Journal of Engineering Science and Technology
Special Issue on ISSC'2016, April (2017) 126 - 136

CONSTRUCTION FIRMS' SUSTAINABILITY COMPLIANCE LEVEL

J. A. BAMGBADE*, M. N. M. NAWI, A. M. KAMARUDDEEN

School of Technology Management and Logistics, University Utara Malaysia.
*Corresponding Author: jibril1717@yahoo.com

Abstract

The "triple bottom line" concept is a useful guide towards a comprehensive attainment of sustainability baseline in construction, which includes social, economic and ecological footprints. The construction industry has defined sustainability as meeting the growing demands for building and infrastructure by balancing environmental protection, social diligence, and economic prosperity. Measures of construction sustainability is challenging, as the built environment is a complex system that is characterised by enormous resource flows. Thus, this paper assesses the extent of sustainable construction compliance among Malaysian large contractors in projects delivery. This study took place in eleven states of peninsular Malaysia, where a proportionate stratified random sampling was used to select a sample of 708 large contractors. After several data screening exercises, a number of 172 questionnaires was used for data analysis. Using the five-level rating scale to explain the extent of sustainable construction of Malaysian contractors based on previous studies, statistical analysis reveals that environmental, social and economic sustainability of Malaysian large contractors are high. Public policy implications, as well as the implication for future research are also discussed.

Keywords: Environmental sustainability, Social sustainability, Economic sustainability, Large contractors, Malaysian construction industry.

1. Introduction

Building and infrastructural development in most developed countries are the major consumers of states' energy resources, which necessitated the call for the consideration of sustainability issues in construction project delivery [1-4]. Over 40% of world's energy is consumed by both residential and commercial structures, and with the continuous rise in consumption rate annually, a

substantial amount of detrimental CO_2 emissions is massively contributing to the world's climate change [5]. Besides, building and infrastructural construction are responsible for several other environmental issues like water and atmospheric pollutions [6], arising from the usage of harmful building materials and unsustainable processes. Consequently, the construction industry has become a burden that continually stretches the environment beyond its limits, leaving nations with the dilemma of delivering housing and infrastructure that could meet the population's social needs in an ecologically responsible manner [6].

Studies have shown that an approximately 10% of the global energy consumption goes to building materials manufacturing [7]. Construction phases and the eventual demolition also contributes about 40% of the solid waste generated in the developed nations, while the operation stage of construction products emits almost 40% of the entire global greenhouse gas, thus, placing the construction industry at the topmost position in the global energy consumption [8]. These impacts have led to construction industry's shift from the traditional construction techniques to sustainable construction adoption, where the general sustainability concepts of environmental, social and economic considerations (the triple bottom line) are given prominence [9-11].

2. The TBL Concept of Sustainable Construction

The triple bottom line concept has become the new guiding instrument that provides operational definition of sustainability in business management domain. Thus, within the construction industry, sustainability addresses the creation of a favourable built environment that meets human's present needs without jeopardising the ability of the future generation to meet theirs [12], so that the complex problems that construction generates for the environment are resolved in order to restore balance between the natural and the built environment. In this regard, the construction industries across the globe are being sensitized to engage in the sustainability debate and formulate business strategies in response to the heightened demands from the clients and environmental activists for sustainable construction [13]. Globally, the construction industry is now under obligation to uphold sustainability principle.

The concept also explains the responsibility of the contractors to adopt sustainable development in project execution by using the triple bottom line to strike a balance between environmental conservation, social well-being and prosperity in development for the benefit of the present and future users. Impact reduction on both humans and the environment throughout the phases of construction is a key consideration of this agenda [14]. In attaining this agenda, the evaluation goes beyond the immediate users, as it extends to other stakeholders like the local community in which the structure is domiciled. This brings in the inter-generational sustainability framework, which ensures that the needs of generations to come are not compromised by the present activities [15], since building construction is a portrayal of the community's longstanding cultural orientation.

