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Importance of Certification in the Construction Industry: Case of Value Engineering

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Construction project cost saving can be achieved while sacrificing the performance, quality or safety levels without knowing. With the increasing demands of project owners, it is key to optimize cost, performance and quality to obtain the needed value. Value engineering (VE) is a potential tool for achieving value in projects. The Southwest Florida region in the United States of America (USA) experienced an influx of people with increased number of construction projects, but it was not apparent whether the needed value was being obtained by the project owners. Therefore, research was conducted focusing on VE implementation in various construction projects with the specific aim of investigating the existence of VE, amount of its use, certifications and outcomes. Online survey questionnaire was administered to construction practitioners in the region to get their feedback about VE. Results showed that VE was used by experienced contractors who were mainly involved in various projects where they benefited from using VE. However, the knowledge of VE was not at the required level with limited VE certifications to warrant demonstrated qualifications to provide value in projects. It was recommended that more VE training was needed to streamline efforts for certification and value addition in the construction industry.

Key Words: Certification, Construction Project, Value Analysis, Value Management

Introduction

The construction industry contributes significantly to the national economy whereby the United States of America Bureau of Economic Analysis (2023) estimated construction to be about 3% of the gross domestic product in the second quarter of the year 2023. With this positive contribution to the global economy, it is also the industry that is experiencing lack of skilled or professional workers. Barrows et al. (2020) stated that there is a growing need for skilled and proficient construction professionals to ensure that project goals are met and delivered within budget, on time and at the required level of safety, high performance and quality. The 2023 Construction Outlook Survey by the Associated General Contractors of America (AGC) found out that about 80% of construction firms have trouble filling both salaried and craft positions, and about 60% of the firms foresee labor shortages to be the biggest problem and challenge in the years to come. It can therefore be argued that this could result in overstretched skilled workers, delays in project completion and increased project costs which may

impact performance and quality requirements, among other various project parameters. Additionally, the industry is found to be labor intensive and high resource utilizing which require a high level of quality of resources, greater performance, a high degree of safety, and that project requirements to be met at the lowest possible budget/cost. According to the AGC 2023 report, construction accounts for about 7% of total employment, and so it is expected that the subsequent delivery by these workers will be of the best possible value. In addition, there is a need for professional people who can meet the project goals at the highest level of efficiency. Thus, project owners will have a higher assurance that their projects are being managed efficiently by skilled, ethical and professional teams who are experienced and acting as professional beings in their own accord (Wao et al., 2022).

With the labor shortages and high utilization of resources, there is a need for the project teams to diversify avenues to ensure that the various projects are constructed and delivered in a manner that provide the best value to the project owner/client, and taking into consideration that the construction project teams always strive to meet or exceed the owner project requirements (OPR).

Various multi-objective tools such as goal programming, utility theorem could be used in projects. Noteworthy, VE could be a better or worthwhile approach to ensure that project owners' needs are met satisfactorily and that the final product provides the needed value in projects.

Initiated at General Electric in the 1950s after World War II by Lawrence D. Miles, VE, also called value analysis, was used to buy resources that were needed at the time. Miles was working at General Electric, a major defense contractor, where they faced a shortage of strategic materials needed to produce items. With value and management in mind, Miles constructed the concept of function analysis, later called value analysis or engineering (VA/VE). He stressed on the idea that products needed to be bought for a specific purpose, namely, for what they could do best, including providing the best aesthetic qualities to users (Miles, 1947). In developing the idea, Miles (1947) stressed that items or resources are sought and must be incorporated in areas where they are needed most, or specifically, where they can function best so that better results could be obtained. A group of practitioners later formed the Society of American Value Engineers (SAVE) in 1959 (Wao, 2018). VE is now applied in projects that are costly, repetitive, complex, requiring design modifications, or those that require improvement or need some desired performance or quality level as defined by 'value' to the project owner (Wao, 2023).

