APPLICATION OF VALUE MANAGEMENT TO REFURBISHMENT PROJECTS: A SRI LANKAN CASE STUDY

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Refurbishment offers profound solutions to contemporary issues such as deterioration and obsolescence of buildings by upgrading, altering, extending, renovating and improving facilities. Nevertheless, refurbishment projects are uncertain and sophisticated with many challenges and lead to subvert value for money. Value management (VM) is recognised as a suitable approach to ensure value for money in construction projects. The application of VM to refurbishment projects remain unprecedented although investigating the application of VM in new building projects is a continuing concern. This research therefore, sets out to examine the application of VM to refurbishment projects in Sri Lanka, through a single case study of a hotel refurbishment project, which has employed VM. Subsequently, data was collected through unstructured interviews with seven participants of the VM study, document reviewing and observations and analysed using content analysis. This project employed a VM job plan derived from the SAVE 40-hour job plan during the demolition and construction stage of the project with the focus of reducing costs through alternatives. The unstructured VM job plan constituted of pre workshop, information gathering, project analysis, options developing, analysis, presentation and post workshop phases. VM is predominantly interpreted as value engineering (VE) in Sri Lanka, although the alternative use of both VM and VE was evident amongst the respondents.VM proposals yielded a cost saving of 5.06% from the total cost of the project and a reduction of operational and maintenance budget by 8.31%, although the ad-hoc manner of application of VM contributed to a time overrun of two to three months. This study recommended that an initial VM study should be conducted during the concept design stage, which is to be followed by a second VM workshop during the demolition and construction stage to revisit and revise original design solutions to match with the existing conditions of the building.

Keywords: refurbishment projects, Sri Lanka, value for money, value management

INTRODUCTION

Building maintenance and preservation of usable conditions have necessitated ensuring value and functionality of the buildings (Puķīte and Geipele 2017), predominantly for the aging building stock, in which refurbishment is perceived as a strategic avenue to conquer many contemporary issues associated with buildings (Babangida *et al*., 2012). As revealed by Mansfield (2009), refurbishment offers solutions to inevitable physical deterioration and obsolescence. Ali *et al*., (2009) pointed out that refurbishment is materialised as an alternative towards the end of

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service life of the building or when the building is on the verge of failing to perform the required functions. Despite the notion of enrichment of market value of old buildings through refurbishment, building owners are reluctant to administer refurbishment decisions (Chau *et al*., 2003), primarily due to the inevitable challenges associated with the existing building. Juan (2009) also confirmed this view by highlighting that majority of the refurbishment projects are characterised with high level of risk, uncertainty and complicated coordination compared to new buildings. Hence, the same approaches used in the new building construction projects are not always suitable for the refurbishment projects as the challenges are peculiar to existing buildings (Rahmat and Ali 2010) and these challenges could result in subverting value for money.

In this context, there is a need for an approach to overcome the challenges and thereby enhance value for money in refurbishment projects. According to Kelly *et al*., (2004), value management (VM) is a process to enhance value for money from the concept phase through to the operation and use of a building. A multitude of research on the application of VM in construction projects is evident throughout the history. However, a very few instances of probing the application of VM can be found in the construction industry of Sri Lanka. Perera *et al*., (2003) discussed about the application of VM practices during the initial stages of "World Trade Center" project. The authors asserted that the fragmented construction industry of Sri Lanka limits the application of VM. Karunasena and Gamage (2017) further highlighted that there is a lack of pre-defined method to apply VM in Sri Lankan construction industry.

As pointed out by Dallas (2008), VM may not only be applied to new building constructions, and can also be harnessed to improve the buildings in operation, which have subjected to degradation of value over time. In this context, VM could be regarded as a suitable approach to enhance value for money in refurbishment projects. Therefore, this study is focussed on exploring the application of VM to refurbishment projects via a single case study of the Sri Lankan context. The study adopted a derived form of standard SAVE 40-hour job plan to derive VM proposals.