Shen, et al. [16] provided a comprehensive framework towards a better understanding of the essentials of the key issues affecting sustainability performance in construction projects across their entire cycle. The study also considered the triple bottom line of sustainability performance, which are economic

sustainability factors (ESF), social sustainability factors (SSF), and environmental sustainability factors (EnSF) at inception, design, construction, operation and demolition stages of a project.

The environmental sustainability addresses issues relating to the reduction of ecological effects of present construction in terms of natural resources extraction for the sake of the future generation. Social sustainability dimension deals with the responsibilities of the construction firms to conduct business such that the construction impacts on the host communities is reduced [17]. And economic prosperity is demonstrated when the conduct of construction business assures future economic development by considering micro and macro-economic issues. However, there are various issues relating to sustainable construction under these dimensions, some of which are quite similar across sustainable construction researchers like Beheiry, Chong and Haas [18]. These issues, which are not mutually exclusive as presented in Figure 1, are critically considered in construction projects for the achievement of triple bottom line (TBL) of sustainable construction.

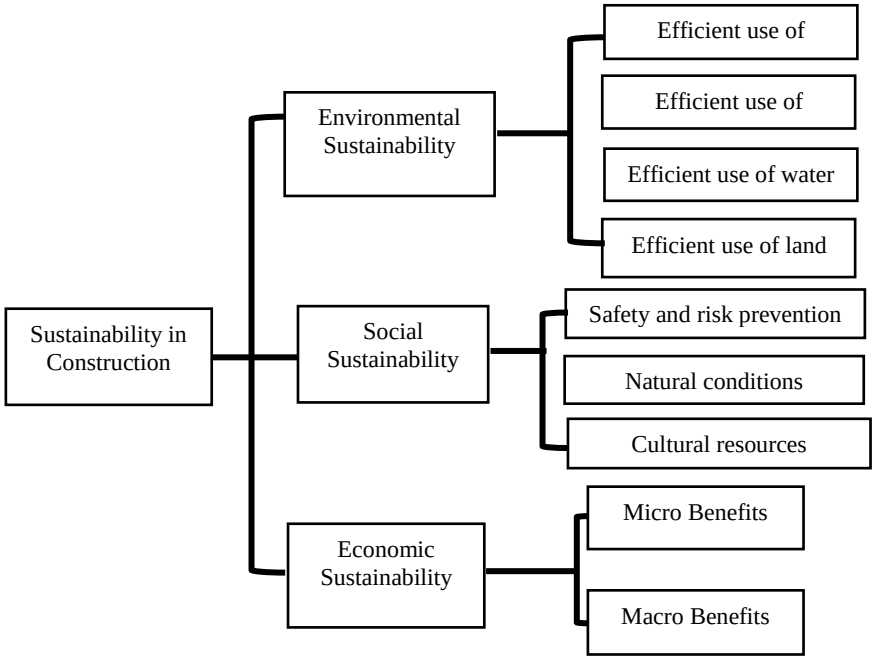

Fig. 1. Sustainability issues in construction projects (Adapted from Abidin) [29].

3. Importance of the Study

In view of the special role that the contractors play in transforming designs into real structures in order to support government's economic initiatives, this study evaluates the extent of sustainable construction of Malaysian large contractors (the G7 contractors) operating in the peninsula Malaysia. Contractors are important players in construction sustainability agenda due to their roles as construction project initiators and their dominant influence over the entire project direction [19]. This research effort could help to reveal the level at which the

contractors within the Malaysian Construction Industry (MCI) adopt sustainable construction in their project execution. The findings of this study intend to validate the findings in previous studies, where financial sustainable construction of the Malaysian contractors was demonstrated to be relatively higher than non-financial construction sustainability [20].

