



Stakeholders' Perception on Critical Cost Variation Factors in Malaysian Building Projects

Samiullah Sohu ^{a*}, Abd Halid Abdullah ^a, Sasitharan Nagapan ^a, Ahsan Ali Buriro ^b, Kaleemullah ^a

^a Faculty of Civil and Environmental Engineering, Universiti Tun Hussein Onn Malaysia, Part Raja 86400, Johor, Malaysia.

^b Quaid e Awam University of Engineering College of Engineering Science and Technology, Larkano, Pakistan.

Received 07 June 2018; Accepted 26 August 2018

Abstract

Effective cost management is one of the prime requirements for successful completion of construction projects. However, deviation from initially planned cost had been prevalent in construction projects. Cost variation has become a frequent phenomenon in construction projects and Malaysian building projects has no exclusion. This paper aims to establish the critical factors instigating cost variation in Malaysian building projects. Extensive literature review and field survey were two main methods for conducting this study. 34 factors causing cost variation were identified through deep literature review. A questionnaire survey based on identified factors, was carried out among construction stakeholders: clients, consultants and contractors involved in handling of building projects in Malaysia. The collected data was analyzed using SPSS V22 software, which enabled the ranking of factors based on their Mean Value. The results of the survey indicated that (1) fluctuation in cost of materials, (2) improper planning, (3) Incompetent main contractors, (4) poor site management, (5) and client financial problems were top five critical factors causing cost variation in building projects. The inferences drawn in this study can serve as a guide lines for construction stakeholders to achieve effective cost management in building projects.

Keywords: Cost Management; Critical Factors; Cost Variation; Building Projects.

1. Introduction

A construction project is regarded as successful, when it is completed within budget, before the due dates, and in accordance with the stakeholder's specification and requirements. Despite the importance of cost for successful completion of construction projects, cost variation or cost increase is one of the main problem in construction industry and it is associated with majority of the construction projects [1]. Cost increase is the variance between initially planned cost and the final cost of a construction project at completion [2]. Aziz [4] cited that a construction project experience 33% increase in cost on average at the time of completion. Cost variation in construction projects is a global phenomenon, and it is common in both developed and developing countries. Literature review confirms that construction projects in both developed and developing projects are affected by cost variation. However, the severity and occurrence of cost increase is more common in developing countries [5].

A study by Anastasopoulos et al [6] indicated that bridge projects in USA has a propensity to experience a cost increase of 15.3% on average. In Germany, Kostka et al. [7] investigated cost variance in 78 building projects completed between 1962 to 2015, and found that average cost increase was 51%. Zujo et al. [8] examined cost increase in 177

* Corresponding author: hf150092@siswa.uthm.edu.my

 <http://dx.doi.org/10.28991/cej-03091140>

➤ This is an open access article under the CC-BY license (<https://creativecommons.org/licenses/by/4.0/>).

© Authors retain all copyrights.

building projects in Bosnia and Herzegovina and indicated that 41% of the projects experienced increase in final cost. In Kuwait, Koushki et al. [9] studied cost variation in 450 randomly selected residential building and found that 33% of the projects faced cost increase. In Palestine, Mahamid et al. [10] investigated cost variation in 169 construction projects and found that 100% of the projects suffered from cost increase.

Likewise other countries, the construction industry in Malaysia is also facing the severe problem of cost variation [11]. A study by Shehu et al. [12] found that in 359 recently completed public and private sector building projects in Malaysia, 55% of the projects experienced cost increase. Similarly study of Abdullah et al., [13] cited that 90% of MARA large construction projects were affected with delays leading to cost increase since 1984. Further, a recent study on performance of public construction projects in Malaysia reported that 191 projects were found sick, being not completed on scheduled time, experienced cost increase, and not meeting quality specifications [14].

Cost variation in building projects can occur due to various reasons. To overcome the problem of cost variation in building projects, it is important to figure out these reasons. Various studies have been carried out on detection and evaluating factors initiating cost variation in construction projects; however, a deeper insight of causative factors of cost variation particularly in Malaysian building projects is still needed. As according to [15] the factors which causes cost variation vary from country to country and with types of construction projects. Various studies have been carried out on detection and evaluating factors initiating cost variation in construction projects; however, a deeper insight of causative factors of cost variation particularly in Malaysian building projects is still needed. As according to [15] the factors which causes cost variation vary from country to country and with types of construction projects. Thus, the objectives of this research are:

- 1) To determine factors causing cost variation in construction projects.
- 2) To identify and rank the factors of cost variation in Malaysian building projects, perceived by construction stakeholders i.e. contractors, consultants, and clients.

