

# Value Engineering in Construction Industry in Oman

[Ali S. Alnuaimi, Ibrahim A. Al Balushi and Usman Fathoni]

**Abstract**—The main objective of this research was to measure the level of awareness and application of Value Engineering (VE) in construction industry in Oman. Data obtained from 64 respondents representing the public and private construction sectors was analyzed. The findings indicated that VE is recognized in construction industry in Oman and there is a sign that some organizations are applying VE in their projects, but there is confusion in understanding its process and application with the cost saving tasks. 42 per cent of the respondents rated VE as limited to some special projects and 40 per cent stated that the application of VE is low. 89 per cent of the respondents assumed that implementation of VE in construction projects will benefit the construction industry and minimize time and cost overruns, improve values, and meet requirements. The main factors retarding the application of VE in construction projects were found to be lack of knowledge, guidelines and non-availability of dedicated VE team

**Keywords**—value engineering, construction management, Oman, constructio

## I. Introduction

The use of Value Engineering (VE) technique for a variety of projects has proven its effectiveness in reducing project costs without reducing the scope of the work. VE can be applied at any stage and to any part of the project. However, the earlier it is applied in a project life cycle, the greater the saving will be made [1]. The applications of VE have been forced by laws in some countries [2]. Unfortunately, application of VE does not seem to be well embraced in the Middle East [3]. In Oman, VE program introduced officially in 2004 by the Value Engineering Centre, VEC, which is a private local consultant working in oil and gas operation projects through the ministry of oil and gas. VEC has contributed to the improvement of the design and construction of different oil and gas projects. Project's time and cost overruns due to change orders as well as deviations from planned quality are the most popular problems encountered in construction projects in Oman [4]. Findings of a study about

perception towards implementation of VE among the private sector in Malaysia [5] concluded that the perception of private sector's consultants towards VE is skeptical and negative. The expenditure on construction projects in Oman is made by both the public and private sectors. The public sector accounts for the major part of the total capital expenditure on construction and mostly goes to infrastructure and development projects, while the private sector expenditure is largely allocated to residential housing, commercial buildings, industrial construction, and lately in tourism and natural gas related projects. It is clear that the measurement of the current level of VE application in Oman's construction industry is very important for the further appraisal of VE. The involvement of the public and private sectors in any investigation is critical as they are the key players in construction industry. One objective of this research was to measure the level of awareness and application of VE in construction industry in Oman. More results and in-depth analysis can be found in [6].

## II. Data collection and methodology

A field survey via questionnaire was distributed to obtain information which contains measuring parameters of awareness and implementation of VE in construction projects. The survey questionnaire was distributed to one hundred (100) professionals, who are members of the projects' teams, in a distribution database that was created to provide an equal distribution among the various members of public and private sectors. All selected participants were educated with minimum degree of a BSc. The participants were chosen from a diverse background with their industrial experience ranging from 1 year to over 20 years. The distribution ensured that the responses to the questionnaire would consider the various perspectives of the different project team members, thus providing general overall results. The obtained data was analyzed using Microsoft Excel software to produce descriptive statistics of the level of awareness, implementation, and obstacles of VE.

## III. Results and discussion

### A. Types of respondents

64 respondents managed to complete the forms, 36 (56.25%) were from the public sector and 28 (43.75%) were from private sector. This indicates that the VE gained more interest among the staff of public sector than of the private sector. Table 1 shows that project engineers, design professionals, construction managers and quantity surveyors dominated the number of respondents. The owners and contractors were less involved with 6 and 3 per cent respectively. This shows that the owners who invest a lot amount of money and contractors who take the responsibility

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and risks of construction have less knowledge about VE than others.

Table 1: Respondent’s job classification

Classification	Respondent	Percentage
Owner	4	6.25 %
Design professionals	16	25 %
Construction managers	7	10.9 %
Contractors	2	3.13 %
Project Engineers	28	43.75%
Quantity surveyors	7	10.9 %
Total	64	100%

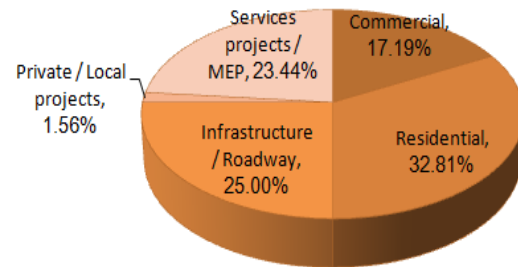


Figure 2: Respondents and projects types

### B. Respondents’ experiences and types of projects

Figure 1 shows that the respondents have good background and experience in construction industry. 25 per cent of the respondents have more than 20 years’ experience and 36 per cent of them have experience more than 15 years. Figure 2 shows the percentage and type of projects handled by the respondents. It is clear from the results that, the residential projects have the largest portion of construction industry which goes in line with data obtained from the Ministry of Economy [7]. From the type of projects and respondents as well as their experiences, it can be stated that, the collected data was suitable for analysis to represent the real situation of construction industry in Oman.

