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The Effect of Using the Value Engineering Approach in Enhancing the Role of Consulting Firms in the Construction Industry in Egypt

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ABSTRACT: This study introduces an application of the value engineering approach in construction projects and creating opportunities to enhance the role of consulting offices. In addition, this study executed a detailed explanation of value engineering and interviews conducted with consulting offices, clients and contracting companies and the nature of their role in the construction industry .It appeared that there is no understanding of the behaviour and pattern of the concept of value for the client and often there is no opposite and different concept for consulting office engineers, and no common ground for the concept of the client for needs and the concept of consulting engineers for needs. The research clearly demonstrated the basic benefits acceptable to stakeholders and customers from the application of value engineering and the material return from it. Although the value engineering approach and its characteristics with its various technologies are well established in the United States and European countries, they are approximately non-existent in the construction sector in Egypt. The research clearly recommended studying the possibility of applying value engineering in the construction industry in Egypt by a governmental work team and directives to government departments to conduct their studies through their advisory offices.

KEY WORDS: construction projects, value engineering, consulting offices, consultant, client or stakeholders, job analysis, implementation constraints.

I.INTRODUCTION

The importance of cost in public and private projects is one of the main indicators that are controlled for the success of projects. Costalso, is the backbone of any successful economic or administrative plans, so it was necessary to develop methods and mechanisms for measuring costs, monitoring and following up the impact of their application on public projects, controlling and managing[19].

As value engineering is the most successful of these methods for controlling project costs without compromising the objectives or job and without prejudice to the quality of the project and the satisfaction of the beneficiary (customers), and the application of value engineering to projects is the most successful method for reducing costs in public and service projects[18].

In the construction industry in Egypt today it is no longer enough to be a good engineer. Where clients need more than technical expertise and problem solving, they need a value for the project in exchange for the amounts they pay to the consulting offices. As the satisfaction of the beneficiary (clients) has become a fundamental issue for the participants in the construction industry, so it was necessary for the consulting firms to constantly strive to improve their performance.

The best time to apply the value engineering approach is in the planning and design stages. The reason is that if alternatives can be found at this stage, the main cost savings that the client achieves with the contractor will not be shared in the same way as occurs in some countries, and the consulting offices that apply the value engineering approach find an important role in the satisfaction of the beneficiary (the customer). It enables them to attract other clients through it, and through the application of the value engineering approach, they can give themselves a competitive advantage over other companies and consulting firms that do not apply the same approach [1-24]. Since 2004 FIDIC[1] (International Federation of Consulting Engineers) price competition and low fees to be the number one threat facing the consulting engineering profession. They also found a new deficit in consulting office infrastructure and in the style and method of practices and competitive bidding in design and construction, which in turn are among the major factors influencing the construction industry affecting consulting engineers worldwide.

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II. AIM OF THE RESEARCH

A. Research Problem.

Poor design and specification can be responsible for up to 12% of the project [2] cost the decline in project quality is related directly to reductions in design costs, increases in project time, delayed implementation, disputes over cost overruns and delays in project delivery. As a key industry stakeholder, "it is imperative that the engineering profession address this situation with a view to ensuring that the construction industry returns to effective performance" [3]. So, there was a need to study the strengthening of the role of advisory offices in the application of value engineering approach[24].

B. Goal of Research.

The objective of the study is to look for an opportunity to strengthen the role of the consultant engineer, through the introduction of value engineering approach as an additional service to the beneficiaries of the advisory service (customers) and to study the technical and economic feasibility of the application of value engineering approach.The importance of the study lies in the belief of some that any process calling for economics will be adopted easily. This was not the case with value engineering. Therefore, the consulting offices and the bodies to which the offices provide consulting services were chosen to form the case study. This research use the analytical method depends of the data and information that is reached through theoretical and practical study.