It is a decision-making tool that can have varied applications in projects but the main aim is to meet the function of project items at the required level of performance, quality, safety, schedule, cost or what is defined as valuable by the project owner. Knowledge of the team is important to the success of the VE process and so the project must integrate a VE team that is multidisciplinary and one that has experience in the project to be constructed. It is envisioned that a successful VE study could reap the best benefit or return on investment (ROI) when this VE process is integrated in a timely manner during the project life cycle and with the best analysis of function and applying relevant tools in the VE process. While executing VE, there can be barriers to the VE process in projects as shown by Lin et al. (2022). These need redress for efficient application of VE methodology.

VE can be applied in every project and anywhere to meet the owner/client's needs. In this regard, Southwest (SW) Florida had in the last 5 years started experiencing influx of people moving into the region from other regions in the USA, and there had been a significant increase in the number of construction projects. As seen before, labor shortages and lack of professional constructors were common happenings in the SW Florida construction field. With the viewpoints and as a consequence thereafter, it was prudent to ensure that the construction projects in the region were being delivered at the best value possible to the project owners and other consumers or beneficiaries of the projects,

whether in residential, commercial construction projects, etc. VE is a tool that could be used to ensure that the value goal in projects is achieved, and its degree of application in projects is an important step to document its overall benefits especially to the SW Florida construction market. At the time of the research, it was not apparent if VE was being used in projects to provide value in projects and so there was that knowledge gap to quantify the number of certified value engineers in the region. Therefore, this research investigated the existence and application of VE in projects in SW Florida with the aim of assessing the VE certification and level of use amongst practitioners. Literature review documented the application of VE and overall importance of certification in the construction industry relative to improving service delivery in the construction industry.

Literature Review

Certification in the Construction Industry

Typically, certification is provided by voluntary third-party organizations that recognize the education or experience of an individual who meets certain criteria as stipulated by them. These certifications are varied and their number continue to increase with the evolvement of the construction industry (Barrows et al., 2020). However, certification need to be differentiated from licensure. According to Coglianese (2018) and Barrows et al. (2020), licenses are usually needed for those professionals who would want to practice in certain professions such as architecture or engineering where they are required to meet the required standards of care while certification is not required to practice a profession but rather a show of competence, and provides a high level of assurance that the professional personnel will fully complete the project in a manner that is required of a professional being. The value of certification is seen when the other professionals and public accept and benefit through better salaries and improved image or better quality of projects delivered by those who are certified (Wao et al., 2022; Barrows et al., 2020; Clevenger et al., 2017).

El Debs et al. (2016) on the importance of certifications to recent graduates found out that safety certifications (OSHA-10hr and OSHA-30hr) and sustainability certifications were ranked highest by industry people who were surveyed with a survey questionnaire. Barrows et al. (2020) focused on the value of certifications in seeking employment where it showed that Project Management Professional (PMP) certification was most valued in senior project management levels followed by LEED AP. OSHA trainings were most valuable to project engineers and project managers. Coglianese (2018) also investigated the value of certifications through survey of newly graduated CM students and found out that safety with OSHA training displayed highest value. Value engineering (VE) did not appear anywhere in those surveyed meaning it had little or no significance for those surveyed.

Value Engineering in Construction Projects

SAVE International (2023) stipulates that the terms Value Management (VM), Value Analysis (VA), VE and Value change are applied depending on the project phase, and it is apparent that the name VE shifts focus depending on the project phase. Noteworthy is that VE can be applied at every stage of a project with the earlier implementation being the best in getting higher value since there will be lesser instances of change orders being realized in the project. The various names are shown in Figure 1 which also shows the timing of VE study during the project life cycle.

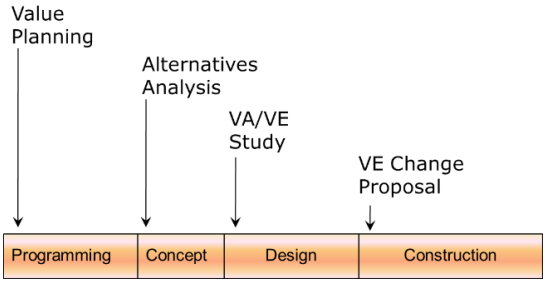

Figure 1. VE study timing for construction project (SAVE International, 2023).