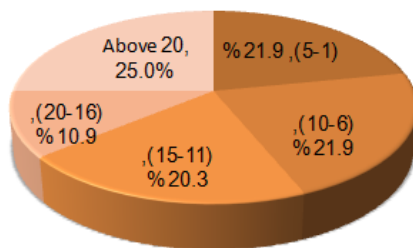


Figure 1: Years of the participants’ experiences

### C. Respondents’ general knowledge about the concept of VE

The results in Table 2 illustrate that, 57 (89.06%) of the respondents showed awareness of VE. The remainder 7 (10.94%) respondents were not familiar with VE concept and techniques. Figure 3 shows that, 15 (26.32 %) of the respondents who were aware of VE learned about it from their work environments. 14 (24.56 %) respondents claimed that they learned basic facts about VE from their colleagues and friends. A further 24.56 per cent learned about VE through attending seminars, and 10 (17.54 %) respondents learned through attending specialized short courses. Only 4 (7.02 %) of respondents learned about VE through literature. The results in Table 3 show that 31 (48.44%) of the respondents understand the basic concept of VE and another 12 (18.75%) respondents know a great deal about the application of VE. 3 (4.69%) of the respondents consider themselves experts in VE application. The findings give an indication of the presence of VE in construction industry in Oman and awareness of some respondents about the VE general knowledge. Furthermore, the results indicate that some of the construction industry organizations apply VE in their projects as 15 (26.32 %) of the respondents who were aware about VE learned it through application in their projects. Generally, the results show that information about VE has reached the construction industry and it is suggested that the concepts, rules and methodology of VE should be explained extensively.

Table 2: Respondents’ awareness of VE

Aware of VE	Respondents	Percentage
Yes	57	89.06%
No	7	10.94%
Total	64	100%

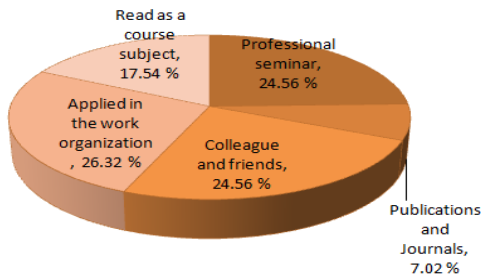


Figure 3: Source of respondents' VE knowledge

Table 3: Statement on the respondents' general knowledge of VE

Respondents' general knowledge of VE	Respondent	Percentage
Never heard of VE	7	10.94%
Heard about VE, I don't know much about it	11	17.19%
Understand the basic concepts of VE	31	48.44%
Know a great deal about VE	12	18.75%
Considered an expert on VE	3	4.69%
Total	64	100%

#### D. Implementation of formal VE in respondents' organization

The survey results showed that 42 (65.63%) of respondents claimed that they applied VE techniques in their projects. Table 4 shows that 15 (26.32 %) of the respondents learned about VE through their organization projects. 25 respondents out of the 42 declared that their organization applied VE techniques in a range of 1-5 projects in the last five years. 8 out of the 42 respondents stated that their organization applied VE techniques in more than 15 projects in the same period. 7 out of the 42 participants stated that they applied VE in a range of 6-10 projects in the last five years and 2 participants claimed that they applied VE techniques in the same period for a range of 11-15 projects. The results prove that there is a high interest in the organizations to apply VE in their projects.

