment, maintenance, development, improvement, operation and monitoring of systems, with the aim of consciously transforming the existing situation/environment into the desired situation/environment.

➤ Engineering is a term that refers to a type of humane activity, related to the creative design, manufacturing, of systems, which aims to either solve a problem or complete a task related to creating, designing or developing a product. That is, transforming, in an intelligent and conscious way, an existing problem into the desired solution to this problem. Any who practices engineering is called an engineer.

➤ *There are several type of engineering, for example, mechanical, civil, architectural, chemical, electrical, industrial, agricultural, mining engineering, software engineering, ..etc.*

Depending on the previous submission, we will show the relationship between engineering and accounting from a financial standpoint, by determining the cost of the contract and determining its annual financial result throughout the completion period, and disclosing the data and information necessary to make various engineering decisions. This makes us introduce a new term for accounting, which is Engineering Accounting.

1.1.2. Engineering Accounting

Engineering is concerned with applying science and knowledge to confront the problems facing society, it seeks to find solutions to most issues related to planning, design implementation ... etc.

This is at the lowest possible cost and as simple as possible, while achieving profits and making decisions by comparing several alternatives and technical options, this is affected by the financial and technical aspects of projects.

Speaking of making the appropriate final decision regarding the continuation of any engineering project or not, preference is given to the financial return, the results of which are governed by financial accounting, over the engineering return generated by engineering designs. In other words, if the project is not economically profitable, it is transformed into another profitable project, even if this project has excellent engineering features and characteristics over other engineering projects.

➤ The importance and priority of the financial aspect at the expense of the engineering aspect.

Considering that accounting is an important element for tracking the financial status of any project and determining its outcome, engineering accounting is also an absolute necessity, Engineering Accounting is also an inevitable necessity due to the developments that engineering design projects have witnessed, in terms of their large size and thus increasing the amount of capital to complete theme. On the other hand, in that design, engineering projects need to have their own accounting, that suits current, and future modern engineering practices than they were in the past.

The need of accounting for engineering projects and designs appears in the artistic embodiment and design of the idea (the study stage), and after the idea of the engineering project itself is finally approved (the completion stage). Hence, it is possible to separate two phases of the engineering project, namely the technical stage and the practical stage. We will show the need for these two stages of Engineering Accounting as follows:

1.1.2.2. The Technical Stage (the study stage):

By the technical stage of the engineering project, we mean the beginning and creation of the engineering idea, creativity and innovation in it. The engineering design process only needs to estimate and determine first the value of the elements of the project after its technical value. It can be called also the stage of studying the project from its financial and design aspects.

At this stage, the term pre-estimated engineering accounting can be used, the purpose of which is to determine the contract cost for the engineering project in order to choose between the presented alternatives. In most cases, the least expensive engineering project is taken over others, even if it is found to be an excellent project from an engineering standpoint.

➡ To choose the best option, the cost factor must be included as a very important element.

In the field of architecture, the engineer develops designs according to the proposed proposal. While estimating the cost of implementing these designs, by displaying approximate quantities in order to determine the contact value in general (Indexation). In addition, taking into account the market value of the cash in the period specified for implementation, it includes the value of the work, including the supply, storage, installation, and transportation of materials and their quantities, as well as the expenses of missions, building materials, sufficient employment, and other work necessary to implement the contact as required. Here it appears that the engineer is who measures the works according to his knowledge and experience, regardless of price fluctuations for materials, supplies, and

equipment in local and international markets, laws of all kinds, currency rates, and any other current or future obligations.

The estimates made by the engineer about the amount of expenses for example, have a high probability that they will not be identical at the beginning of the implementation of the engineering project, or at an advanced stage of its completion, due to the change in prices that will occur in the end (Doubt).

➤ *It may be possible and better to adopt engineering accounting in the technical phase of the engineering project, in order to estimate and determine the contract value for this project in an honest and reliable manner.*

From the above, it can be said that the practitioner of the engineering profession needs accounting knowledge as well in his practical life, in order to make various engineering decisions, which are also based on economic requirements at the expense of engineering requirements, to reach results for future operations.