4. Method

4.1 The Cronbach's alpha coefficient test

The internal consistency test, Cronbach's alpha coefficient (α), was used to determine the reliability and goodness of the measures. Researchers do conduct several reliability tests, however, "the internal consistency reliability test" is commonly used [21]. The internal consistency of measures explains the homogeneity of measuring items that taps a particular construct. It is the extent to which items of a construct jointly and independently measures the particular construct in question, while the items are also correlated among each other, so that respondents attach the same overall meaning to each of the items. And the most popular internal consistency test is Cronbach's coefficient alpha. Thus, the higher the coefficients, the better the instrument [21]. All the results in Table 1 demonstrated high reliability coefficient, ranging from 0.90 to 0.95. Ordinarily, a Cronbach's alpha coefficient of 0.60 is considered average by research experts, while 0.70 and above is rated high reliability [31-32].

Table 1. Summary of reliability result.

Constructs	Dimensions	Number of Items	α
Sustainable	Three (3)		
Construction	Environmental Protection	8	0.92
	Social Well-being	7	0.95
	Economic Prosperity	5	0.90

In table 1, all the results demonstrated high reliability coefficient, ranging from 0.90 to 0.95.

4.2 Sampling procedure

This design of this study is cross-sectional [21], and it covers the Malaysian peninsular, comprising of 11 states. The study's population (4520) consists of names and addresses of large contractors in all the 11 states of Peninsular Malaysia, obtained from the CIDB website in 2014. This population in all the eleven states of Peninsular Malaysia was firstly divided into mutually exclusive stratum. Then, a proportionate stratified random sampling was used, where a member (one G7 contractor) represented in the sample from each stratum (in this case, states in Peninsular Malaysia) is proportional to the entire number of elements in the respective strata [21]. And, in order to satisfy the guidelines of proportionate stratified random sampling, 8% of members from each stratum was selected for the survey, such that member are consistently selected from each of the states.

Data collection was done at organisational level. This implies that the unit of analysis is organisation (the G7 contractors in Peninsular Malaysia). And the

study's population consisted of large contractors that are registered with the Construction Industry Development Board (CIDB) in peninsular Malaysia in 2014. Dillman's [22] technique was incorporated in this study guide against incorrect sample size and to ensure accurate sample size that will be representative of the study's population. Therefore, using the study's population of 4,520, the computation of the sample size is given in Eq. (1):

$$n = \frac{(N)(p)(1-p)}{(N-1)\left(\frac{B}{C}\right)^2 + (p)(1-p)} \quad (1)$$

where, n = the required sample size that is computed for the desired level of precision; N = the population size; p = the proportion of population expected to choose; B = acceptable amount of sampling error, or precision; and $C = Z$ statistic associated with the confidence level which is 1.96 corresponding to 95% level of confidence.

Ideally, the value for B can be set at 0.1, 0.05, or 0.03, which amounts to ±10, 5, or 3% of the true population value, respectively. This study however, considers the acceptable amount of sampling error of 0.05 (5%). The confidence level of 1.96 also corresponds to the 95 per cent level.

Since the percentage of the participants that will respond to the survey was not known prior to the data collection, thus 0.05 value for B was used instead of 0.03 to achieve a consistent sample. By using 0.05, a greater sample size will be achieved. The computation is presented as followed.

$$n = \frac{(N)(p)(1-p)}{(N-1)\left(\frac{B}{C}\right)^2 + (p)(1-p)}$$

where N= 4,520, p = 0.5, B = 0.05, C = 1.96

$$n = \frac{(4520)(0.5)(1-0.5)}{(4520-1)\left(\frac{0.05}{1.96}\right)^2 + (0.5)(1-0.5)}$$

$$n = \frac{(4520)(0.5)(0.5)}{4519 * 0.000651 + (0.5)(0.5)}$$

$$n = \frac{1130}{2.942 + 0.25}$$

$$n = \frac{1130}{3.192} \simeq 354$$

Thus, this computation shows that a minimum of 354 contractors are required as respondents in this study. However, it should be noted that Malaysian construction industry has been associated with low rate of response [23]. So, to take care of this peculiar syndrome, and also to minimize sampling error, the suggestions of Hair, Wolfinbarger and Ortinau [24], that the sample size be doubled, is adhered to in this

study. Therefore, a total of 708 questionnaires were sent out to the contractors across the eleven states in peninsular Malaysia.