The results of this research can act as baseline for developing effective solutions for the factors causing cost variation in construction projects.

2. Literature Review

Cost variations in construction projects can be caused by numerous factors. Literature shows that various studies have been carried out on factors initiating variance in projects costs. In Vietnam, Kim et al. [15] studied the causes of cost variation in hospital construction projects using questionnaire procedure. Questionnaire consisting of 22 causative factors was distributed to construction professionals. The results of the study indicated that main causative factors were price fluctuations of materials, errors in design, changes in the scope of project, underestimate of project duration, and additional work.

In India, Wanjari et al. [16] assessed the factors that cause variation in cost of construction projects. Based on the 85 valid response from construction practitioners, the significant factors affecting project cost were: poor coordination between construction stakeholders, additional work, mistakes in design, incomplete tender documents, and poor relationship between management and labours. A study conducted by Nasir et al. [17] investigated the causes of cost variation in highway projects of Pakistan through questionnaire survey. In total 50 questionnaires were sent to construction experts, out of which 37 valid responses were received back. The results of the survey showed that main three causes were improper planning, delays in decision making, and inaccurate cost estimates.

In Saudi Arabia, Allahaim et al. [18] identified the factors contributing to cost variation in infrastructure projects through a quantitative study. The top causative factors were frequent changes in the prices of materials, assigning contract to lowest bidder, delay in approval of design documents, delay in materials supply and improper planning. Aziz [4] examined the causes of cost variation in construction of wastewater projects in Egypt. In total, 52 causes were shortlist for questionnaire from literature review. A filed survey was carried out with experts from public and private construction firms. Findings of the study revealed that main causes of cost variation were: awarding contract to lowest bidder, additional works, lack of funds, unexpected site conditions, wrong estimation of project cost, and instability in costs of raw materials. Enshassi et al. [19] studied the factors causing cost variance in construction projects in the Gaza strip, Palestine. The results of the survey analysis showed that significant factors of cost variance in construction projects are high cost of materials, delay in supply of construction materials to the site, late delivery of equipment, frequent design changes, lack of coordination, and changes in the scope of project.

In Portugal, Moura et al. [20] investigated the causes of cost variation in construction industry. The main causes of difference between final cost and planned cost of project were changes in design, changes in the scope of project by client, and unforeseen site conditions. Olawale et al [21] found 21 factors causing cost increase in UK construction projects. The main factors were incorrect project cost, lack of experience of subcontractors, lack of coordination between project parties, low skilled labors, and late payments by client.

From literature review, factors of cost variation shown in Table 1 were found, the same factors were used in questionnaire for this study.

Table 1. List of factors of cost variation according to literature review

Serial No.	Cost Variation Factors	Serial No.	Cost Variation Factors
1	Poor site management	18	Late progress payments by client
2	Poor communication among project parties	19	Delay in materials supply
3	Fluctuations in cost of materials	20	Late handover of site by owner
4	Incapable project team	21	Assigning contract to lowest bidder
5	Improper planning	22	Poor financial control on site
6	Financial difficulties of contractors	23	Improper selection of consultants
7	Frequent design changes	24	Poor relationship between management and labours
8	underestimate of project duration	25	Poor contract management
9	shortage of labour	26	Rework due to mistakes in construction
10	Delays in decision making	27	Wrong estimation of project cost
11	lack of equipment	28	High cost of machineries
12	changes in the scope of project,	29	Incomplete design documents at tender stage
13	Client financial problems	30	Absenteeism of laborers
14	Incapable subcontractors	31	Shortage of materials
15	Errors in design	32	High cost of skilled labourers
16	Variation orders	33	Unexpected site conditions
17	Incompetent main contractors	34	delay in approval of design documents

3. Research Method

The research methodology of this study includes the following steps.