The engineer finds himself in deep through between relying on those who will handle the financial and economic matters to determine the cost of his engineering project, and his is not concerned with that as long as there is someone specialized in that. or he is the one who undertakes the task due to his experience in the field, which can help him understand the details of the components that make up the engineering project and determine their cost, better than resorting to another party to do the job, who may not be able to accurately determine this cost. This is due to his lack of specialization in engineering, and his lack of sufficient knowledge of what an engineering project needs; this is on the one hand.

On the other hand, resorting to specialists will raise the costs of the engineering project in addition to the costs of its completion, while it is possible to exploit these additional costs in the engineering project itself, or dispense with them from the beginning.

➤ *Estimating and determining the cost of a specific engineering project must be undertaken by an engineer with experience and knowledge of the requirements of this project, in addition to evaluating the benefits that will arise from its implementation*

compared to the cost that must be spent on it. this will create an engineer who is both a designer and an accountant at the same time.

It can be said that engineering accounting in the technical phase of an engineering project is discretionary engineering accounting, which is considered the source of previous financial data, which is needed in the process of determining the measurements related to the future financial conditions of the engineering project (studying the contract value of the engineering project). it also considered the main source of data upon actual completion of the project, where analyzes can be performed to compare the actual results of the engineering project with its expected results.

I.1.1.2.2. The Realization Stage (completion stage)

It expresses the stage after making the decision to invest in the preferred engineering project, after making the decision that serves the stakeholders by investing capital in it. In addition, identify the engineering alternatives offered and choose from them the appropriate alternative to implement the project at the lowest possible cost (assessing the benefits generated by implementing a specific engineering project, compared to the cost required to be spent on it). Economic feasibility after the technical feasibility of the project). Appropriate information is available that can be relied upon to make current decisions that serve the future process of the preferred engineering project, and choosing the correct decision depends on comparing the initial results of the chosen alternative with the results that were actually achieved, within the limits of what is available and can be done.

After making the decision regarding investing money in the engineering project (William G. Sullivan et al, 2004, p 638). The supplies of money and those who have an interest in the project want to know the financial results, therefore, methods are developed that enable recording and summarizing financial events related to investment, with the aim of determining the financial results and using control to achieve financial goals. Financial accounting and cost accounting are methods that provide this necessary service in the project; therefore, accounting studies are concerned with past and

current financial events, the accountant can be referred as the financial historian, engineers must make serious efforts to learn the practice of accounting, so that they can communicate better with the project's senior management.

⇒ *The available capital will be allocated to provide the maximum financial return to the owners.*

After we assumed that pre-engineering accounting is in the project study stage, it is considered the main source of data upon actual completion of the project. Analyze can be performed to compare the actual results of the engineering project with its expected results, thus, knowing the financial returns achieved during a specific period (the percentage of progress in the completed works is determined for each agreed upon period), which is as follows:

- After passing the part of the completing an engineering project by the institution in charge of that (45% of completed works), the contracting authority was obliged to make payments to this institution according to the actual percentage of completion;
- The engineer follows up the completion rate, stage by stage, and submits his report on that, and the institution also submits its report on actual achievements in the form of invoice or attachment form, it show the percentage of occupancy completed for the project, along with showing the quantities and their price that were agreed upon in the contract when studying the project;
- The engineer reviews these quantities and price and ensures that they are correct and conforms to them, this is to pay the dues for the works actually completed by the contracting authority, which is usually a public party;
- The contracting party must note that the expenses, that is has accepted and agreed upon will be that final accounting for works.