Physical distributions of the questionnaires were done in states of Kedah, Perlis and Penang. This form of questionnaire administration in these states was done to allow for personal contact with the respondents, to increase the response rate, and also to reduce the time taken to receive posted responses. A postal survey method was also adopted in the remaining states. Additionally, questionnaires were also physically administered to contractors during the CIDB year-round workshops called Continuing Professional Development (CPD). The workshops serve as a better avenue for the researcher to explain in greater details, the nature of the survey and the need for the respondents to participate in the survey. A number of 79 contractors responded during the three different workshops that were attended by the researcher.

A total of 172 questionnaires were acknowledged and retained for analysis as against the entire 189 returned questionnaires. Invalid and incomplete responses were specifically responsible for the exclusion of 9 responses. While another 8 cases were removed after the assessment of multivariate outlier. This gives a 25% overall response rate. This low response rate was largely due to the nature of the survey, the unit of analysis, and confidentiality of information. However, this response rate is adequate according to researchers. Akintoye [25], and Dulami et al., [26] argued that postal survey response for the construction industry is usually within the range of 20–30 %. Hence, the response rate in this study is justified.

Survey method was used to obtain the responses regarding the level of sustainable construction of Malaysian large contractors in this study. Going by the recommendations of Waris et al., [22]; Hilmi et al., [27]; and Jantan et al., [28] one representative (an executive director, a project manager, a marketing manager, an engineer, a quantity surveyor, a contract manager, a sales manager, or an account manager) in each of the contractors is enough as a respondent.

5. Data Analysis

Data analysis for this study was done with the aid of Statistical Package for Social Science (SPSS) v21 for Microsoft windows. The demographic profile of the contractors and respondents were analysed using descriptive statistics. The descriptive statistics such as the mean score, standard deviation, and percentage were then used.

The categorization of Abidin's [29] scale to determine sustainable construction of Malaysian construction practitioners, which has a five-level rating scale (1= Very Low; 2= Low; 3= Moderate; 4= High; 5= Very High) was adopted in this study with few modifications. Abidin's study described construction practitioners based on matters concerning sustainability and value management. The contractors with "very high" sustainability are regarded as those that "consider almost all sustainable construction dimensions listed in the survey instrument". Construction practitioners that recorded "high" sustainability consideration are those that have been able to take into considerations "most of the sustainable construction dimensions listed in the survey instrument" in their project execution. In the same manner, construction firms that recorded "moderate" sustainable construction consideration is an indication that they have considered "some of the sustainable construction dimensions listed in the

survey instrument" in project execution. If any construction firm is ranked "low" in sustainability consideration, it implies that the firm has the tendency to "consider only a few of the sustainable construction dimensions listed in the survey instrument". And a "very low" response signifies that the contractor did not "consider any of the sustainable construction dimensions listed in the survey instrument".

In this study, the same number of likert scale was used in measuring all the variables. In the researcher's view, using the same likert scale for all the study's latent variables would not only generate consistency of the questionnaire items, it will also allow for comparability and make response easier for the respondents, so that they do not lose ground on the differences between elements in the scale. Thus, following Kamaruddeen et al's., [30] interpretation of the Likert scale, the values used in this study to define the 5-point Likert scale were: 1 = not at all (1.0-1.49); 2 = slightly true (1.5-2.49); 3 = moderately true (2.5-3.49); 3 = mostly true = (3.5-4.49); 5 = completely true (4.5-5.00). Then, Abidin's [29] sustainable construction rating scale were adapted to interpret this study's 1 to 5 point Likert scale as follows: not at all (1.0 to 1.49) = very low; slightly true (1.5 to 2.49) = low; moderately true (2.5 to 3.49) = moderate; mostly true = (3.5 to 4.49) = high; and completely true (4.5 to 5.00) = very high. Therefore, the contractors' level of sustainable construction was determined by examining which of the range adopted corresponds with the mean score of sustainable construction recorded in the SPSS descriptive statistics output. A mean score that falls between 4.5 and 5.00 is an indication of a very high level of sustainable construction.

