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INTEGRATING PROJECT-BASED MANAGEMENT (PBM) IN ARCHITECTURAL FIRMS FOR INCREASING PROJECTS' DESIGN VALUE

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ABSTRACT

In the private sector, an architect/consulting engineer's role was frequently limited to preliminary technical design and legal approval of building projects. Nowadays, consulting firms are facing up the challenge of handling performance demands in their projects' designs to reach the satisfaction of their client's needs and values, which raises the need to seek a new system of management to manage design works.

The research explores the optimum management system that fit in the architectural practice and facilitates the application of Value Engineering workshops through design phases, in order to improve the value of projects by reducing project costs, improving teamwork and developing the right project, process, systems, or technique to meet the client's needs.

A survey questionnaire is used for data collection from a number of recognized Egyptian consulting firms in the architectural consulting industry. One of the results emphasized at the end of this research is the importance of the application of Project-Based Management (PBM) methods in architectural and engineering design firms. Such application facilitates the usage of value engineering workshops which helps in creating a better relationship between the different parties through the project life-cycle.

KEYWORDS: Architectural Management, Design Charette, Organizational structure, Project-Based Management, Value Engineering.

INTRODUCTION

As a result of the failure of management techniques and tools derived from repetitive industrial processes to fit in the ephemeral world of architecture, there was a need for management thinking and tools to support and enhance the act of creating architecture. The establishment of architectural management as a new discipline of research and practice is developed by the efforts exerted to combine managerial thinking with the management of architectural design organizations.

Although it was not easy to introduce the field of architectural management, the term 'architectural management' has been in use since the 1960s. Architectural practice was merely considered a business until after the Second World War when practitioners were primarily concerned about art and commerce rather than management. There was apparent conflict between the image of an architect and the necessity of professional management of the architectural business. It appears that the management of architectural design as well as architectural management in general are still not given enough importance.

On the other hand, value engineering is a unique process and a comprehensive revolution that seeks to reduce expenses as far as the function is accurately achieved. With both quality and performance in mind, value engineering works on providing more money rather than wasting it in vain. Therefore, the initial cost as well as the life cycle cost of the building is included under the broad concept of value engineering study.

Architectural Management (AM) is divided into office management and project management (Brunton et al, 1964). Office management provides an overall framework within which individual projects are commissioned, designed and completed. Despite of having the same objectives, both parts use different management systems (Emmitt, 2014).

On the other hand, each of the previous management methodologies cannot fit alone with the concept of (AM). Therefore, the researcher finds that the new approach of Project Based Management system is the most suitable approach to identify architectural management as well as the matrix organizational structure in order to be conforming for architectural & consulting organizations.

ARCHITECTURAL MANAGEMENT

According to Emmit (2011), the term Architectural Management (AM) was first introduced in 1964; since then only a few attempts have been made to redefine it. Based on certain types of methodology, various definitions of AM were proposed. As a result, different thoughts, scopes and functions are included under the umbrella of architectural management. "The gathering of the three most basic distinctions of a society, namely education, economy and culture. Architectural management is about all these subjects, thus about thinking, doing and feeling!", "Coordinating people and information towards the goal of getting the design of a building built". "Managing our reasoning capabilities.....Thus, managing the meaning of life". "The management and organization of aspects associated with architectural design". In fact, the most recent attempt to define AM was at CIB-W096 Conference in Vienna 2011 (Emmit, et al, 2011) :

"Architectural Management (AM) is the strategic management of the architectural practices that assures the effective integration between managing the business aspects of the office with its individual projects in order to design and deliver the best value to all those involved in the society". This definition is illustrated in **Error! Reference source not found.**

Architectural management resulted from approaching the design as an isolated activity at the front-end of projects, to cover the project from inception through to demolition, recycle and reuse. **Error! Reference source not found.** describes the context in which design management happens, and demonstrates the importance of communication and collaboration with different stakeholders. These are essential design and design management skills (Emmit, 2007).

Unfortunately, Design Management is mainly concerned about developing managerial practices to improve the design process which leads to development of high-quality innovative products through effective processes. Excellence in management can represent the difference between success and failure in multidimensional and complex project environments; however, it is not considered a substitute for a high-quality creativity and innovation. In general, the past research has focused on two different design management dimensions, i.e. office management and individual job management (the management of the design/project in hand). However, such distinction may be potentially misleading since the two are interconnected i.e. the management of people and social characteristics of the employed staff will create the unique culture of the firm, which

will in turn affect the way individual projects are managed.