⇒ *Engineering Accounting is an important element for tracking the financial status of any engineering project, and determining its financial result.*

From the above, it can be concluded that Engineering Accounting:

- Is an absolute necessity due to the developments that engineering design projects have witnessed, whether in terms of the large size of the projects, and thus increasing the capital to complete them, or in that design-engineering projects need to have their own accounting, suitable for current and future modern engineering practices, than in the past.
- Based on recording, classifying and summarizing the financial operations related to engineering projects, and presenting them in monetary form.
- It is concerned with measuring and communicating engineering financial information to users to make financial, investment and operational decisions.
- This information presented in financial statements that translate the financial status of the engineering project.
- It is considered a communication tool between the engineering project in its technical and practical stages, and its internal and external surroundings.
- It is concerned with determining the financial result of the engineering project and tracking its financial status.
- Can be adopted in the technical stage (study stage) to estimate and update the contract value of the engineering project, it is in the form of estimated engineering accounting, it then becomes the main source of data upon the actual completion of the engineering project (realization stage). Analyzes are conducted to compare the actual results of the engineering project with its expected results.

I. 2. The importance of Engineering Accounting:

The importance of Engineering Accounting can be summarized as follows:

- Know the financial results of investing capital in the engineering field, by developing methods that enable recording and summarizing financial events related to engineering investment, then determine its financial result;
- Providing appropriate information that can be useful for making various decisions in the engineering field, accordingly, results for future engineering operations are reached;
- Assisting engineering science in conducting financial and economic studies for project, and knowing its results and making decisions about it before and after starting it;
- Assistance in comparing projects and engineering alternatives and choosing the best one;
- Use appropriate financial engineering information and conduct control over it, and use it to help the engineering project achieve its desired financial goals;
- Determine the costs and revenues of the engineering project accurately, and adjust and control it;
- Determine the social costs of the engineering project;
- Providing financial and non-financial engineering information in a timely manner, and communicate it to its user to make various decisions;
- Engineering accounting is considered an important communication tool between the engineering project and its internal and external surroundings;
- Identifying engineering alternatives, there are usually several alternative engineering methods that can be used in implementing a specific engineering project.

II– Engineering Accounting Disclosure:

II.1. Definition of the Disclosure

Making various decisions by parties related to the engineering project, it depends largely on the information provided by this project, by disclosing this information and other data by presenting it in reports and financial statements prepared in accordance with generally accepted accounting principles.

In general, Disclosure expresses the accounting policies, rule and principles applied to prepare the final accounts, with reference to important financial events necessary for users of financial statements, it has several ways, which are presented briefly, including financial statements and reports, appendices, marginal notes, ... etc, disclosure of information is necessary when information asymmetry is very high.⁴

The information published in the annual report is disclosed according to two categories, disclosure of information about past events, which expresses the category of information that refers to the previous financial results disclosed, and information about future events, which expresses the category of information that refers to current plans and future expectations. which enables investors and others users to evaluate the future financial performance of the company. It requires disclosure of future information, financial expectations such as profits for the coming years, revenues and expected cash flows, it also requires disclosure of non-financial information, such as risks and uncertainties that could significantly affect actual results, and cause them to differ from expected results.⁵

✍ *Disclosure is the communication of information to interested parties, who wish to benefit from it to make various decisions, and giving a clear and honest picture of the company's financial situation, by showing appropriate financial and non-financial information to its user.*

II.2. Definition of the Engineering Accounting Disclosure

Engineering Disclosure defines in tow aspect:

II.2.1. Technical Engineering Disclosure

As we mentioned previously, the technical stage of an engineering project is the stage of its study that is, its estimation, definition, and design. Choosing the best engineering project done by comparing it with other engineering projects on offer, and choosing the project with low costs.

Therefore. Technical engineering disclosure define as the disclosure of the engineer preparing the engineering project. Mostly, it is an engineering studies office in reports that he prepares with his experience, he includes all the facts related to the project design aspects, from a financial and technical standpoint, during specifics periods, which represent the stages of development of the project's completion from a technical standpoint. These reports must have a degree of clarity, transparency, accuracy and credibility in the information and data presented.

The engineer in charge of designing the project, provides the parties concerned this project, with information related to estimating the cost of designing the project, and determine the value of the contract on the basis of which the decision is made, regarding accepting its completion or abandoning it another project of low cost. Without giving importance to the aspect of engineering creativity. While showing separately the possibilities of price increases, and changing the engineering plan in anticipation of any symptom and adapting to it.