III.APPLICATIONS OF VALUE ENGINEERING

A. Importance of value engineering.

There is an urgent need to apply the value engineering approach, as the adoption of the value engineering approach in application in public and private projects has resulted in savings in funds resulting from the scientific reductions in the costs of these projects[24]. The United States was able to avoid high costs from the fiscal year 1981 until the fiscal year 2006 by adopting value engineering. The United States was maintaining more than 30 billion dollars, equivalent to an average of about one billion dollars annually [5]. Value engineering in the United States is specifically characterized by a legal nature, as value engineering is stipulated in the General Law (104-106) of the 1996 fiscal year, which states: "Every executive agency will establish and maintain the effective cost (Cost – Effective) through the value engineering procedure and processes) [6] . In 1980, this approach was transferred to the Kingdom of Saudi Arabia through the General Administration of Military Works at the Ministry of Defense and Aviation .The general director of sugar works at that time, Abdul-Aziz bin Turki Al-Ataishan, who established the first special department for value engineering in the general administration of military works in Saudi Arabia in 1986, and then it transferred to the Gulf countries and some arab countries [7].

B. Reasons for the high construction costs.

According to the previous studies, deals with value engineering in construction projects [1-12] the main reasons for the cost increasing of the construction projects could be summarized in the following items:

- Lack of information: Where you rarely find a project with complete information, there must be a deficiency in meeting all the requirements and desires of the beneficiary[23].
- Temporary conditions: The decision is often taken in circumstances beyond control, such as the necessity to finish the design quickly, or reschedule, and these circumstances may meet the emergency requirements, but at the expense of cost [22].
- False beliefs: Often wrong decisions are made based on beliefs and not on facts. False beliefs disrupt or limit good ideas.
- Wrong customs and traditions: Some habits and routines contribute to increasing costs, such as designing or constructing based on a specific method only because the design that was previously followed.
- Lack of ideas: The increase in costs may arise from the failure to follow an organized method to obtain alternative options or means. In most cases, we are satisfied with the first proposal or practical alternative that comes to our minds[22].
- Change in technology: There may be a less expensive technology to design or create a project but itmay not exist during the presentation of the idea or at the beginning of the design[24].
- Change in the requirements of the beneficiary: Serious requirements may arise or change in some of them during design or implementation, depending on certain circumstances.

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- Following old specifications and standards: Most of the currently followed specifications are over twenty years old, and some specifications and standards follow for many years, and then a defect becomes apparent in them[14].
- Time constraints: Often there is pressure to design or establish a project within a short time, forcing the decision-makers to follow the first solution that comes to mind. .
- Lack of good relations or coordination: coordination between all relevant parties and effective communication are two of the most important ingredients for success[15].
- Negative impressions: There are people who not like change and you always find them opposed to good ideas only because they were not familiar with them in the past .
- Lack of advice and killing advice: Some consider consulting others as deficient or defective, or appearing in an appearance who does not know about things that may be their specialty.
- Lack of value metrics: Rarely do you find measures of value that help determine quality or value, and most designers have not received practical training on cost estimation.

C. Time to apply value engineering.

Based on field statistics made in the United States, and the Kingdom of Saudi Arabia among the influential parties in the total costs of any project, it could be noticed that the design is the most influential factor, by 49 percent as shown in fig. 1, although it is the least expensive. This is self-evident because all subsequent decisions and actions will be based on design. The important note here is that the owner has only 10% of the effect on the cost, although it is assumed that the project owner is the main influence on the cost [9].