Achieving Value for Money by Applying Value Management

Achieving value for money is the final outcome of all construction projects and thus, agreement on value parameters for earning client's satisfaction is necessitated (Emmitt *et al*., 2005; Martinsuo and Killen 2014). However, "value" is interpreted in different perspectives by different participants of building projects (Bowman and Ambrosini 2010). Value is defined as the level of importance placed upon a function, item or solution (Potts and Ankrah 2013). Furthermore, Yan (2012) suggested that value of construction projects should be interpreted in terms of function, quality, cost and time. When inventing the concept of VM, it was identified that the focus on function could stipulate better value for money (Potts and Ankrah 2013). Therefore, the rationale behind VM is that the elements contributing to the poor value of projects need to be addressed to improve value for money by enhancing project performance while removing unnecessary costs (Shen and Yu 2016).

The Concept of Value Management

Various definitions of VM have been presented in the literature. Amongst such definitions, VM is described as "a structured and analytical process which seeks to achieve value for money by providing all necessary functions at the lowest cost consistent with the required levels of quality and performance" (AS/NZS 4183:1994). Moreover, Oke and Aigbavboa (2017) emphasised that VM was introduced to

compare alternatives in order to arrive at the one that provides the best function at the lowest possible overall cost. The main idea of the concept of VM, which is encapsulated from various definitions is that VM focuses to enhance value for money by providing all necessary functions at the lowest life cycle cost without degrading the quality and performance. In the construction industry, VM and VE are tend to be used interchangeably to describe a systematic process of appraisal of the functions of a project to ensure effective delivery of outcomes (Al-Yami and Price 2005; Ilayaraja and Eqyaabal 2015).

Olawumi *et al*., (2016) asserted that a well-planned VM study should yield savings in 10-15% of total project cost while the cost of VM study is about 0.3% to 0.5% of the project cost (Daddow and Skitmore, 2005). Value studies of a project can be carried out at any stage of the project from its inception to its development and even during construction. However, earlier the application, higher the acceptance of value proposals would be, since late studies reveal higher cost of application, thus lesser acceptance of proposals (Ilayaraja and Eqyaabal 2015). According to Coetzee (2009), inception is the best stage that can improve the value of a project, and latter implementation of VM techniques gives less benefits and can interrupt the construction process. Further, Abdulaziz (as cited in Abdullah and Arabiyyat 2016) identified three different design stages where VM could be applied. The first instance is during the planning stage where functions and requirements of the project are established. The second instance is when the design is at 15% to 30%, and the third instance is where the design has developed up to 80% to 85%.

The systematic VM offers a job plan, which can guide to address the issues effectively throughout the building's life cycle (Jaapar *et al*., 2012; Shen and Tu 2012). It is commonly known as the VM job plan, and it has been discussed in many forms consists of five to eight phases (Al-Yami and Price 2005; Chhabra and Tripathi 2014). VM job plan is sometimes referred to as VM workshop as well as value study process and are in the forms of SAVE 40-hour job plan, contractor's change proposal, charette, truncated workshop, concurrent study and VE audit (Kelly *et al*., 2004; Shen and Yu 2016). The widely practiced standard SAVE 40-hour job plan is generally organised in three main stages: pre workshop, VM workshop with the sub phases; information, function analysis, creative, evaluation, development and presentation phase, and post workshop stage (Rad and Yamini 2016; Shen and Yu 2016).

Application of Value Management to Refurbishment Projects

The construction industry has long been employing VM for reinforcing the value of construction projects (Zhang *et al*., 2009). However, very few studies on the application of VE or VM to refurbishment projects are recorded over the history. Witschey and Wulff (1998) investigated the application of VE in the renovation project of the Science Museum of Virginia and the authors emphasised the importance of VE as a strategy to reduce costs, while ensuring the quality. Moreover, Alan Short *et al*., (2007) investigated the application of VE in five capital arts projects, which involved refurbishment as well as partly new construction. VE was applied in those projects to reduce budget overruns. In both studies, VM, which was perceived as VE was applied in an ad-hoc manner, because application of VM was customised as per the requirements of the projects. However, the mainstream literature suggests the lack of exploration of the applicability of VM to refurbishment projects.