6. Result and Discussion

The sample from 172 contractors indicates that construction firms with 10 years and above has the highest percentage (63.3%). As indicated in Table 2, firms with 6-10 years constituted 15.6%, followed by those that were established within 1 - 5 years (21.1%). Similarly, this descriptive statistics also reveals operational locations of companies sampled. Majority of the sampled firms (37.8%) operates across the entire Malaysia (including Eastern Malaysia). Result of firms' staff strength indicated that those with below 100 employees responded most (68.3%). Finally, the company's descriptive statistics also shows respondents companies' specialization. Using a multiple response option, majority (31.7%) of the respondents chose residential, followed by infrastructure (26.3%), then, non-residential, social amenities, and others, constituting 24%, 10.3% and 7.7% respectively.

Table 2. Demographic profile of construction firms.

Parameters	Frequency	%
Company age		
1-5 years	38	21.1
6-10 years	28	15.6
More than 10 years	114	63.3
Operational location		
Local market areas	35	20.3
Within few states	40	23.3
Regional	20	11.1
Across the entire Malaysia (including East Malaysia)	68	37.8
International market	9	5.0

Workforce		
<100	120	69.7
101-250	13	7.6
251-500	10	5.6
>500	29	16.1
Specialization		
Residential apartment	99	31.7
Non-residential apartment	75	24.0
Social amenities	32	10.3
Infrastructure	82	26.3
Others	24	7.7

6.1. Descriptive analysis and extent of sustainable construction among Malaysian contractors

The descriptive statistics for this study constructs are presented. This was done by computing both the mean and standard deviations. A five-point, using Alston's [31] Likert scale interpretation was used in measuring all the variables in this study, anchored by 1 = not at all to 5 = completely true. Values (range) in ascending order were assigned to these 5-point scale in the survey questionnaire thus: 1 = not at all (1.0-1.49); 2 = slightly true (1.5-2.49); 3 = moderately true (2.5-3.49); 3 = mostly true = (3.5-4.49); 5 = completely true (4.5-5.00).

Table 3. Descriptive statistics for latent variables.

Latent Variables	Number of Items	Mean	Std. Deviation
Social Wellbeing	7	3.964	0.653
Economic Prosperity	5	4.086	0.665
Government Support	5	3.982	0.686

The overall descriptive statistics for this study's variables is indicated in Table 3. Particularly, the mean and standard deviation for environmental protection, social wellbeing and economic prosperity were 3.840, 0.668; 3.964, 0.653 and 4.086, 0.665 respectively. Implying a moderate level sustainable construction. This result is a strong indication that the construction firms in this study have a moderate level of sustainable construction.

Table 4. Extent of sustainable construction (SC) among Malaysian contractors.

SC	Frequency	%	Mean	Median	Mode	SD
Very low	-	-				
Low	2	1.20				
Moderate	35	19.60				
High	108	60.00	3.95	4.00	4.00	0.59
Very High	35	19.50				

Table 3 reveals the frequency and percentage scores for the extent of sustainable construction among Malaysian contractors. Contractors with high extent of sustainable construction have the highest frequency (108) with 60 %. The mean score of 3.95 implies that there is a high extent of sustainable construction among Malaysian large contractors.

7. Conclusion

This study was conducted with the main objective of assessing the extent of sustainable construction of Malaysian large contractors. The study is an attempt to answer this research question: What is the extent of sustainable construction of Malaysian large contractors? Contractors listed on the Construction Industry Development Board (CIDB) database in 2014 were stratified and randomly selected to participate in this survey. A total of 708 large contractors were sent copies of structured questionnaires. And after series of strategies taken to improve the response rate, a total of 172 responses were usable for data analysis, after 17 responses have been excluded due to some invalid/incomplete responses, and the presence of multivariate outliers.