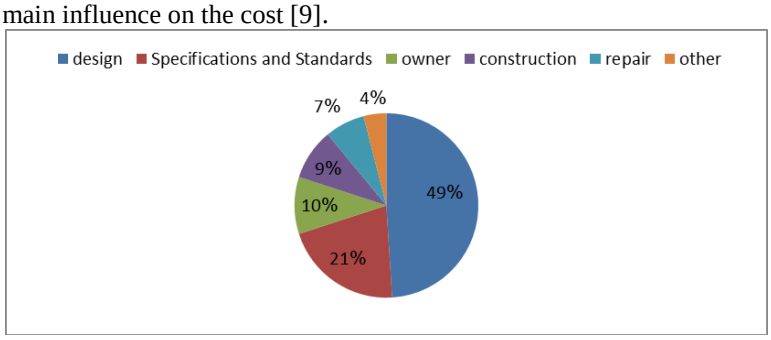

Fig. 1: The factors influencing the total costs of projects

D. Applying value engineering according to the consulting firms.

- There is a clear discrepancy between what the client expects and what the consulting engineer thinks they expect.
- There is also a gap between what the client expects and what he understand from the consulting firms in terms of service quality[15].
- Many of the two businesses believe that consulting firms provide value engineering as a part of their regular design work, and consulting firms. Also, they believed that they provide a full service that deserves them in exchange for offering their clients economic designs and trying to provide a thoughtful design that meets or exceeds the owner's specifications, as this is considered a form of value engineering[13].
- The application of value engineering is often met with resistance and a lack of understanding.
- Value engineering consulting firms often consider value engineering to be a waste of time and criticism of their technical capabilities [10].
- The time spent on value engineering by the design firm is often viewed negatively [11].
- Consulting firms often find their clients unacceptable to the concept of introducing value engineering incentives into client / engineer relationships.
- Value engineering consulting firms often view value engineering as an unwanted disruption (redundancy) in the design process. This creates an additional burden to review value engineering proposals, which wastes time.
- It is often thought that choppy work and remodelling are more expensive than any expected gains. Because engineers perceive their customers as risk-averse, they prefer tried-and-true design.

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- The method of selecting consultancy offices currently, which is through competitive bidding, and which depends on at least a price, is shown as one of the most important obstacles to applying value engineering in projects.

IV.METHODOLOGY

This study presents and discusses the results of a field survey. In terms of the characteristics of the study community, the application of value engineering tools and techniques in construction projects, the economic and cultural return from their application, and the strengthening of the role of consulting offices in conducting their studies.

A. Study population characteristics

The general characteristics of the study population were examined. It includes the scope of work, classification of consulting offices, experience of respondents, number of employees, values of projects implemented during the past five years, and the person responsible for managing the consulting office.

B. Year of establishment

Fig. 2 shows that 90% of the respondents had their own advisory office or body established after 2010 and 7% of the respondents established between 2000 and 2010. The lowest percentage of 3% established before the year 2000. This indicates that most of the companies are relatively newly established and have experience of less than 11 years.

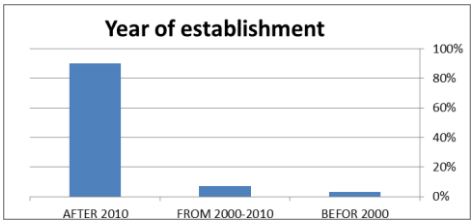

Fig. 2: Year of establishment

C. Field of work

In Table (1) shows that the buildings sector occupies the first place for the work of consultancy offices b ratio of 97 %, while electro mechanics. the lowest - sector comes Consultants operates by only 3%, while the road sector represents 63% of the respondents and the water sector and sewerage 21% of Its employees from consulting offices.

Table 1: Field of company specialization

Company Work field		Mean
Building work field	***Frequency***	**32**
	Percentage %	**97%**
Water and sewerage works	***Frequency***	**7**
	Percentage %	**21%**
Roads works.	***Frequency***	**21**
	Percentage %	**63%**
Electro mechanics	***Frequency***	**1**
	Percentage %	**3%**

D. Respondent designation: -

Fig. 3 shows the most respondents from the owners of office advisory and they target the sample by 69. 7 % (23) while project managers by 9 0.1 % (3) The respondents of engineers consulting offices increased by 15.15% (5) and the ratio least of engineers sites by 6 .1 % (2).