RESEARCH METHODS

This research seeks to address the research problem of "how VM is applied to refurbishment projects in Sri Lanka" through a qualitative approach, as qualitative methods contribute to conduct in depth investigation on emerging concepts and is more appropriate, when the research has a small sample of respondents (Yin 2011). Due to the lack of applicability of VM concept in refurbishment and other construction projects in Sri Lankan construction industry, drawing a large sample of respondents for the data collection was constrained for the present study, hence a qualitative approach was administered. Since the case studies enable an in-depth examination of the context (Fellows and Liu 2008; Yin 2011), it was considered that case study approach would supplement and extend the in-depth investigation. A single case study is appropriate to explore a unique circumstance (Yin 2011). The author further explained that the criteria for selecting a case depends on the convenience, judgement, time and cost constraints. In this research, the unique case of a hotel refurbishment project, which has employed VM was selected considering aforementioned factors. This single case study was undertaken as a pilot study to a larger subsequent investigation.

Yin (2011) pointed out several data collection techniques to be included in case study research such as interviews, observations and document reviews. Punch (2005) highlighted interview method as a most commonly used data collection method, when the research embodies a qualitative approach. Employing un-structured interview method is preferred in qualitative approach since the respondents are given the opportunity to answer independently with a limited control imposed by the researcher (Dawson 2007). Accordingly, un-structured interviews were conducted for collecting data focusing on selected respondents, who involved in the VM study of the selected refurbishment project. This refurbishment project was scheduled to be undertaken in two phases. For the case study, only the details from the phase one was gathered, since the phase two of the project has not been commenced yet. Moreover, observations and reviewing relevant documents were undertaken to capture the required data. The authors referred to documents such as VM proposals, bill of quantities (BoQs), summary report of the VM workshop, drawings of the design proposals, photographic analysis of project documents and archival records of the building for data collection. The refurbished areas were observed by visiting the hotel building and photographic evidence were secured. The details of the refurbishment project and the participants are summarised in Table 1. This study employed a qualitative analysis to gain insights to the application of VM in the refurbishment project. For qualitative researches, content analysis provides subjective interpretation of texts through systematic coding and patterns (Hsieh and Shannon 2005). In order to facilitate content analysis of this research, NVivo (2010) was used for code based content analysis along with the manual content analysis.

Although the kitchen and laundry design consultant and the interior designer also participated in the VM study, the authors could not approach them as they are international design consultants.

Table 1: Profile of the refurbishment project and the respondents

Project details	Details of the respondents
Five star rated hotel with 19 storey building located in Colombo operating under the brand name of an international parent company. Under phase 1 of refurbishment, front of house, selected back of house areas, lobby lounge, public toilets in lobby, Chinese restaurant, All day dining restaurant, main kitchen, board walk, executive lounge including mechanical, electrical and plumbing (MEP) services, the kitchen and laundry, lotus pond, air handling unit (AHU) room, fire commanding centre and lift lobby were refurbished. The project was traditionally procured and the contract type was re-measurement contract. Contract price was LKR 220,000,000 and final project cost was LKR 250,000,000. Planned duration of the project was 9 months but the actual duration of the project was 14 months.	A1: Project manager with 24 years of work experience and 10 years of prior experience in VM A2: Cost consultant with 21 years of work experience and 11 years of prior experience in VM A3: Lead design consultant with 27 years of work experience and less than 1 year of prior experience in VM A4: Contractor with work experience of 15 years of work experience and 5 years of prior experience in VM A5: Chief financial officer (CFO) as the representative of the client with 18 years of work experience and no prior experience in VM A6: Chief Engineer (MEP Engineer) with 11 years of work experience and no prior experience in VM A7: Maintenance engineer with 12 years of work experience and no prior experience in VM