In this study, sustainable construction has been described as the measurement of certain attributes reflecting the extent of sustainability adoption among the Malaysian large contractors. Findings of this study highlights the extent of environmental, social, and economic sustainability adoption of Malaysian large contractors, where high extent was recorded for the three dimensions of construction sustainability. Thus, Malaysian large contractors are efficient in utilising the finite resources (energy, water and materials), and have also been forthcoming in reducing construction impacts on both humans and the environment throughout the construction phases.

The extent of construction sustainability of Malaysian large contractors that was presented in this study might have been influenced by the interpretation of the scale adopted. While the same mean scores obtained in this study can also be obtained in similar studies, the corresponding extent of construction sustainability will depend on the scale interpretation used.

This study made critical contributions to organizational researches within the context of construction. And, it is hoped that this study would contribute to increase the methodological concerns, irrespective of the perspective and analytic tools used by construction project management scholars. The study also provided some practical implications about large construction firms' compliance level with sustainability in construction. It could be noted from the results of this study that firm compliance with sustainability dimensions varies, and practitioners are usually faced with difficulties in addressing sustainability issues in holistic manner.

The findings of this research are limited to the issues of determining the sustainable construction level of Malaysian large contractors, and thus, similar studies can be conducted to further investigate the compliance level of other categories of contractors in order to draw comparison between the hierarchies of the construction firms. It is also pertinent to ascertain certain antecedents of sustainable construction among different categories of contractors to determine the possible factors that may contribute to the sustainable construction adoption. The findings is of immense importance to construction organisations and other construction stakeholders in the construction industry such as the Construction Industry Development Board (CIDB), Association of Consulting Engineers Malaysia, Ministry of Urban Wellbeing, Housing and Local Government, Malaysia.

Acknowledgement

Authors of this paper acknowledge the research funding from the Fundamental Research Grant Scheme (FRGS), Managed by RIMC, Universiti Utara Malaysia (S/O code 12809).

References

1. Li, T.H.; Ng, S.T; and Skitmore, M. (2012). Conflict or consensus: An investigation of stakeholder concerns during the participation process of major infrastructure and construction projects in Hong Kong. *Habitat International*, 36(2), 333-342.
2. Shi, Q.; Zuo, J.; and Zillante, G. (2012). Exploring the management of sustainable construction at the programme level: a Chinese case study. *Construction Management and Economics*, 30(6), 425-440.
3. Tam, C.M.; and Tong, T.K. (2011). Conflict analysis study for public engagement programme in infrastructure planning. *Built Environment Project and Asset Management*, 1(1), 45-60.
4. Teo, M.; and Loosemore, M. (2003). Changing the environmental culture of the construction industry. *ASCE Construction Research Congress Conference*. Manoa, Honolulu, 345-376.
5. Hwang, B.G.; and Tan, J.S. (2012). Green building project management: obstacles and solutions for sustainable development. *Sustainable Development*, 20(5), 335-349.
6. Xue, J. (2012). Potentials for decoupling housing-related environmental impacts from economic growth. *Environmental Development*, 4, 18-35.
7. Rode, P.; Burdett, R.; and Soares Gonçalves, J.C. (2011). Buildings: investing in energy and resource efficiency. The London School of Economics and Political Science.
8. Wong, J.K.W.; and Zhou, J. (2015). Enhancing environmental sustainability over building life cycles through green BIM: a review. *Automation in Construction*, 57, 156-165.
9. Matar, M.M.; Georgy, M.E.; and Ibrahim, M.E. (2008). Sustainable construction management: Introduction of the operational context space (OCS). *Construction Management and Economics*, 26(3), 261-275.
10. Gan, X.; Zuo, J.; Ye, K.; Skitmore, M.; and Xiong, B. (2015). Why sustainable construction? Why not? An owner's perspective. *Habitat International*, 47, 61-68.
12. Ofori, G. (2001). Challenges facing the construction industries of Southern Africa. *Regional Seminar on Developing the Construction Industries of Southern Africa*. Pretoria, South Africa, 23-25.
13. Zhao, S.; Huang, B.; Shu, X.; Jia, X.; and Woods, M. (2012). Laboratory performance evaluation of warm-mix asphalt containing high percentages of reclaimed asphalt pavement transportation research record. *Journal of the Transportation Research Board*, 2294(1), 98-105.
14. Chua S.S.; and Oh, T.H. (2011). Green progress and prospect in Malaysia. *Renewable and Sustainable Energy Reviews*, 15(6), 2850-2861