- 1) A thorough literature review was conducted, which resulted in identification of 34 cost variation in construction projects.
- 2) A questionnaire was developed for use in the survey comprised of two parts. In first part demographic information from respondents were asked and part second was aimed to know the perception of stake holders on 34 cost variation factors in Malaysian building projects. The respondents were asked to select one degree of severity for each cost variation factor which are 1= not severe, 2= low severe, 3= moderate severe, 4= high severe, or 5= extreme severe.
- 3) In order to check the relevancy of design questionnaire to Malaysian building project, pilot test was performed. 10 exports working in Malaysian building projects were participated in pilot test. They were asked to review the structure and cost variations factors listed in questionnaire. According to exports all cost variation factors given in questionnaire are relevant to Malaysian building projects.
- 4) After pilot test, the questionnaire was randomly distributed to building construction stakeholders i.e. clients, contractors and consultants.

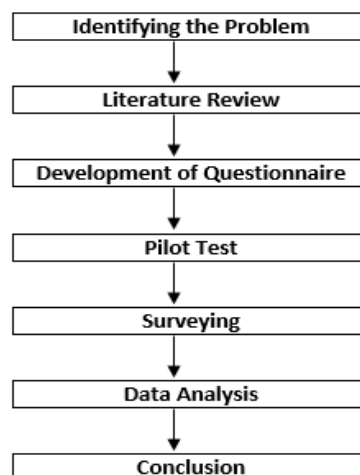


Figure 1. Research Methodology Flow Chart

4. Data Analysis and Discussion

In total, 250 questionnaires were distributed, out of which 155 valid questionnaires were assembled, with a response rate of 62%. The details of respondent’s professional cadres, academic qualification and experience in building projects is shown in Table 2. In questionnaire survey, seventy-five (75) contractors, forty-six (46) consultants and only thirty (34) four clients participated.

Table 2. Demographic characteristics of respondents

Demographics	Responses	%
Professional cadres		
Client	34	21.94
Contractor	75	48.38
Consultants	46	29.68
Education		
Diploma	38	24.52
Bachelors	77	49.68
Masters	40	25.80
Work experience		
Less than 10 years	39	25.16
10 – 20 years	68	43.87
More than 20 years	48	30.97