It is also important to note that there are critical phases in VE job plan where VE can be applied and the results show significant value in projects. These phases as shown in Figure 2 are defined below;

(1) Function analysis phase: analysis of the project systems to understand the functions.
(2) Creativity phase: ideas are generated on ways to meet the required functions which improve the performance, quality, and lower project costs.
(3) Evaluation phase: evaluation takes place and the selection of feasible ideas for development.

These phases are critical as they determine items to be put in the project after evaluation of options.

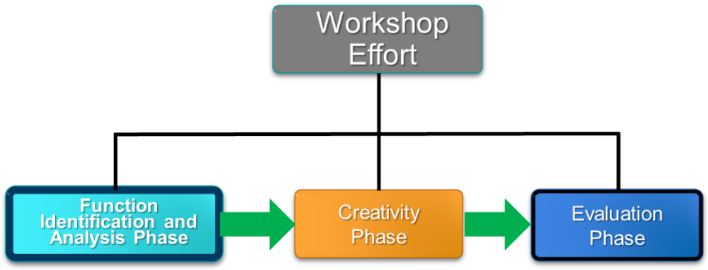

Figure 2. Critical phases of the VE methodology (ASTM E1699-20).

These processes require professional people who understand the principle, technique and application of VE in projects. It is only through this that the project value and overall saving will be realized at the highest level of performance, quality and safety. Professional certification in the field of VE was seen to be lacking in Cognianesse (2018) and even Barrows et al. (2020) did not list VE among the most valued certifications.

Therefore, this research set to examine the extent of VE certification by those in the SW Florida where construction activities were found to be on the increase. With the VE certification among users, it was expected that those users would be knowledgeable and that project owners would be guided well to getting the required savings and value in their projects. Also, it was expected that certified VE professionals would bring value in both private and public projects. Research methods follow.

Research Methods

The aim of the research was to investigate the existence and application of VE in the SW Florida region with the objectives of assessing its amount of use, certifications and outcomes to its users in projects. The end goal was to ensure that the users get value from applying VE in construction

projects. An online survey questionnaire was used to collect the data owing to the type of population targeted who were mostly in the construction field.

Survey Questionnaire Design and Administration

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As part of achieving the aim and objective of the research, an online survey questionnaire was administered to the construction professionals via Qualtrics survey software. Prior to its administration, four constructors in the region (n = 4) were asked to be involved in a pilot study which tested the validity and reliability of the questionnaire items. Cronbach's alpha statistics tested the reliability of the data items with an alpha estimate of 0.93 implying that the survey questionnaire was reliable. Consent to conduct the research with human subjects was sought and granted by the Institutional Review Board (IRB) whereby the first section of the survey questionnaire required the respondents to read and understand the consent form and then agree to it before proceeding to fill up the survey and be a part of the research.

The survey questionnaire consisted of open ended and multiple-choice questions. One part of the questionnaire focused on the respondents' demographic data such as work title, number of years in the construction field, familiarity and knowledge of VE, application of VE in various types of projects and their certification in VE. The other part required the respondents to rate the current use of VE in their companies on a five (5) point Likert scale (1 = not rewarding, 2 = neutral, 3 = somewhat rewarding, 4 = rewarding, 5 = very rewarding). Additionally, they were required to rate their level of satisfaction with the use of VE in their companies on a 5-point Likert scale (1 = very dissatisfied, 2 = dissatisfied, 3 = neutral, 4 = satisfied, 5 = very satisfied.

The research used both convenient sampling and random sampling methods. Convenient sampling method was used to select the research participants who were leaders in the SW Florida construction industry and they were expected to send the survey out to others who would therefore be selected randomly to take part in the research. The convenient sampling method was used in this research since it focused on finding those who were readily available to be a part of the research (Levy and Lemeshow, 2013) and also that it was an easier data collection method which incurred lower cost, and spending less time to accomplish (Chandler and Shapiro, 2016).