RESEARCH FINDINGS

Achieving Value for Money in the Refurbishment Project

Achieving value for money in the project was triggered due to challenges encountered during the refurbishment process. All the respondents confirmed that refurbishments are prominent in hotel buildings in Sri Lanka compared to other types of buildings, as hotel buildings need to be upgraded and modified frequently to maintain the tourist attraction. The top most challenges attributed are the budget overruns in superficial designs and construction activities, time overruns for refining designs to cater unanticipated building conditions, limitations to introduce changes to the existing building structures and the interruptions to building occupants due to simultaneous operations. These challenges adversely affected in achieving value for money in terms of cost, time, quality, hotel customer satisfaction and sustainability.

The Value Management Job Plan

The current status of the application of VM to refurbishment projects as captured from the opinions of the respondents deduced that although application of VM is becoming popular in new building projects, application of VM to refurbishment projects is very low. They also pointed out that VM is recognised as VE, despite lead designer's claims; "actually we interpreted it mostly as VE, however, we tend to use VM and VE alternatively". Regardless of its ad-hoc nature of application, all the respondents confirmed that VM workshop was conducted during the demolition and construction stage perceiving VM primarily as a cost reduction technique. Chief engineer noted; "some designs needed to be changed due to unanticipated building conditions encountered when actual construction activities started and mainly wanted to overcome resulting cost overruns". The reasons for not adhering to any standard or systematic approach for conducting the VM study for this project as opined by project manager; “the need for employing VM did not emerge when the project was initiated and we did not have enough time and knowledge to go by the book”. Hence they indicated that VM should be initiated during the concept design stage and another VM

workshop should be conducted during the demolition and construction stage. Since there are no trained VM facilitators in Sri Lanka, the cost consultant played the role of the VM facilitator. The VM job plan adopted for this project was derived from the standard SAVE 40-hour job plan, which was conducted in the hotel premises for three consecutive days, with a duration of maximum 6 hours per day as follows.

14. Pre workshop stage- Similar to the standard job plan, VM team was formed and a briefing on the VM study was conducted to make the participants aware of VM. The objectives of the VM study were communicated by the cost consultant. Recently completed refurbishment projects of 5-star and 4-star rated hotels in the neighbourhood were studied.

Workshop stage- This stage comprised of five sub phases as below:

Information gathering phase- This phase corresponds to information phase in the standard job plan and focussed on collecting necessary information. As built drawings, relevant BoQs, structural survey reports, site inspection reports by the contractor and contractor's initial proposals were obtained. Problems identified during the site survey and initial demolition works were discussed through presentations and brainstorming.

Project analysis phase- The activities conducted during this phase were analogous to function analysis phase. Four value enhancing opportunities were determined. The required functions were identified and the costs per function were assigned with reference to BoQs. These activities were aided by functional analysis.

Options developing phase- Similar to the creativity phase, various alternatives were determined through brainstorming sessions and presented as VM proposals.

Analysis phase- The subsequent phases of evaluation and development in the standard job plan correspond to the activities conducted in this phase. BoQs for generated alternatives were developed and they were compared in terms of initial cost, maintenance cost, time of construction or installation, degree of quality achievement, maintainability, aesthetic appearance, environmental friendliness, durability and availability of material. Best alternatives were selected after evaluating the ranked options through checklists.

Presentation phase- Corresponds to the presentation phase in the standard job plan, selected best alternatives were turned in to written recommendations and project manager presented them to the VM team in the form of a summary report.

Post workshop stage- The implementation of accepted VM proposals and the follow-up session was undertaken.

None of the VM job plan phases were well structured even though the activities carried out were analogous to the standard SAVE 40-hour job plan.