Although a number of authors have attempted to address the issues of Architectural Management, they did not manage to provide an explanation for it. Nicholson's (1995) later attempt at a definition concludes that the architectural management field covers the entire construction process, from inception, through design and construction to facilities and maintenance management. Prins et al. (2002) suggests that architectural management is a process function for delivering greater architectural value to the client and society, without defining what these functions are, and who executes them (Emmitt, Prins, & Otter, 2009)

1.1. Project-Based Management: An approach for Architectural Management

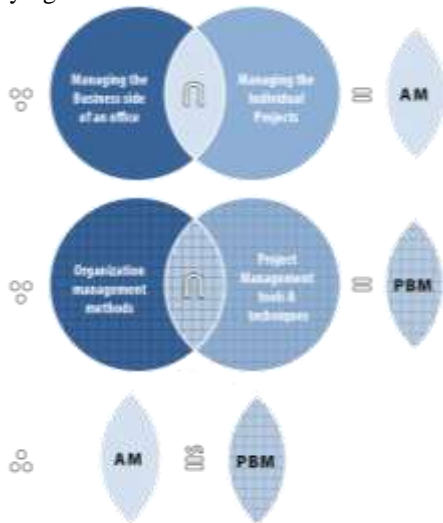
There are two types of management subjects, first: the philosophies or the framework subject, second: technique (project) subject. Framework (office) management includes the coordination of repeated work of a similar nature by the same people. On the other hand, Project management includes the coordination of one teamwork by a team of people who often have never previously worked together. Despite the similarity of the basic principles of management of these types of management, there is a kind of difference between both of them.

It is necessary for the architects to understand management skills more than the design and construction of buildings. It must include a thorough understanding of sound and economical building, proficiency in the appreciation of business and legal principles and the motivation, coordination and control of a complex group of people. Thus, the term 'managements' (the planning and organization of an elaborate sequence of operations and processes) may be defined as 'creation of conditions to bring about the achievement of objectives by the optimum use of available resources' (Oberlender, 2000).

The nine "body of knowledge" areas which are the management of integration, scope, human resources, quality, cost, time, risk, communication, and procurement are included in the book (PMBok) of Project Management Institute PMI. The middle seven are equivalent to PBM seven functions that was suggested by Turner (Turner, 2009). Turner has used the term project organization rather than human resource. The controlling process of each method includes the communication between both of the project manager and client. **Error! Reference source not found.** summarizes methods used to manage the five core functions.

It is noticed from the previous preview that there is a strong relationship between AM and

PBM.in terms of consistent of AM and the methods of applying PBM.



Therefore, **Error! Reference source not found.** illustrates the congruence of architectural management of design organization (firm) with the project-based management methods. In other words, this research deduce that tools and techniques used in PBM could be applied through architectural design firm management or through AM.

1.2. Project-Based Organization's structure

Project-based organizations (PBOs) indicate the different types of organizational forms (i.e., functional, matrix, or projectized) interested in developing temporary systems to do their work. Since the success of the work is measured by the final result rather than by position or politics, the hierarchy and bureaucracy inside the organizations may be diminished by the use of PBOs

PBOs carry out the majority of their work as projects rather than functional approaches. PBOs can refer to either entire firms (as in telecommunications, oil and gas, construction, consultancy, and professional services), multi-firm consortia, or networks. Moreover, some large project-based organizations might have functional support areas or might be nested within subsidiaries or divisions of larger corporations (PMI, 2013).

Organizational structure is an enterprise environmental factor. Such factor has the capacity to influence the availability of resources and the way projects are carried out. Organizational structures range from functional to projectized, with a variety of matrix structures in between. **Error! Reference source not found.** shows key project-related characteristics of the major types of organizational structure.

All these structures are included at a variety of levels in several organizations which are often called composite organizations. The team may involve a full-time staff from different functional departments, may develop its own set of operating procedures, and may even operate outside of the standard formalized reporting structure during the project. Although an organization may manage most of its projects in a strong matrix, it may allow functional departments to manage small projects.

Projects are considered as the main important factor in a project-driven organization, such as construction or design because they help in the characterization of all the work. Each project acts as a separate cost center having its own profit-and-loss statement. The summation of the profits on all projects forms the total profit to the corporation. In other words, everything in a project-driven organization revolves around the projects (Kerzner, 2009).