✍ *Technical engineering disclosure supports the acceptance of the engineering project and the transition to its practical stage, or rejection and re-selection from the presented alternatives and comparison between them.*

II.2.2. Realization Engineering Disclosure

After presenting the technical engineering disclosure regarding investment in engineering project, which is between two specific parties, often a studies office and a public party, and after approval by the stakeholder-public party, comes the stage of accepting the engineering project and initiating its completion.

The engineering disclosure in the practical stage appears as follows:

II.2.2.2. Engineering disclosure at the completion agreement stage

- **By the Engineering Studies Office**

The engineering studies office disclosure the technical aspects of the engineering project as a first stage, which was previously presented in the case of technical disclosure. However, this disclosure is directed only to interested parties, which are generally represented by a public party with the project idea, in order to know the estimated and possible cost of the contract.

↳ *Full disclosure depends on all available information, with the possibility of displaying it in large quantities and available in one direction only (from the studies office to the contracting authority- a public party).*

- **By the contacting Interest -public party**

After the studies office presents the estimated project cost, the completed study is delivered to the contracting party, the latter offers a tender to parties interested in completion, to obtain a lower cost per contract than the cost resulting from the study by the studies office. Therefore, the disclosure here is not complete but partial, that is, disclosing the project from the design aspect only, without showing the financial aspect, this is to compare the offers submitted by interested customers, and choose the lowest cost offer.

Here, the contracting interest depends on the fair engineering disclosure of information, with the aim of ensuring that the same amount of it reaches all its beneficiaries, without bias towards a

specific party, this is using a method or terminology that is easy to understand by the beneficiaries.

- **By the contacting client party**

After presenting the project as a deal by the interested party, the contracting client demonstrates his interest and desire to complete the project, he expresses what he can do and his own appreciation, it also depends on full engineering disclosure of all available information, with unit price offered, displaying information in large quantities is also possible.

The disclosure is only in one direction (from the contracting client to the interested party).

⇒ *The degree of interest in the engineering disclosure of the project and its trends appears, because of its importance in reaching the best offers and choosing the lowest cost.*

⇒ *Manipulating the physical elements of an engineering project is considered a means of generating benefit in the economic field (achieving a return or profitable result).*

After defining the project and determining its technical and financial limits, and the requirements for achieving it are by choosing the best options, comparing them among them, and choosing the least expensive one, which is considered the optimal option, the stage of implementing the option comes-starting to complete the project according to the agreement between the relevant and interested parties. Full engineering disclosure must be made to all parties to make current and future decisions.

For example, in the field of architecture, the following is full disclosure is made:

- **Determine of deal in terms of:**
 - The subject of the deal.
 - Content of works.
 - Determine of transaction services.
 - How to conclude a deal.

- Technical specifications.
- **Financial termes :**
 - Details and definition of prices.
 - Additional work.
 - Amendment.
 - Workshop situation.
 - Contractor's responsibility.
 - Secondary dealing or participation without a license.
 - Restore it to the initial state.
 - Things found in the fossils.
 - Entry to the workshop
- **Source, quality and use of materials:**
 - Generalities.
 - Source of building materials.
 - Supplying, receiving and storing materials.
 - Quality use and control of materials.
- **How to implement and monitor the works:**
 - Works implementation program.
 - Holding the workshop.
 - Workshop diary.
 - Observation and receiving experiences.
 - Cleanliness and work security.
 - Risks and damages resulting from others.
 - Workshop meetings.
 - The contractor's presence in the workshop.
 - Defects in performance.

- Death, bankruptcy, or judicial settlement of the contractor.
- Employing workers.
- Contracting obligations.
- Works progress program.
- **How to evaluate the works:**
 - Payment of prices for unscheduled works.
 - Definition of unit price.

II.2.2.2. Engineering disclosure during the stage of initiating the completion

In the stage of initiating the completion of the engineering project, in addition to the information that can be disclosure referred to previously, engineering disclosure at this stage can be based on the engineering accounting information published in the financial statements, through the following main components:

- Determine the target user of engineering accounting information.
- Determine the purposes for which engineering accounting information is used.
- Determine the nature and type of engineering accounting information that must be disclosure.
- Determine the methods of engineering disclosure of engineering accounting information.
- Timing of engineering disclosure of engineering accounting information.