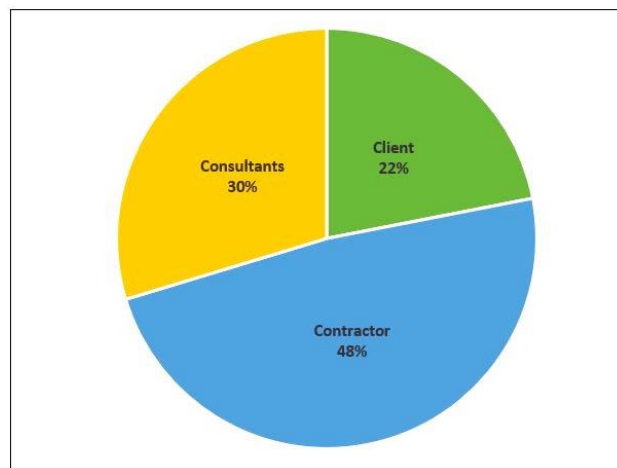


Figure 2. Demography of respondents based upon their professional cadres

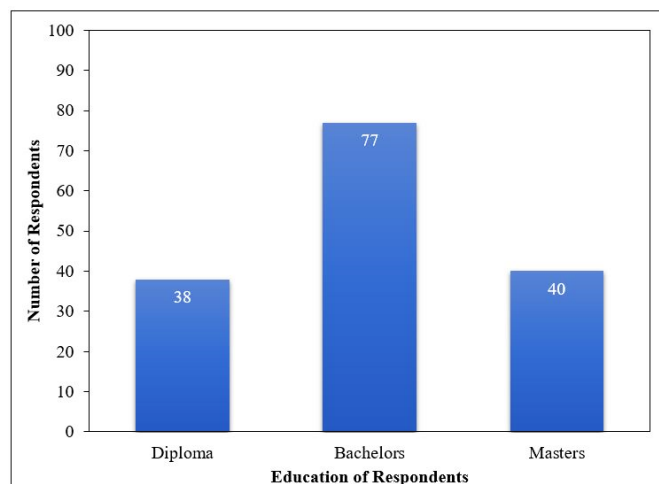


Figure 3. Demography of respondents based upon their educational qualification

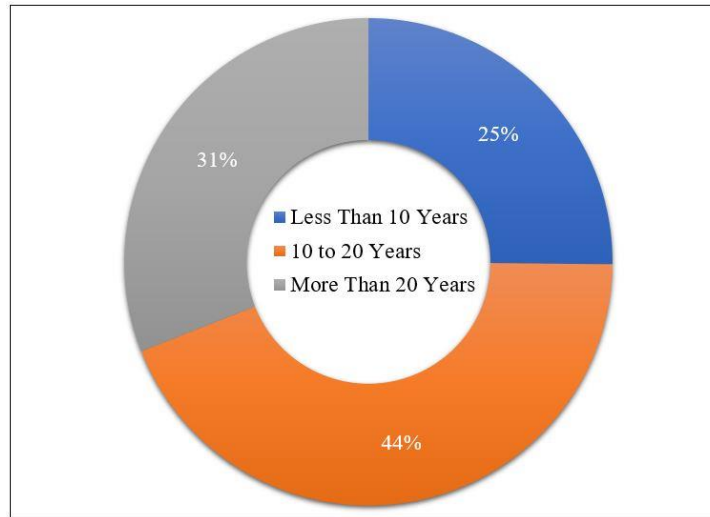


Figure 4. Demography of respondents based on their working experience

From Figure 2, it is obvious that majority of the survey respondents are from contractors group, this confirm that the inputs from them is useful for this research, as they are one of the stakeholders who are directly involved in activities at construction site. Educational level and experience of respondents are important aspects in questionnaire survey. Figure 3 shows that almost half of the respondents have bachelor’s degree while 25% have obtained master’s degree. Further, Figure 4 presents that majority of the respondents of survey have several years of experience of handling building projects. This indicates that respondents of the survey were competent and capable.

The data gathered in the questionnaire survey was analyzed using SPSS V22. To check the reliability of factors, Cronbach’s alpha coefficient was used. The Cronbach’s alpha coefficient of the survey was 0.853, which is more than 0.7, showing that the data gathered in questionnaire is highly reliable [22].

4.1. Ranking of Cost Variance Factors

The different factors of cost variation in Malaysian building projects were ranked based on their “mean value” evaluated with SPSS. Table 3 lists the ranking of factors according to their mean values.

Table 3. Ranking of cost variation factors

Cost Variation Factors	Mean Value	Rank	Cost Variation Factors	Mean Value	Rank
Fluctuations in cost of materials	4.56	1	shortage of materials	3.44	18
Improper planning	4.53	2	assigning contract to lowest bidder	3.41	19
Incompetent main contractors	4.51	3	delay in approval of design documents	3.40	20
Poor site management	4.46	4	shortage of labour	3.38	21
client financial problems	4.42	5	poor contract management	3.34	22
Frequent design changes	4.33	6	delays in decision making	3.31	23
Incapable project team	4.25	7	delay in materials supply	3.29	24
Poor communication among project parties	4.18	8	improper selection of consultants	3.25	25
Financial difficulties of contractors	4.15	9	high cost of machineries	3.23	26
underestimate of project duration	3.98	10	variation orders	3.20	27
changes in the scope of project,	3.96	11	high cost of skilled labour	3.13	28
late progress payment by client	3.86	12	unexpected side conditions	3.09	29
Errors in deign	3.70	13	lack of equipment	3.00	30
Wrong estimation of project cost	3.63	14	late handover of site by owner	2.85	31
Rework due to mistakes in construction	3.56	15	Poor relationship between management and labours	2.78	32
Incomplete design documents at tender stage	3.54	16	Poor financial control on site	2.75	33
Incapable subcontractors	3.51	17	absenteeism of laborers	2.73	34

Table 3 shows that thirty factors have mean value more than 3 while, four factors have mean value less than 3. According to Kim et al. [15] that factor having mean value less than 3 means that respondents assessed that these factors have no impact on cost variations in construction projects. Respondents ranked the factor “fluctuations in cost of

materials” as the prime cause of cost variation in building construction projects in Malaysia. Construction materials contribute a significant portion of project cost hence any additional cost of materials will affect the overall cost of the project. “Improper planning” was ranked as second factor leading to cost variation with mean value of 4.53. Contractors due to lack of experience often fail to prepare a realistic and practical “work program”.

Thus, faces difficulties in implementation and control of site planning. Improper planning at the initial stage runs throughout the project and results in delay of project activates, which ultimately affect the final cost of the project. Respondent ranked “Incompetent main contractors” as the third significant cost variation factor with mean value of “4.51”. Poor site management” and “client financial problems” were ranked as fourth and fifth significant cost vacation factors in Malaysian building project. Four factors having mean value less than 3 were late handover of site by owner, poor relationship between management and labors, poor financial control on site, and absenteeism of laborers.