The online survey questionnaire link was sent out to the SW Florida construction industry personnel. All respondents were assured of confidentiality and anonymity in their feedback and this was communicated clearly in the informed consent form. To further improve on the response rate, respondents were informed in the consent form that their feedback would help in advancing the knowledge base in the field once the results were published.

Sample Size and Data Analysis

The study used 53 construction professionals who completed the survey. This sample size (n = 53) was considered adequate as required by parametric or univariate statistical analyses and tests for adequate statistical power.

The quantitative data analysis utilized Statistical Analysis System (SAS) on Demand statistical analysis software (SAS, 2023) for descriptive statistics. The descriptive statistical analysis results utilized the measures of central tendency and dispersion that consisted of mostly of percentages and mean (or averages). The main purpose of these analyses was to determine the level of VE certification and satisfaction with the current state of VE in the construction industry. Qualitative data themes were also identified and analyzed using content analysis. Content analysis facilitated deeper review of the

open-ended questionnaire feedback by identifying the focus of the subject matter being responded to and capturing emerging patterns in an array of feedback items.

Results and Discussion

Demographics and Level of Experience

Of those who completed the survey, 85.71% were males while 14.29% were females. They were consultants, directors, project managers, project executives, presidents, senior vice presidents and construction managers of their companies. This showed that the sample was from the population that held leadership and managerial roles in the construction industry which was believed to provide reliable data for better generalizability of the research findings. Their experiences in the construction industry was shown in Table 1.

Table 1

Level of experience (as a percent) in the construction industry

Years	2-10 years	11-20 years	21-30 years	Over 30 years
Percent (%)	14.28	28.58	28.57	28.57

Their business lines were in general contracting (44.44%), construction management (38.89%), roofing, mechanical, electrical and plumbing (11.11%) and sustainable design and construction (5.56%). Majority of them were involved in commercial construction projects (48.15%) followed by residential construction projects (22.22%), industrial (11.11%) while the rest (14.81%) engaged in healthcare projects, higher education projects and consultancy. These showed a high level of engagement in construction with many years of using VE in projects which implied greater reliability of the data they provided because the many years which meant being knowledgeable in the field.

Knowledge and Goal of VE in Projects

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With regard to examining their familiarity and knowledge of VE in construction projects, 100% were familiar with VE, where 64.29% of them first heard the word ‘VE’ from job training, 21.43% heard it from webinars related to their job while 7.14% had heard it first from taking courses and from colleagues respectively. Their definitions of VE captured the actual reasons for employing VE in projects, i.e., cost saving or lowering cost while improving performance, quality and safety.

In order to understand the first triggers when they heard about VE, about 24.44% stated that cost/budget came to their mind first, followed by quality (20%), time/schedule (17.78%), safety (15.56%), performance (13.33%), sustainability (6.67%) in that order. When asked about the most important among them, cost/budget was mentioned by the majority (63.64%) as the most prioritized one, then performance (9.09%) while the rest of 27.27% felt that priority is set by the owner and as such owner objectives drive the VE process. All these viewpoints tend to support the fact that cost is the main driver of VE, but it is also worth noting that quality, performance, sustainability, safety and other objectives were also important aspects of consideration because value is subjective and the project owner drives the VE goals, i.e., success of VE must have the owner at the front. In all, there needs to be an optimal consideration that captures all the criteria.

VE, VA and VM terms are used in projects. In order to understand them from the practitioners' viewpoints, about 54.55% thought that they were synonymous terms while 45.45% thought they were different terms. Those who thought they were different stated that VE offers alternate products or procedures while VA is the actual analysis of such revised offering, and VM is the actual management of the project itself. Others believed that they were similar, but were based on owner objectives. They stated that for some project owners, VE is solely the bottom line of construction cost (VE) while for some, it is the cost of construction as well as long term operation (VA and VM). These viewpoints related to SAVE International (2023) that stated that VE can have different names depending on the project phase (figure 1).