Table 4: Number of projects where VE was applied in the last five years

Quantity of projects where VE was applied in the last five years in respondents' organization	Respondents
1-5	25
6-10	7
11-15	2
Above 15	8
Total	42

Further investigation of the results on VE implementation in participants' projects, showed that 11 (26.19%) stated that VE was performed during the final design stage, while 9 (21.43%)

declared that VE was performed during the preliminary design stage. 9 (21.43%) participants stated that VE was performed during the conceptual phase of the project and 9 (21.43%) performed VE in their projects during the construction stage. 4 (9.52%) showed that they performed VE in their projects during the bidding phase. Figure 4 shows the stages of the project life cycle where the participants' organizations performed VE in their projects. According to VE standard job plan and procedure, the results are not consistent with the formal VE procedure and job plans as 24 (57.14%) of the respondents claimed that VE was performed in their projects during the final design, bidding or construction stages. As a general VE rules, the VE formal study should be started in the early stages of the project before commitment of funds and approval of systems, services and design. The benefits of VE comes down as the project move further from the concept phase and becomes very less in the construction stage, where more focus will be in the cost rather than the functions. The results show that 22 respondents claimed participation in VE study on some projects. 18 (81.82 %) of them participated in a formal VE study where a dedicated project study team was formed and 4 (18.18 %) participated in non-formal study. Moreover, the project engineers and owners led the performed formal VE study team as shown in Table 5.

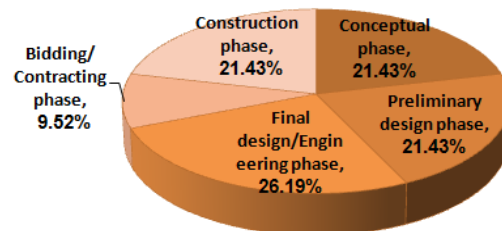


Figure 4: Stages of project's life cycle where organization perform VE

Table 5: Who leads the formal VE process in the project study?

Who leads the formal VE process in the project study	Respondent	Per cent
Owner	5	22.73%
Architect	1	4.55%
Construction manager	3	13.64%
Project Engineer	9	40.91%
Contractor	2	9.09%
General Manager	1	4.55%
Course instructor	1	4.55%
Total number of answers	22	100%

It can be learned from the results that, the respondents may have participated in reviews of the projects’ scopes for cost savings as this task is very common in Oman during bidding and construction stages where it is mostly led by the owner or his representative. Therefore, it can be stated that there is a lack of understanding of the general VE application procedures and rules in construction industry and the participants might have been confused between the cost saving tasks and VE techniques. Figure 5 shows that, the respondents believe that project’s engineers, owners and construction managers should participate in the VE dedicated team during the project value study. They also believe that owners and construction managers have the most impact in elimination of the project unnecessary cost as shown in Figure 6. These findings support the statement that respondents are confusing cost saving with the VE. This opinion is established because usually the owners and construction managers are the leaders of the project team in Oman who decide on the construction cost and requirement revision tasks, it is not a designer who is establishing the vision of the project and evaluating the value of the works. This is again lined up with the fact that in construction industry, the owner leads the consultant design team to his requirements during the early stages of the design, then the consultant continue the detailing works.

**E. Respondents’ opinions on obstructions to implementing VE**

Table 6 shows the factors that hinder the implementation of Value Engineering in the construction industry in Oman as per the respondents’ opinions. It is worth mentioning that, 57 (89.1%) respondents completed this part of the survey while the other 7 (10.9%) respondents were not having clear answers for the questions. Accordingly, their answers were not considered. 226 answers collected in this part as the respondents can choose more than one answer.

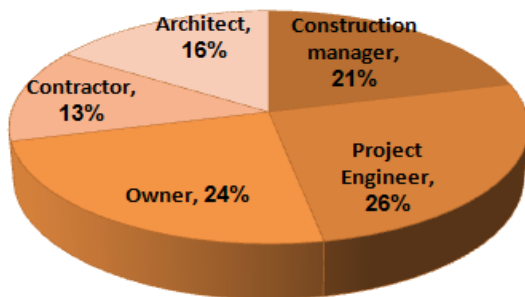


Figure 5: Participants in a formal VE analysis

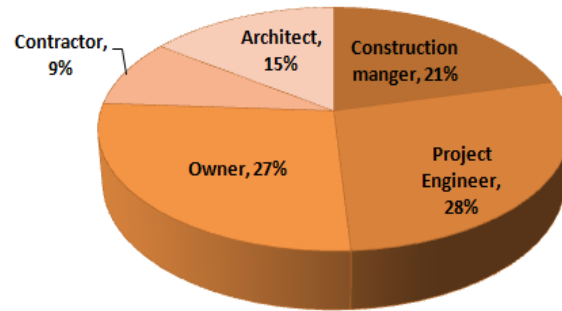


Figure 6: Members who have largest impact on elimination of unnecessary costs

Table 6: Obstructions to the VE process and application in construction projects in Oman