VALUE ENGINEERING

The main objective of this study is optimizing a system of management in the organizational design framework for architectural and construction projects, which should have the flexibility and reliability to reach the quality and the value determined by the owner/client. Therefore, this system applies the value engineering methods in the project design processes in order to construct a project of maximum return, less expensive, or both together, leading to the success of the organization. The Value Engineering's Action Plan consists of five stages which are logically organized to finish the stage before getting into the following one. This has been consolidated schematically into the datum for the exercise of benchmarking of the Value Management EPSRC IMI 1995 and is set out in **Error! Reference source not found.** The Systematic procedure applied during a VM study, whether a VP or VE study, includes the three distinct Phases of Pre-Workshop, Workshop and Post-Workshop activities which are described in the following. (Norton & McElligott, 1995)

1) Pre-study phase: the pre-study phase is mainly concerned about the well coordination of all parties in addition to the availability of ample information for review during the VM study.

Generally, an orientation meeting is required to be held between the value specialists and relevant Client and/or design team representatives. The objective of this meeting is start on establishing the logistics for the study and to get the Value specialists to know about project issues and constrains so that the study may be properly targeted. Nevertheless, the mission of the Value specialists is to translate any

cost estimate information available into easily comprehensible cost models which can be used to focus on high cost areas throughout the study.

1.3. Classical and new approaches for Value Engineering

Actual application of individual VE studies for a project were on a case-by-case basis until value consultation through the design process became an accepted practice. VE application is separated from the remainder of the A/E activities by the classical approach. The design team prepared each stage of design with little or no coordinating input from the value engineer. Architect/engineers did not have much say in this approach.

Several basic changes have resulted from a new approach in design which remarkably affected the classical way of conceptualizing VE. One of the most important changes is that VE can be practiced on both a formal and an informal basis, by both an independent team or by the design team. The independent VE team is formed according to the requirements of a certain value study, however; it is made up of other design team members who have not taken part in the original design of the project. The principles of VE-including following the Job Plan, function analysis, separation of creativity and evaluation, LCC analysis and recommendations- are still a fundamental part of every study. Moreover, the VE team's job is not finished by the time the VE recommendations are given to the original designers. Being part of the same organization, it becomes necessary for the VE team to participate in the implementation of each idea. The VE team may be summoned to complete the work in case further research is required (Alphonse, 1997).

FACTORS AFFECTING THE APPLICATION OF VE IN CONSULTING FIRMS

There are some differences between the in-house pre-established approaches for applying value engineering through design firms which could be summarized in the following:

- 1-Size of the projects which have been undertaken by firms (size and level of complexity)
- 2-The organizational structure of the firm.
- 3-Size of the firm according to its number of employees, engineers, consultants and CVS (if applicable)
- 4-The Recurrence of partnership agreements with outsourcing consultants.
- 5-The management system used to manage the firm.

Other characteristics of the architectural practice that do not have a major effect on applying VE system in managing a design firm are not overemphasized; for example:

-Types of projects held by the firm: as value engineering could be applied for all types of projects.

-Definite discipline: as applying value engineering should have a multidisciplinary team that should have a whole view of the project's functionality.

-Post Occupancy Evaluation (POE): the main objective is to describe the possibility of applying VE study in a design firm. As a result, it is required to evaluate the VE workshop procedures through the implementation and after the presentation stage. Contrary to this, POE should be used to evaluate the design's outputs as well as satisfaction of end users, etc.

1.4. Organizational structures for applying in-house VE studies

An investigation of the current addicted organizational structure, as well as the appropriate alternatives is conducted in order to modify structures of consulting firms in terms of applying VE studies through the different design stages. According to McCurdy's VE- A/E combined program which consists of two teams of, at least, six CVSs of different disciplines, those specialists are unable to fit into the functional structure because the power of decision making is directed to functional managers. When positioning those specialists in a functional matrix, the power of decision making increases in relation to the CVS facilitator as well as the discipline managers as shown in Figure Error! No text of specified style in document.-1. On the contrary, there is no flexibility in the projectized matrix for managing individuals due to putting one person in direct charge which increases the difficulties of managing a large number of team members & certified specialists as shown in **Error! Reference source not found.**

However, in applying VDBC, the VE team could be an indoor team or an outsourcing team, in both cases they are led by a CVS Facilitator who is directed by the manager of the firm. This approach is more projectized than the other one because its task is only applying VE studies on the output of the design stages without interfering as designers. Therefore, the appropriate structure of VDBC could be a functional or a balanced matrix organization as shown in Figure Error! No text of specified style in document.-2.