4.2. Comparison with Previous Selected Studies

The purpose of this part is to compare the causative factors of cost variation among some selected countries. The top five causative factors from this survey were compared with different previous studies as shown in Table 4. The study of Kim et al. [15] in Vietnam , Wanjari et al. [16] in India, and Allahaim et al. [18] in Saudi Arabia were selected for comparison. The methodology of these studies might be different, the comparison is worthwhile to understand the causative factors of cost variation in different countries.

Table 4. Comparisons with Previous Studies

Malaysia	Vietnam [15]	India [16]	Saudi Arabia [18]
Fluctuations in cost of materials	Additional work	Fluctuations in cost of materials	Market conditions
Improper planning	Wet weather effect/ rework	Delay in planned activity	Changes in design
Incompetent main contractors	Quantity increased measured	Lack of co-ordination between construction parties	Awarding contract to lowest bidder
Poor site management	Resumptions/accommodation work	Additional work	Delay in Design
Client financial problems	Project administration cost increase	Regular changes in design	Errors in design

Comparison among the studies showed that main causative factors of cost variation in this study and the study of Wanjari et al. [16] is same i.e Fluctuations in cost of materials. The main factors of cost variation in the study of Kim et al. [15] and Allahaim et al. [18] is additional work and market changes respectively. Planning related factor in ranked 2nd in both this study and the study of Wanjari et al. [16]. Design related causative factors of cost variation is more frequent in the study of Allahaim et al. [18] while none of the top five factors is related to design in this study and Kim et al. [15]. However, Regular changes in design is ranked 5th in the study of Wanjari et al. [16].

5. Conclusion

Construction industry is one the leading industries contributing significantly to social development and generates employment opportunities in Malaysia. However, building construction projects are facing the challenge of poor cost performance. Conducting a questionnaire survey results 30 critical factors of cost variation in Malaysian building projects. Among thirty critical factors top three factors of cost variation were fluctuation in cost of materials, improper planning and incompetent main contractors. The scope of this study is limited to building projects in Peninsular Malaysia. The future studies can be focused to investigate controlling measures for cost variation factors in building projects. The findings of this study are valuable for construction professionals to improve cost performance in construction industry.

6. Funding

This research work was supported by Research Management Centre (UTHM), Batu Pahat under Vot number U636 and Ministry of Higher Education Malaysia.

7. References

- [1] Mahamid, Ibrahim, and Nabil Dmaid. “Risks Leading to Cost Overrun in Building Construction from Consultants’ Perspective.” *Organization, Technology & Management in Construction: An International Journal* 5, no. 2 (December 15, 2013): 860–873. doi:10.5592/otmcj.2013.2.5.
- [2] P. E. D. Love, C. Sing, B. Carey, and J. T. Kim, “Estimating Construction Contingency : Accommodating the Potential for Cost Overruns in Road Construction Projects,” *J. Infrastruct. Syst.*, vol. 21, no. 2, pp. 1–10, 2014. Doi: 10.1080/15732479.2012.715173.
- [3] K. Amoa and S. Allotey, “Cost overruns in Building Construction Projects : A Case Study of a Government of Ghana Project in

Accra,” *Dev. Ctry. Stud.*, vol. 4, no. 24, pp. 54–65, 2014.