Value Management Proposals and Their Impact

The VM proposals and the decisions made in formulating them along with the resultant impacts are highlighted below.

15. VM Proposal I

Initially, 4 decorative metal screens of satin bronze were proposed to be fixed to walls in the lobby area, to provide a metallic finish to enhance aesthetic appearance. In order to achieve the same function, screens of 2,400×3,000mm in metallic paint finish

on laminated HDF board were proposed and it in turn achieved a cost saving of LKR 88,199.02. The metallic paint finish resembles the satin bronze finish without impairing the expected quality.

16. VM Proposal II

The quantity of hanging glazed pendant lamps in all day dining restaurant was initially decided as 46. After the functional analysis, a new layout was proposed and the quantity of lighting fixtures was reduced from 46 to 42 without lowering the luminance level and the aesthetic appearance. The resultant cost saving of the modifications was LKR 12,072,960.00.

17. VM Proposal III

The initial proposal of laying 20mm stone tiles in the Chinese restaurant area was evaluated with the alternative of timber flooring. Before the refurbishment, this area had already been a timber floor. The functional analysis suggested that it was less time consuming, cost effective and convenient, if the existing timber floor was replaced with another timber floor instead of stone tiles. However, in terms of durability and aesthetic appearance, laying of stone tiles would have enhanced quality, because timber floor could subject to wear faster than stone tiles. In order to overcome this issue, engineered timber flooring of 900mm x 15mm was introduced by saving a LKR 841,963.20.

18. VM Proposal IV

The service lines, duct lines and electric cables running inside the ceiling were laid inappropriately, and it was realised after removing the ceiling. Hence, for the reception area, the initially proposed average 900mm dropped gypsum board suspended ceiling was proved to be frail and less moisture resistant. Alternatively, a moisture resistant gypsum board suspended ceiling of, average 900mm was introduced incurring an additional cost of LKR 341,275.50.

In total, the VM proposals achieved a cost saving of LKR 12,661,850, which is 5.06% saving from the total cost, LKR 250,000,000. Additionally, a reduction of annual operational and maintenance budget by 8.31% was reported for the areas, VM proposals were implemented. There was no additional cost incurred for the VM study, since the VM workshop was conducted simultaneous to project meetings. However, maintenance engineer pointed out; "time was consuming in the workshop, mainly because VM had not been planned from the outset of the project". Although, changing some design alternatives as per the VM study contributed a delay of 2 to 3 months in the project, project manager, cost consultant and contractor indicated that project could have gone through a time overrun of 7 to 8 months, if VM had not been implemented to enhance value through best design alternatives. Although there was no evidence to quantify the impacts quality improvement, hotel customer's satisfaction and achievement of sustainability, all the respondents endorsed the view that application of VM contributed immensely in the success of the refurbishment project of the hotel.

DISCUSSION AND CONCLUSIONS

Previous studies have suggested that despite the notion of enrichment of market value of old buildings through refurbishment, building owners are reluctant to administer refurbishment decisions (Chau *et al*., 2003), primarily due to the inevitable challenges associated with the existing building. Findings of the current study have corroborated

the above notion, by highlighting that the need for VM was triggered as an approach to achieve value for money by overcoming the challenges. However, a very few instances of probing the application of VM can be found in the construction industry of Sri Lanka, primarily due to the lack of a proper guideline to apply VM (Perera *et al*., 2003; Karunasena and Gamage 2017).