N.B: due to circumstances and factors, occupancy can be added by increase or decrease to the previously agreed upon contract, this is disclosed in the amendment, by presenting the subject of:

- The amendment, how is concluded and its mount.
- The new mount.
- The content of the amendment.

- The contractual material.
- The period consumed.
- The effective date of the amendment.
- The relevant parties eligible to sign the amendment.

➤ *Engineering Accounting Disclosure is based on providing financial and non-financial information and data in an honest, transparent manner and with a degree of clarity, this helps the parties involved in the engineering project in making various decisions. Hence, it increases the efficiency of obtaining this information in an equal and fair manner for all parties and in a timely manner, as previously indicated, engineering disclosure is not limited to financial information only, but also extends to the disclosure of non-financial information as well.*

Conclusion:

Engineering accounting came as a result of the development witnessed in the engineering field, in term of the large volume of investments or in term of rapid engineering development, it also considered a means of communication between the engineering project and relevant parties. In order to know the financial result of the engineering project, an accounting system must be available for this type of project (engineering accounting system), it works to provide the needs of users of this system.

The most important **results** reached:

- Engineering projects and designs must not only be achievable from a physical standpoint, but must also be possible from a financial and economic standpoint.
- The importance and priority of the financial aspect at the expense of the engineering aspect
- When choosing appropriate engineering projects, the importance and priority of the financial aspect at the expense of the engineering aspect.
- In engineering projects, to choose the best option, the cost factor must be included as a very important element.

- It may be possible and better to adopt engineering accounting in the technical phase of the engineering project, in order to estimate and determine the contract value for this project in an honest and reliable manner.
- The engineering profession needs accounting knowledge as well in his practical life.
- Estimating and determining the cost of a specific engineering project must be undertaken by an engineer with experience and knowledge of the requirements of this project.
- Engineering accounting in the technical phase of an engineering project is discretionary engineering accounting.
- Engineering accounting consider the main source of data upon actual completion of the project.
- The Realization Stage (the completion stage) expresses the stage after making the decision to invest in the preferred engineering project.
- Engineering Accounting is an important element for tracking the financial status of any engineering project, and determining its financial result.
- Engineering accounting is concerned with determining the financial result of the engineering project and tracking its financial status.
- Technical engineering disclosure supports the acceptance of the engineering project and the transition to its practical stage, or rejection and re-selection from the presented alternatives and comparison between them.
- Full disclosure depends on all available information, with the possibility of displaying it in large quantities and available in one direction only (from the studies office to the contracting authority- a public party).
- The degree of interest in the engineering disclosure of the project and its trends appears, because of its importance in reaching the best offers and choosing the lowest cost.
- Engineering Disclosure is based on providing financial and non-financial information and data in an honest, transparent manner and with a degree of clarity, this helps the parties involved in the engineering project in making various decisions.

Referrals and references:

- ¹ Carl S. Warren and al., 2014, Financial and Managerial Accounting, 12 Edition, South-western, Cengage Learning, USA, p 04
- ² Samuel Ojo Iwene, 2017, Accounting Information and Bond Market Liquidity Evidence from Nigerian Capital Market 2003-2012, Journal of Taxation and Accounting Management, Vol 1 (2), p 26.
- ³ Amer A. Moustafa, 1988, Architectural representation and meaning: Towards a Theory of Interpretation, PHD thesis, Department of Architecture in partial fulfillment of the requirements for the degree Master of Science in Architecture Studies at The Massachusetts Institute of Technology, 1988, p 75.
- ⁴ Mehdi Nekhili, Khaled Hussainey, 2016, R&D Narrative Disclosure-Corporate Governance and Market Value-Evidence From France, The Journal of Applied Business Research, Vol 32, N° 01, p 113.
- ⁵ Khaled Aljifri, Khaled Hussainey, 2007, The determinants of forward-looking information in annual reports of UAE companies, Managerial Auditing Journal, Vol 22, N° 09, pp 882-883.