Implementing VE in construction Projects

Many respondents (100%) affirmed using VE with 81.82% of them having used VE for over 20 years in over 20 projects mostly located in SW Florida (92%). Their projects were classified evenly as private (50%) and public projects (50%). VE was mostly employed in the design/preconstruction phase (52.38%) followed by construction phase (38.10%) and end of life or deconstruction phase accounting for 9.52% of the respondents. Table 2 shows the usage of VE in various projects.

Table 2

Using VE in Construction Projects

Project Value on Average ($)	350,000	800,000	6 Million	50 Million	Over 100 Million
Percent (%)	17.14	17.14	20	14.39	31.33

It can be deduced that VE was used a lot in the different projects and it would be used largely in those over $100 million projects because of high cost and possibly complex types as those for federal highway projects which require VE studies for greater ROI and savings.

With certification in VE, about 95% of the respondents were not certified and unaware of any benefit of VE certification including engaging in any professional development activity for improving VE knowledge. As such, 92% would not recommend VE to anyone when they were asked about the possibility of recommending it to others in construction. Their reasons for not recommending were;

- Not free to recommend something they knew little about.
- Their definition of VE was providing alternate products that are cheaper or more readily available and they see no training/certification needed for that.
- No value addition with VE certification.
- Initial training is good but every job is different which calls for different ways to solutions.
- Not aware of any certifications in VE.

These viewpoints show lack of awareness and gap in knowledge which is needed to be bridged through training and professional development activities.

Current Status of VE in the Construction Industry

In rating the current use of VE in the construction companies, majority of the respondents were neutral (45.45%) with about 9.09% stating that it was somewhat rewarding while 27.27% and 18.18%

stating that it was rewarding and extremely rewarding respectively. When asked about their satisfaction with using VE in their construction projects, about 45.45% were neutral while about 36.36% were satisfied with over 18.18% being extremely satisfied with the current usage of VE. The average score (mean) was 4 on a 5-point scale.

Conclusion

VE application has been assessed with the aim of determining its level of use, certification and benefits to the project owners in the SW Florida construction industry. Its usage saw many contractors and construction managers with senior level responsibilities being involved in various projects. Even though a few practitioners were professionally recognized through VE certifications, the vast majority were not even aware that VE could be a profession with its line of certification which is wanting with the amount of money that were being spent in those projects by looking at the different projects. Ideally, a professional value engineer starts by being Value Management Associate (VMA) which is the basic level of certification and then become a Certified Value Specialist (CVS) who has many years of expertise in VE/VA/VM and leading teams in VE workshops. The sampled population surveyed showed that no one was a CVS which implied lack of leadership in VE since a CVS is considered the highest leader in VE related activities in projects.

In conducting VE studies, it is worth noting that understanding the difference between VE, VA and VM is key because their different definitions show that function analysis can be conducted at every phase of the project life cycle even though there is inclination to apply it in the design or preconstruction stage of a project. The recommendation is to apply it early since more benefits and/or ROI is obtained when VE is conducted early in the project life cycle. However, focusing more on reducing cost could easily overlook performance, safety, sustainability or quality improvement avenues thereby negatively impacting the VE outcomes.

Training and certifications in VE could significantly advance attaining the needed value in projects since there will be better understanding of VE with improved ways to conduct VA. Multi-objective decision making methods such as choosing by advantages (CBA) and weighted analysis methods (WAM) when integrated in VE methodologies could potentially enhance evaluation of alternatives developed after rigorous function analysis and creativity in the VE process.

With the outcome of this research, it was recommended that more training in VE was needed and these would streamline efforts for VMA and CVS certifications that could provide many construction professionals with a defined path to ensure more value addition in construction projects. This training and certification process when implemented well may need to begin from university education through integration in undergraduate curriculum and then extend to practitioners through certification training and professional development activities which could improve shared understanding and experience that improve value in projects.

This study contributes to the wider VE body of knowledge focusing on improving value addition in the construction industry and providing the project owners with information that could advance their knowledge in the construction field especially in this age of technological advances and digitalization under Industry 4.0 and Industry 5.0. Future research may assess motivation for certification in VE and ways to improve VE methods for better value in projects.

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