15. Sarkis, J.; Meade, L.M.; and Presley, A.R. (2012). Incorporating sustainability into contractor evaluation and team formation in the built environment. *Journal of Cleaner Production*, 31, 40-53.
16. Shen, L.Y.; Li Hao, J.; Tam, V.W.Y.; and Yao, H. (2007). A checklist for assessing sustainability performance of construction projects. *Journal of Civil Engineering and Management*, 13(4), 273-281.
17. Jones, T.; Shan, Y.; and Goodrum, P.M. (2010). An investigation of corporate approaches to sustainability in the US engineering and construction industry. *Construction Management and Economics*, 28(9), 971-983.
18. Beheiry, S.M.; Chong, W.K.; and Haas, C.T. (2006). Examining the business impact of owner commitment to sustainability. *Journal of Construction Engineering and Management*, 132(4), 384-392.
19. Abidin, N.Z.; Yusof N.A.; and Othman, A.A. 2013. Enablers and challenges of a sustainable housing industry in Malaysia. *Construction Innovation: Information, Process, Management*, 13(1), 10-25.
20. Osman, W.N.B.; Udin, Z.M.; and Salleh, D. (2012). Adoption level of sustainable construction practices: a study on Malaysia's construction stakeholders. *Journal of Southeast Asian Research*, 1-6.
21. Sekaran, U.; and Bougie, R. (2013). *Research Methods of Business-A Skill-Building Approach*. New York: John Wiley and Sons Inc.
22. Dillman, D.A. (2000). *Mail and internet surveys: the tailored design method*. Brisbane: John Wiley and Sons Inc.
23. Waris, M.; Liew; M.S.; Khamidi M.F.; and Idrus, A. (2014). Criteria for the selection of sustainable onsite construction equipment. *International Journal of Sustainable Built Environment*, 3(1), 96-110.
24. Hair, J.F.; Wolfinbarger, M.F.; Ortinau, D.J.; and Bush, R.P. (2008). *Essentials of marketing research*. New York: McGraw-Hill/Irwin.
25. Akintoye, A. (2000). Analysis of factors influencing project cost estimating practice. *Construction Management and Economics*, 18(1), 77-89.
26. Dulaimi, M.F.; Ling, F.Y.; and Bajracharya, A. (2003). Organizational motivation and inter-organizational interaction in construction innovation in Singapore. *Construction Management and Economics*, 21(3), 307-318.
27. Hilmi, M.F.; Ramaya, T.; Mustapha, Y. and Pawanchik, S. (2010). Product and process innovativeness: evidence from Malaysian SMEs. *European Journal of Social Sciences*, 16(4), 556-564.
28. Jantan, M.; Nasurdin, A.M.; and Fadzil, N.F.A. (2003). Designing innovative organizations in Malaysia: Do structure and culture matter? *Global Business Review*, 4(2), 213-226.
29. Abidin, N.Z. 2005. Using value management to improve the consideration of sustainability within construction. Ph.D. thesis, Loughborough University.
30. Kamaruddeen, A.M.; Yusof, N.; and Said, I. (2012). Dimensions of firm innovativeness in housing industry. *Emerging issues in the natural and applied sciences*, 2(1) 118-133.
31. Alston, A.J.; and Miller, W.W. (2001). Analysing the barriers and benefits towards instructional technology instruction in North Carolina and Virginia secondary agricultural education curricula. *Journal of Southern Agricultural Education Research*, 51(1), 50 -62.