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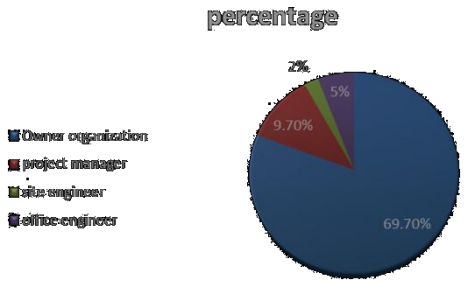

Fig. 3: Respondent designation

E. Experience of respondents: -

Fig. 4 shows The majority of respondents to the survey who have experience more 10 years increased by 72.73 % (24) , while the least percentage of their experience of 1-3 years increased by 6.1 % (2), while those who have experience of 3-5 years , the proportion 9.1% (3), while those with 5-10 years of experience 12.12% (4).

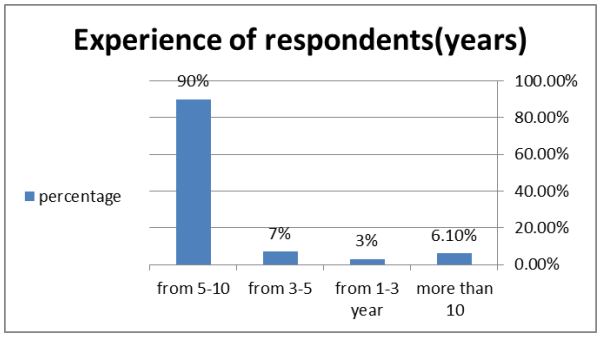

Fig. 4: Experience of respondents

F. Classification of consulting

In Table 2 the majority of respondents to the questionnaire who have a first classification in the field of construction are shown with rates of 36.4% (12) for the first classification, 33.33% (11) for the second classification, and 30.3% (10) for the third classification, while the lowest classification comes in the electromechanical field. With rates of 3% (1), while the field of roads has rates of 21.21% (7) for the first classification and 15.15% (5) for the second classification and 21.21 (7) for the third classification, while the water and wastewater field has rates of 27.27% (9) for the first classification and 15. Also,15% (5) for the second classification and 3% (1) for the third classification.

Table 2: Degree of classification

Company classification according the contracting for the following fields		First class	Second class	Third class
Building work field	Frequency	12	11	10
	Percentage %	36.4%	33.33%	30.3%
Water and sewerage works	Frequency	9	5	1
	Percentage %	27.27%	15.15%	3%
Roads works	Frequency	7	5	7
	Percentage %	21.21%	15.15%	21.21%
Electro mechanics	Frequency	1	1	1
	Percentage %	3%	3%	3%

G. The value of projects for consulting firms in the last five years :

Table 3 shows that most consulting firms have a value of more than 2 million in the last five years, at a rate of 60.6% (20), while the value of consulting firms 'work that is less than 0.5 million is the lowest rate of 3% (1).In the same time

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the value of their work ranges between Half a million and a million 6% (2), and companies whose business value ranges between one million and two million 30.3% (10).

Table 3: Distribution of value of executed projects

Total amount of executed projects during the last five years (in million dollars)	Frequency	Percentage %
0.5 and less	1	3%
0.51 – 1	2	6%
1.1 – 2	10	30.3%
More than 2	20	60.6%

V. RESULTS

A. According of clients

Table 4 shows that clients are not satisfied with the service provided to them by consulting firms by 31.8%, while more than half of respondents 54.5% believe that consulting offices have a desire to develop and introduce modifications to the initial designs of projects, as well as 59.1% of respondents. Respondents that their consulting offices are aware of the importance of value engineering, while 68.2% of them believe that if they get 10% of the savings that they propose to designs, they can create more economical in design.