Comparatively, lack of exploration of the applicability of VM to refurbishment projects is evident. The study of Witschey and Wulff (1998) on the application of VE in the renovation project of the Science Museum of Virginia and the study of Alan Short *et al*., (2007) on the application of VE in five capital arts projects, which involved refurbishment as well as partly new construction, are among the few examples, in which VM was perceived as VE and applied mainly as a cost reduction strategy. Similar findings were derived from the present study, in which VM was applied to a hotel refurbishment project, interpreting it as VE. VM was employed in this project to achieve value for money in terms of cost, quality, time, hotel customer's satisfaction and sustainability. Despite the ad-hoc nature of application, VM was actually employed mainly to reduce unnecessary costs, which the project had been suffered from the outset. The present study has practiced the VM workshop stage in an unstructured process of information gathering, project analysis, options developing, analysis and presentation phases. It can be inferred that ad-hoc nature of application of VM in the project is mainly due to the lack of knowledge about VM and incapability of planning the use of VM from the outset of the project. According to Olawumi *et al*., (2016), a well-planned VM study should yield savings in 10-15% of total project costs while the cost of VM study is approximately 0.3% to 0.5% of the project cost (Daddow and Skitmore, 2005). Although no additional costs were incurred, the present VM study have secured a cost saving of a 5.06% and a reduction of annual operational and maintenance budget by 8.31% . Although it has been suggested to apply VM to construction projects at inception and design stages (Coetzee 2009; Ilayaraja and Eqyaabal 2015; Shen and Yu 2016), these claims have focussed on new building projects. However, the approaches used in the new building projects are not always suitable for the refurbishment projects because the challenges are peculiar to existing buildings (Rahmat and Ali 2010). Hence, the present study recommends that VM should be should be initiated in refurbishment projects during the concept design stage and another VM workshop should be conducted during the demolition and construction stage to revisit and revise original design solutions to match with the existing conditions of the building.

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REFERENCES

Alan Short, C, Barrett, P, Dye, A and Sutrisna, M (2007) Impacts of value engineering on five Capital Arts projects. *Building Research and Information*, 35(**3**), 287-315.

Ali, A S, Kamaruzzaman, S N and Salleh, H (2009) The characteristics of refurbishment projects in Malaysia. *Facilities*, 27(**1/2**), 56-65.

Al-Yami, A M and Price, A D F (2005) Exploring conceptual linkages between value engineering and sustainable construction. *In*: Khosrowshahi, F (Ed.), *Proceedings 21st Annual ARCOM Conference*, 7-9 September 2005, London, UK. Association of Researchers in Construction Management, Vol. 1, 375-84.

Abdullah, R and Arabiyyat, A R (2016) The possibility of applying value engineering: Case of Municipality of Al-Salt. *Management Science and Engineering*, 10(**1**), 38-42.

AS/NZS 4183:1994 (1994) Joint Australia/New Zealand Standards Committee OB/6 on Value Management.

Babangida, I, Olubodun, F and Kangwa, J (2012) Building refurbishment: holistic evaluation of barriers and opportunities. *In*: Smith, S.D (Ed.), *Proceedings 28th Annual ARCOM Conference*, 3-5 September 2012, Edinburgh, UK. Association of Researchers in Construction Management, 1289-98.

Bowman, C and Ambrosini, V (2010) How value is created, captured and destroyed. *European Business Review*, 22(**5**), 479-495.

Chhabra, J and Tripathi, B (2014) Value Engineering: A Vital Tool for Improving Cost and Productivity. International Journal of Industrial Engineering and Technology, 4(**6**), 1-10.

Chau, K W, Wong, S K, Leung, A Y T and Yiu, C Y (2003) Estimating the value enhancement effects of refurbishment. *Facilities*, 21(**1/2**), 13-19.

Coetzee, C E (2009) *Value Management in the Construction Industry: What Does It entail and is it a Worthwhile Practice?* BSc Thesis, Department of Construction Economics, University of Pretoria.

Daddow, T and Skitmore, M (2005) Value management in practice: An interview survey. The *Australian Journal of Construction Economics and Building*, 4(**2**), 11-18.

Dallas, M F (2008) *Value and Risk Management: A Guide to Best Practice*. Oxford: Wiley-Blackwell.