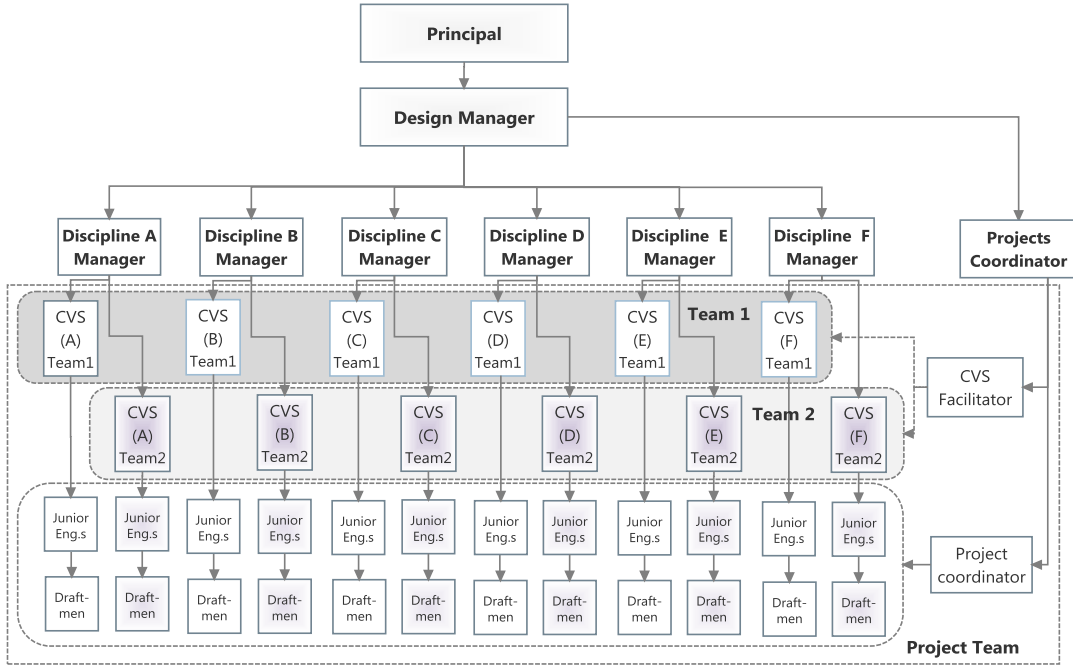


Figure Error! No text of specified style in document.-1 Functional Matrix structure option for VE-A/E Approach

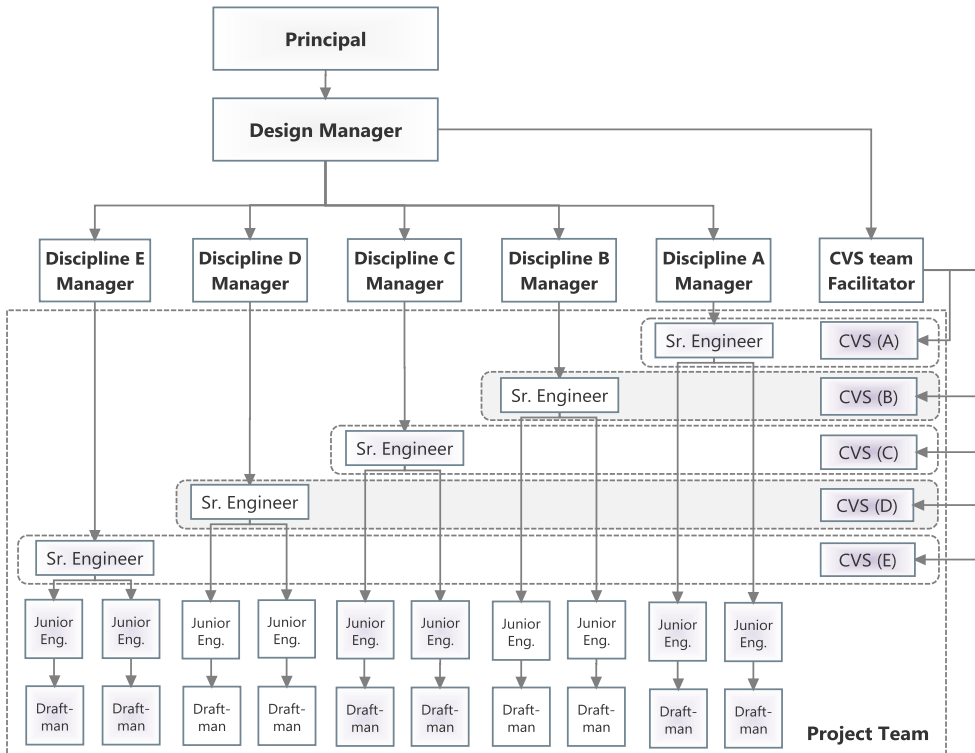


Figure Error! No text of specified style in document.-2 Functional Matrix structure option for VBDC approach