Table 4: Respondents' views on value engineering

Item	Respondents' opinions on value engineering	Disagree	Agree
1	Clients are satisfied with the service provided by consulting offices in the construction industry?	22.7%	31.8%
2	Is value engineering a proposal (initiative) by the construction companies?	22.7%	59.1%
3	Consulting offices have the desire to develop, amend or change the initial designs?	54.5%	13.6%
4	Are consulting firms aware of the importance of technical office engineers?	59.1%	31.8%
5	Consulting offices provide clients with information on value engineering?	13.6%	50%
6	Consulting firms familiar with the role of project management as part of the construction industry?	63.6%	9.1%
7	Consulting firms getting 10% savings during the design phase result in more economical designs?	68.2%	22.7%

B. Design and value engineering.

Table 5shows that 59.1% of the respondents believe that it is not appropriate to limit creativity in design to financial matters only. While, almost the same percentage sees that traditional design tools endanger the service provided by consulting offices, and 31.8% of the respondents believe that The new designs restrict them to work. In the same time, 81.8% believe that the initiative to create innovative designs should be from the consulting offices and not from contractors.

Table 5: Respondents' views on the relationship between innovation in design and application of value engineering

Item	Respondents' views on the relationship between innovation in design and application of value engineering	Disagree	Agree
1	Is creativity in designs eliminated when it is limited to financial matters that are less expensive?	59.1%	22.7. %
2	Do the traditional tools used by consulting office engineers expose the services provided (designs - implementation - supervision) to decline?	59.1%	31.8%
3	Do consultancy contracts limit the design team's ability to innovate as it is part of contracting contracts?	59.1%	18.2%
4	Do the consulting offices provide clients with information on value engineering?	18.2%	63.6%
5	Do consulting offices think that the new and innovative designs restrict them to work?	31.8%	54.5%
6	Do the consulting offices believe that the cost savings resulting from the value engineering that was initiated by the contracting companies give the impression to the family that the consulting offices have failed to find economic solutions?	81.8%	13.6%

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C. Specifications' tendering and value engineering.

Table 6 shows that the respondents believe, by 90.9%, that the current system of competitive tenders and the time allocated for launching them has a significant impact on alternative options in designs. In the same time, 90.9% of them believe that this system does not help in reducing the total costs of projects, and 77% of them saw that the technical specifications should focus on the functional needs of the project and be expressed in independent terms, and 68.2% believe that the goal.

Table 6: Respondents' views on the relationship between specifications' tendering and engineering value

Item	Respondents' views on the relationship between specifications' tendering and engineering value	Disagree	Agree
1	Do you think that the tendering method for selecting consultancy offices has a significant impact on the time allocated for considering alternative design options?	90.9%	4.5%
2	Are you holding that the tendering method for choosing consulting offices contributes to reducing the total costs of the project?	4.5%	90.9%
3	Do you think that engineers work more efficiently than they do to find alternative solutions?	81.8%	4.5%
4	Do the consulting offices provide clients with information on value engineering?	68.2%	9.1%
5	Do you think that the technical specifications of the project should focus on the functional needs of the project and be expressed in independent terms?	77.3%	9.1%
6	Do you think that the main goal of consulting offices is customer satisfaction?	68.2%	31.8%

VI.CONCLUSIONS

Through the theoretical study and the results of the questionnaire, the following conclusions could be obtained:

- Consulting firms should begin an excessive training on the mechanisms, methods and applications of value engineering approach, and conduct workshops to study the economic returns from their application.
- Consulting firms should come up with the idea of applying value engineering to their regular clients.
- Workshops for the technical office'sengineers of the governmental agencies should be held periodically on the mechanisms, applications and economic returns from the science of value engineering.
- The value engineering approaches must be presented within the curriculum of the civil and construction engineering programs in the departments of civil and construction engineering in the Egyptian faculties of engineering and also, in the post-graduate studies programs.
- Governmental institutions, organizations and legislators should consider competitive bids for consulting offices with value engineering as one of the selection determinants.
- Professional organizations should set appropriate directives and recommendations on the topic of continuous professional development, especially with regard to value engineering issues, to ensure that the profession meets the changing needs inthe Egyptian construction sector and the changes at the arab, african and international levels..

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