Reasons	*Respondent	Per cent
Owners do not want to invest money in the VE process	19	8.41%
Owners do not want to invest time in the VE process	16	7.08%
Lack of knowledge about VE procedures, applications and techniques.	43	19.03%
Lack of local guidelines about VE	24	10.62%
Engineers/architects do not have a financial incentive to produce the most efficient design	15	6.64%
Engineers/architects want to complete the design as soon as possible since they are paid a lump sum and do not want to invest time in exploring new ideas.	25	11.06%
Non-availability of dedicated VE team with owners	30	13.27%
Non-availability of dedicated VE team in contractor’s or designer’s organisation	17	7.52%
Local codes limit the use of creativity in design and the use of new technology and products	8	3.54%
Construction managers and project engineers are not made part of the project team until the designs are completed or near completion	18	7.96%



Owner's engineer or contractor does not have financial incentive to produce the most officiate design.	11	4.87%
Total number of answers	226	100%

\*The respondents can choose more than one answer for this question.

The results show that, 19.03 per cent of the obstacles to the VE implementation in the construction industry are associated to the lack of knowledge about VE procedures, applications and techniques while 13.27 per cent are related to non-availability of a dedicated VE team with the owners and 7.52 per cent are related to non-availability of a dedicated VE team with contractors or designers. Furthermore, 10.62 per cent of the obstacles are due to lack of local guideline about VE and 11.06 per cent is due to non-availability of proper time for completing the design of the project since the design firms are paid a lump sum and do not desire to invest time in exploring new ideas. Moreover, the owners inconvenience to invest money in VE process represents 8.41 per cent of the obstacles.

#### F. Respondents Opinion on Future Prospective of VE in Oman

The survey indicated that 89 per cent of the respondents who completed the last part of the survey stated that implementation of Value Engineering in construction projects will benefit the construction industry and minimize the time and cost overruns, improve values, satisfy the requirements. 42.11 per cent of the respondents agreed that the application of VE is limited to some special projects due to various obstructions and another 40.35 per cent agreed that the application of VE is low. Figure 7 shows the level of application of VE in the construction industry.

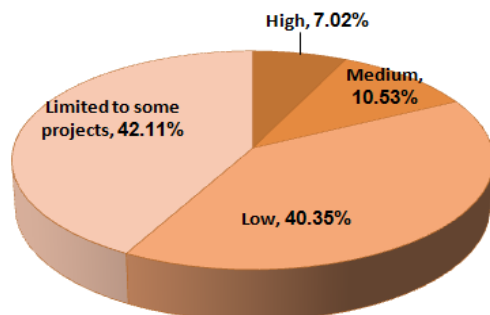


Figure 7: Level of application of VE in construction industry

In order to widely extend the application of VE in the construction industry, most of the respondents stated that the authorized agencies whether they are from the public or private sector should be made aware of the importance of VE

by special workshops or seminars, and should be encouraged to practice in systematic application of VE in their projects. The respondents also mentioned that government rules and regulations should encourage the application of VE in the construction industry especially the implementation of VE in public projects before tendering. There is an acceptance among the respondents that VE is a valuable technique that would aid to elevate the status of the construction industry. They believe that VE can support in solving the variations and cost overrun issues occurring during construction.

#### iv. Conclusion

This paper presented a field survey study conducted among the public and private construction sectors to investigate the level of awareness and application of VE in construction industry in Oman for further improvement and appraisal. 64 respondents, out of 100 professionals approached, managed to complete the survey. It was found that VE is recognized in construction industry as 89 per cent of the respondents were aware of the concepts of VE but there is confusion in understanding its rules, methodology and application with cost saving tasks. The survey proves that some organizations in construction industry are applying VE in their projects but they are not following the proper VE rules and job plans. The findings showed that, the level of implementing VE in construction projects is low and limited only to some project as stated by 40 and 42 per cent of the respondents respectively. The result was encouraging toward future of VE application in construction industry and expected to eliminate the current concerns. There is a number of obstructions need to be tackled with more efforts to educate industrial practitioners and owners on various aspect of VE. Government has to play a leading role in promoting such initiatives.

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