1.5. The size of the firm

The number of employees in a firm (size) including junior engineers, CAD technicians, senior engineers, architects, secretaries, quantity surveyors, etc. affects the act of applying VE studies through the firm and the size of projects greatly. Enterprises in Egypt could be categorized to size according to the African development bank (AFDB) report (Dupouy, 2010) as shown in Table Error! No text of specified style in document.-1 *Categorizing firms according to size*

Figure Error! No text of specified style in document.-1 shows that A/E – VE combined approach requires a hierarchy under each CVS team member in order to manage design work outputs. Accordingly, this approach should be held by either a medium (100 to 500) or a large firm (over than 500 employees).

Table Error! No text of specified style in document.-1 Categorizing firms according to size (Dupouy, 2010)

| Type of formal enterprise (in Egypt 2006) | Number |
|---|-----------|
| Very large (over 1000 employees) | 207 |
| Large (500 to 1000 employees) | 292 |
| Medium (100 to 500 employees) | 2,871 |
| Small (10 to 100 employees) | 3,163 |
| Very small (5 to 10 employees) | 42,538 |
| Micro (1 to 5 employees) | 152,445 |
| Micro (one employee) | 2,252,550 |
| Total | 2,450,903 |

Despite the A/E- VE combined approach, VBDC could be applied through various sizes of firms

1.6. Project size (according to construction costs)

According to Alphonse cases for applying value engineering, although value engineering could be applied for a various range of projects, project size can be measured in several dimensions: amount of money or other scarce resources (skilled people, facilities, other), scope and geography (Archibald, 2013). On the other hand, the cost of the project is considered the main factor of applying VE study. Therefore, it is important to classify projects according to their construction costs.

Although it is essential to add complexity of a project to the classification as mentioned by Adnan Haidar and Ralph D. Ellis Jr (Haidar & Ellis Jr., 2010) as: small & non complex projects, large & non complex, small and complex, large & complex projects, the complexity is still directly proportional to costs required to build up a complex project as mentioned by Alphonse (Alphonse, 1997).

There is a general consensus among practitioners and researchers on the concept of a large scale project with a price tag in excess of one billion dollar to be called a mega project (Fiori & Kovaka, 2005).

Accordingly, it is hard to unify measure costs of projects in Egypt and universal categorizing of projects due to the financial levels in Egypt, the currency power in Egypt besides the currency exchange rate of the universal levels. The researches try to translate international classification of projects in terms of EGP is more than 7B. EGP to 7.5 Billion transfer rate (Dengler & Farmer, 2014).

Therefore, small and medium projects in Egypt could be determined by average revenue /sales of 100 million EGP according to the loans of the National bank of Egypt (National bank, 2014). However, it is known internationally form projects classifications for several countries worldwide that medium projects costs are less than 50 million dollars (Approx. 350 million EGP) while for large projects they are less than 100 million dollars (Approx. 700 million EGP). The researcher tries to simplify the intervals in order to introduce them to Egyptian respondents so that they can extrapolate the size of projects designed.

CREATING A SYSTEM OF PBM / VE IN DESIGN FIRMS

In the system's approach, not only the concentration is on the components or the parts but also on the analysis and design of the entire project. The approach investigates the problem as a whole, taking into account all the facets along side with all the intertwined parameters. In addition, it attempts to understand how they interact with one another and how they build a relationship to figure out the optimum solution of the problem. According to Simon Ramo; "Systems, is something old and something new" (Ramo & St.Clair, 1998).

The researcher tries to build this system between the two noble concepts. The first concept is the practical new management system based on project management science which is called Project-Based Management (PBM). On the other hand, the old empirical theory is the Value Engineering methodology.

The selection of first practical approach of the PBM is based upon its ability to combine both traditional management procedures of organizational management and project management in order to achieve the project success elements which are: success criteria and success factors, as declared by Turner (Turner, 2009) in the following:

- **Success criteria** – How the project is judged to be successful.