Dawson, C (2002) *A Practical Guide to Research Methods: A User-Friendly Manual for Mastering Research Techniques and Projects 3rd Edition*. Oxford: How to Books.

Emmitt, S, Sander, D and Christoffersen, A K (2005) The value universe: Defining a value-based approach to lean construction. *In*: *13th Annual Conference of the International Group on Lean Construction (IGLC)*, 19-21 July 2005, Sydney, Australia, International Group on Lean Construction, 57-64.

Fellows, R and Liu, A (2003) *Research Methods for Construction 2nd Editon*. London: Blackwell Science Ltd.

Hsieh, H (2005) Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(**9**), 1277-1288.

Ilayaraja, K and Eqyaabal, M Z (2015) Value engineering in construction. *Indian Journal of Science and Technology*, 8(**12**), 1-8.

Jaapar, A, Maznan, N A and Zawawi, M (2012) Implementation of value management in public projects. *Procedia-Social and Behavioural Sciences*, 68, 77-86.

Juan, Y K (2009) A hybrid approach using data envelopment analysis and case-based reasoning for housing refurbishment contractors selection and performance improvement. *Expert Systems with Applications*, 36(**3**), 5702-5710.

Karunasena, G and Gamage R K (2017) A decision-making formula for value management applications in the Sri Lankan construction industry. *Journal of Financial Management of Property and Construction*, 22(**1**), 77-91.

Kelly, J, Male, S and Graham, D (2004) *Value Management of Construction Projects*. London: Blackwell Science Ltd.

Mansfield, J (2009) Sustainable refurbishment: Policy direction and support in the UK. *Structural Survey*, 27(**2**), 148-161.

Martinsuo, M and Killen, C (2014) Value management in project portfolios: Identifying and assessing strategic value. *Project Management Journal*, 45(**5**), 56-70.

Oke, A E and Aigbavboa, C O (2017) *Sustainable Value Management for Construction Projects*. Basel: Springer International Publishing AG.

Olawumi, T O, Akinrata, E B and Arijeloye, B T (2016) Value management - Creating functional value for construction project: An exploratory study. *World Scientific News*, 54, 40-59.

Perera, S, Karunasena G and Selvadurai, K (2003) Application of value management in construction. *Built-Environment Sri Lanka*, 4(**1**), 3-12.

Potts, K and Ankrah, N (2013) *Construction Cost Management: Learning from Case Studies*. London: Routledge.

Puķīte, I and Geipele, I (2017) Different approaches to building management and maintenance meaning explanation. *Procedia Engineering*, 172, 905-912.

Punch, K F (2005) *Introduction to Social Research-Quantitative and Qualitative Approaches*. London: Sage Publications.

Rad, K M and Yamini, O A (2016) The methodology of using value engineering in construction projects management. *Civil Engineering Journal*, 2(**6**), 262-269.

Rahmat, I and Ali, A (2010) The involvement of the key participants in the production of project plans and the planning performance of refurbishment projects. *Journal of Building Appraisal*, 5(**3**), 273-288.

Shen, Q and Yu, A T (2012) Value management: Recent developments and way forward. *Construction Innovation*, 12(**3**), 264-271.

Shen, G Q and Yu, A T (2016) *Value Management in Construction and Real State: Methodology and Applications*. New York: Routledge.

Witschey, W and Wulff, R (1998) How to ensure quality and cut costs with cultural institution value methodology. *Museum Management and Curatorship*, 17(**1**), 65-83.

Yan, L (2012) Value engineering application in construction project management. *In*: *2012 International Conference on Industrial Control and Electronics Engineering (ICICEE)*, 23-25 August 2012, Xi'an, China, IEEE, 1265-1268.

Yin, R K (2011) *Qualitative Research from Start to Finish*. New York: The Guilford Press.

Zhang, X, Mao, X and AbouRizk, S (2009) Developing a knowledge management system for improved value management practices in the construction industry. *Automation in Construction*, 18(**6**), 777-789.