• **Success factors** - The elements of the project which can be influence to increase the chance

According to Kelly and Male (Kelly & Male, 1993) assumptions, the researcher has used the VE methodology as client satisfaction oriented study in order to testify the optimization of PBM usage through managing architectural and consulting organizations. Furthermore, the researcher has built the following matrix to test the compatibility of VE stages and procedures along the first axis in comparison to the PBM methods and tools on the other axis by marking and identifying the common VE activity that fits up with the management methods as shown in the next **Error! Reference source not found.**

1.7. Analyzing PBM / VE system

A points system has been used in table 5-2 to figure out the size of the effect of the study of Value Engineering in the application of each method of PBM methods, separately. Furthermore, it has been used in order to determine the percentage of that effect in relation to the full impact of each method on the study of value engineering in order to facilitate the comparison of the effect of the rest of the PBM methods on each other.

Figure 5-4 summarizes the percentage of the effect resulting from Table 5-3. The highest percentage of the effect of management methods is found in the scope management by 71%. In other words, scope management has a remarkable effect on all the stages of the VE study.

In relation to the effect, time management method comes after scope management method. Thus, time is one of the most important factors that affect the application of the VE study because it is related to the schedule of the design process of a project as well as the time limited for the work of the study. Furthermore, the cost comes directly after the time in order, which maximizes its importance due to the high cost of the study in relation to the design process for the consultant in addition to the importance of controlling that cost over the different phases of the study.

Then, risk management comes due to the utilization of its techniques for the project within the study of Value Engineering alongside with a study to pinpoint all the probable risks during the design process by which the consulting firm might be affected. However, organization management methods have the least effect on the study or the contracts because most of its effect takes place in the first phases of the study of Value Engineering.

The rest of the management styles vary in how much they affect the study of value engineering; such as stakeholder's management and quality

management because they occur in the control process in the study of value engineering throughout the life cycle of the project design within the firm, as shown in Figure 5-3.

VALIDATING A SYSTEM OF AM & VM - CORRELATION SURVEY

A dual approach was followed in the collection of the primary data (survey and case study). A background correlation survey was first carried out on the engineering profession. The response rate was significant with 14 usable questionnaires being returned. A two-stage approach was then followed in the interviews of the case study as follows:

Stage 1- involved the use of loosely structured exploratory interviews in order to establish an attitudinal baseline. The interviewees were then requested to complete and return the survey questionnaire prior to the interviews of stage two.

Stage 2- involved the use of semi-structured interviews in order to review the interviewees' response to the questionnaire and to establish the reasoning behind their selections. The data which were collected by the wider survey were introduced at this stage.

For each question the results of the survey will be presented first, followed -where appropriate- by an examination of how the results compare to the literature review. The information from the case study interviews is used to investigate the underlying issues, examine how they are viewed by the engineering profession and consider their implication for the application of a value engineering service. The survey respondents have considerable experience and were technically from the highest levels of management.

The questionnaire was piloted with experienced value engineering professionals, managers and architectural academics in order to ensure that all the questions were clear and precise. The individuals were asked to complete the questionnaire, discuss any problems they encountered and suggest any modifications they felt would make the questionnaire more user-friendly. Their comments- focusing on the content, clarity and formatting of the questionnaire- were addressed where appropriate and the questionnaire was revised accordingly.

Those amendments included a number of questions which were reduced since the questionnaire was considered to be too long. Furthermore, it was considered more appropriate to change the order of presentations in some areas in order to minimize the possibility of bias. On the other hand, it was felt that the fifth level of the original six-level Likert-rating scale could be understood in an easier way in order to avoid the boredom caused by answering the

questionnaire. Nonetheless, it was recommended to provide a translated Arabic questionnaire cards to meet the native language of the respondent firms.

For better results of the response, it was recommended that the questionnaire be limited to the respondents experience in the middle-east construction industry. In addition, the respondents should be asked to state their current position, experience, and time within the firm being surveyed.

1.8. Nature of Sample, Sample Selection and Questionnaire Administration

The samples were selected from different categories of consulting firms as Expert-houses, multi-disciplinary and architectural consulting firms. This variation is used in order to show that the main concerns of the factors affecting the application of VE studies are the size, organizational structure of the firm and the cost of the deliverables designed.

In addition, the classification of firms according Egyptian Syndicate of Engineers is not accurate and doesn't have the data needed such as the size of the firm. These acquired data are accumulative, not updated and do not describe the existent characteristics of firms and their sizes. The only data obtained is the specialties of the firm and the type of services offered in the Architectural consultation industry.

Therefore, the sample was selected from recognized firms in the architectural practice which were registered in the Egyptian Syndicate of Engineers and were categorized according to size and number of employees in the firm. The questionnaire is sent to the selected firms by postal. Thirty five questionnaires were received by consulting firms (14 Expert-houses, 11 Multi- disciplinary firms and 10 Architectural firms).

14 replies were received which represent 40% of the response rate (50% are Expert-houses, 21% are multi-disciplinary firm and 29% Architectural Firms). All respondents have more than 10 years of experience while 65% hold at least a director position.

1.9. Rationale questionnaire

The two-part strategy made possible an exploration of the initial attitude of the interviewee and the way this may or may not change in case of offering further consideration/information.

The design of the questionnaire avoided the reversal of items alleviating the miss-response issue to overcome bias concerns. The questions were designed, piloted and drafted to be as clear as possible. (Ray, 1983). The survey was introduced and to be highly interesting and was directed at the higher management level in the firms surveyed. The high

percentage of top management respondents and the interest levels indicated in the research suggested the validation of the mitigating measures.

The major concern of the questionnaires is the low response rate and the resultant validity issues. Therefore, it is administered in different ways. On the other hand, the response rate is increased in line with the number of contacts considering Moser and Kallon's assertion that the results of a postal survey could be considered biased if the return rate was lower than 30-40 percent. Thus, the 40% percent response rate achieved can be considered as being significant (Moser & Kalton, 1971).

In regard to the time limits dictated by the research, a maximum of four two-stage interviews could be accommodated. This represented 100% of the head office directors and was considered sufficient to alleviate bias while being representative of the overall view of the firm.

Firm directors were selected to be the case study sample as they are most likely to evaluate the impact of decisions, action and/or inaction of other variables on themselves and on the other stakeholders. Therefore, they were considered the most reliable source of relevant insight and knowledge within the firm.

1.10. Interviews

The points of strengths and weakness of interviews are taken into consideration as a means of data collection. Weaknesses include the opportunity for bias in the questions asked, how they are asked and the possible errors of interpretation. Strengths include the opportunity for exploration and the immediate clarification of misunderstandings (Beatham, 2003)

Unstructured face-to-face interviews have been mainly utilized for the data collection of the case study. The utilization of such interview styles made possible the collection of substantive views, opinion, perception and attitudes on the subject and provided the flexibility to adapt the necessary questions. The personal interviews provided valuable first hand information from the field.

The interviews were transcribed and translated with the content analyzed using a simple form of qualitative analysis. This methodology was introduced by Fellows and Liu (2008), which involves the categorizing of communication content, in order to quantify it.

The interviews took place in the firm's offices in September of 2014.

1.11. Case study discussion

- What is Value Engineering?

One respondent stated: *"It is the process of re-functioning of the project in order to achieve the lowest overall costs as the initial cost and operating costs".* Another respondent indicated: *"Is a study carried out by the Contractor's Consultant for reaching work balance to the cost of the product (the project) and that by doing precise calculations to adjust the cost - which makes project reach to a form that satisfies the main consultant of the project and make profit for the contractor and reduce the cost of the project which in turn increases customer satisfaction".*

While others thought: *"A Step is to link the design and implementation phases as a transition from design to working drawings efficiently and with cost-savings appropriate to the needs of the client and site changes".*

- **When do value engineering best applied in design process? And why?**

One respondent stated: *"At the stage of preliminary working drawings - where checking the architectural solution with calculations of construction in order to bid the work on contractors - there could be some modifications in architectural design of the project to reach the optimal structural solution due to absence of multi-disciplinary team in the conceptual design stage (person who puts the idea has no knowledge of all disciplines)"*

Similarly, another respondent indicated: *"After the detailed designs or during the design development and before the working drawings in order to determine the specifications and materials and stereotypes needed by project. It cannot be implemented at the stage of working drawings as this stage is a quick targeted and difficult to intervene in by implementing the study".*

Furthermore, the third declared: *"After developing the idea and after settling the program and determining the elements in the preliminary stage (concept) as the required study implemented when the properties of design criteria appear such as: Spaces, Specifications, multi-MEP, electro-mechanical and different tools Equipment's. Therefore, the value engineering study should be after the main conceptual idea formulation".*

- **Who is best to initiate applying value engineering? And why?**

One respondent said: *"Contractor's Consultant - particularly in the case of lump sum tendering (Lump sum). Nonetheless, the main consultant was not suited especially in the case of the designing of the project for a percentage of fees from the total construction cost".*

While another said: *"Main consultant because he knows the needs of their client".* In contrast to those, the third declared: *"The owner*

because he always seeks to reduce the cost to his own advantage and benefits. The main Consultant prefers not to perform value engineering study because it will increase the design effort, cost and time to the work of the study".

- **What obstacles face applying value engineering through design firm?**

One respondent said: *"The type of agreement on fees between the main consultant and the clients. Designer's fees are too low as the owner tends to save costs while he expects to get the most from Designer. There is no assessment of the post-implementation or after use (POE). As there is no assessment of the running costs for the project (Life cycle costs)"*

The other respondent said: *"There are no clear borders between the stages of design, the working drawings and the detailed graphics. Most of the projects are characterized by shortness of the time according to the client's requirements in starting early in the implementation process in addition to the lack of customer awareness of the importance of this study".*

In line with that: *"Engineers have no knowledge of the study of Value engineering especially when engineers, owners and clients have no awareness of the importance of this study. As there is no role for the Engineers Syndicate for the improvement of science, their current role is limited to providing consuming services to engineers. Finally, There is no role for Association of Egyptian architects in the development of architectural education".*

- **What do you think about project based management? usage, importance?**

One respondent said: *"An effective Administrative system for large-sized enterprises and a means to enlarge the size of small businesses. Arranging consulting business and setting it in a good discipline and order leads to a product that is more convincing for the client".*

The other respondent said: *"Is the management of the design process so as to achieve the needs and wants of the client in the context of appropriate cost to him".*

The third respondent declared: *"First, I cannot answer this question. It could be time management techniques as comparing initial duration with actual duration as well as the rest of characteristics of the firm. That question should be directed to the large major companies and offices in Egypt; may be the 3 largest companies for consultation investments in Egypt. I think it is the system which the investment offices in Egypt lack".*

- **What obstacles prevent applying management methods through a design firm?**

According to the first firm: "No cadres are familiar with the importance of the management science as it is not taught in universities. In addition, the increase of the cost of the service increases the time required to perform the services but the product appears in a complete manner. The revenue from designing projects is not enough to apply or to train staff on management methods. Lack of experience and validity of the implementers may lead to disappearance of the results and the pros of using management systems in the design".

In regard to the second firm: "Tight project time which leads to compressing the design procedures which decreases the product quality required. On the other hand, the failure to adopt the client information and guidance consultant and client's permanent intervention in the design process. The client felt that he is more familiar and experienced than the consultant due to his work experience in real estate development industry. Reduce the cost of design-mainly- to make a profit.

As concerning the third firm: "Need to be a huge institution and the size of a large business in order to be effective. Consulting firms manage their work by more than one person in the administration. As all decisions taken investment firms are personal interpretations. There is no connection between the team responsibilities and the time of the project. There is no assessment for the performance of individuals".

- **Could management methods and value engineering integrated together in a design firms?**

One respondent said: "Yes, of course. In order to apply value engineering study, it needs to be a system that is truly using enterprise management - Because project management studies results into information on which the selection of the right team of specialists who handle the value engineering study is based". Another respondent stated: "Yes, of course - when the consultant and owner agree on the pre-defined fees and the client is fully aware with the characterization of the tasks and the time needed for the study in the agreement".

Furthermore, another respondent stated that: "I cannot apply or work integration between VE and management methods because engineers and

managers do not know originally the defined value engineering science, management techniques or even what integration is. This science should initially be published and taught in college and then to be applied in architectural institutions. Such integration is workable with famous or foreign institutions while not with small or medium enterprises in Egypt".

He adds: " But nevertheless, the application of value engineering have a return on the firm as well as increasing its reputation, as the design as achieves the optimal additive for the product and finally is a new benefit for the firm as the awareness of the staff towards the value engineering".

CONCLUSION

A System of VE and PBM could be applied to architectural project through its design process as concluded from chapter 2 and chapter 4. The three pillars of management (scope, time and cost) - in addition to risk management have the greatest effect on applying value engineering workshops which confirms the definition of Architectural management in increasing the quality of projects and design process to deliver value to the society. A correlation survey of a structured questionnaire and semi structured interview is held to identify and validate the system of PBM and VE assumed throughout the research. It detects additional factors that could affect the application of this system such as the type of contract between the client and the consultant. In addition, obstacles that face the application of management methods in consulting firms show the following:

- 1- There are no cadres familiar with the importance of the management science.
- 2- The revenue from designing projects is not enough to apply or to train staff on management methods.
- 3- Tight project time leads to compressing the design procedures which decreases the required product quality.
- 4- There is no connection between the team responsibilities and the time of the project.
- 5- It needs to be applied in large-scale projects and in large firms which use these systems.

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