- [4] Aziz, Remon Fayek. “Factors Causing Cost Variation for Constructing Wastewater Projects in Egypt.” *Alexandria Engineering Journal* 52, no. 1 (March 2013): 51–66. doi:10.1016/j.aej.2012.11.004.
- [5] Sohu, Samiullah, Abd Halid Abdullah, Sasitharan Nagapan, Ashfaque Ahmed Jhatial, Kaleem Ullah, and Imtiaz Ali Bhatti. “Significant Mitigation Measures for Critical Factors of Cost Overrun in Highway Projects of Pakistan.” *Engineering, Technology & Applied Science Research* 8, no. 2 (2018): 2770-2774.
- [6] Anastasopoulos, Panagiotis Ch., John E. Haddock, and Srinivas Peeta. “Cost Overrun in Public-Private Partnerships: Toward Sustainable Highway Maintenance and Rehabilitation.” *Journal of Construction Engineering and Management* 140, no. 6 (June 2014): 04014018. doi:10.1061/(asce)co.1943-7862.0000854.
- [7] Kostka, Genia, and Jobst Fiedler, eds. “Large Infrastructure Projects in Germany” (2016). doi:10.1007/978-3-319-29233-5.
- [8] Žujo, Vahida, Diana Car-Pušić, and Aida Brkan-Vejzović. “Contracted price overrun as contracted construction time overrun function.” *Tehnički vjesnik: znanstveno-stručni časopis tehničkih fakulteta Sveučilišta u Osijeku* 17, no. 1 (2010): 23.
- [9] Koushki, P. A., K. Al - Rashid, and N. Kartam. “Delays and Cost Increases in the Construction of Private Residential Projects in Kuwait.” *Construction Management and Economics* 23, no. 3 (March 2005): 285 – 294. doi:10.1080/0144619042000326710.
- [10] Mahamid, I., and A. Amund. “Analysis of cost diverge in road construction projects.” In *Proceedings of the 2010 Annual Conference of the Canadian Society for Civil Engineering*, vol. 9, p. 12. 2010.
- [11] Ullah, Kaleem, Abd Halid Abdullah, and Sasitharan Nagapan. “A framework for avoiding cost overruns in Malaysian construction projects.” *International Journal of Advanced and Applied Sciences* 3, no. 3 (2016): 28-31.
- [12] Shehu, Zayyana, Intan Rohani Endut, Akintola Akintoye, and Gary D. Holt. “Cost Overrun in the Malaysian Construction Industry Projects: A Deeper Insight.” *International Journal of Project Management* 32, no. 8 (November 2014): 1471–1480. doi:10.1016/j.ijproman.2014.04.004.
- [13] Abdullah, Mohd Razaki, Ismail Abdul Rahman, and Ade Asmi Abdul Azis. “Causes of delay in MARA management procurement construction projects.” *Journal of Surveying, Construction and Property* 1, no. 1 (2010).
- [14] Nurul, Alifah Jatarona, Md Yusof Aminah, Ismail Syuhaida, and Chaang Saar Chai. “Public construction projects performance in Malaysia.” *Journal of Southeast Asian Research* 2016 (2016): 1-29.
- [15] S. Kim, K. N. Tuan, J. Do Lee, H. Pham, and V. T. Luu, “Cost Overrun Factor Analysis for Hospital Projects in Vietnam,” *KSCE J. Civ. Eng.*, vol. 20, no. 2, pp. 519–529, 2017. Doi: 10.1007/s12205-015-0316-1
- [16] Wanjari, Swapnil P., and Gaurav Dobariya. “Identifying factors causing cost overrun of the construction projects in India.” *Sādhanā* 41, no. 6 (2016): 679-693. Doi: 10.1007/s12046-016-0498-3.
- [17] Nasir, Abdur Rehman, Hamza Farooq Gabriel, and Rafiq Muhammad Choudhry. “Cost and time overruns in highway projects of Pakistan.” In *Sixth International Conference on Construction in the 21st Century*, Kuala Lumpur, Malaysia, pp. 69-76. 2011.
- [18] Allahaim, Fahad S., and Li Liu. “Causes of Cost Overruns on Infrastructure Projects in Saudi Arabia.” *International Journal of Collaborative Enterprise* 5, no. 1/2 (2015): 32. doi:10.1504/ijcent.2015.073176.
- [19] Enshassi, Adnan, Mohan Kumaraswamy, and Jomah Al-Najjar. “Significant Factors Causing Time and Cost Overruns in Construction Projects in the Gaza Strip: Contractors’ Perspective.” *International Journal of Construction Management* 10, no. 1 (January 2010): 35–60. doi:10.1080/15623599.2010.10773137.
- [20] H. P. Moura, J. C. Teixeira, and B. Pires, “Dealing With Cost and Time in the Portuguese Construction Industry,” in *CIB World Building Congress*, Cape Town, South Africa, 2007, pp. 1252–1265.
- [21] Olawale, Yakubu Adisa, and Ming Sun. “Cost and Time Control of Construction Projects: Inhibiting Factors and Mitigating Measures in Practice.” *Construction Management and Economics* 28, no. 5 (May 2010): 509–526. doi:10.1080/01446191003674519.
- [22] S. D. Sousa, E. M. Aspinwall, and A. G. Rodrigues, “Performance measures in English small and medium enterprises: survey results,” *Benchmarking An Int. J.*, vol. 13, no. 1/2, pp. 120–134, 2006. Doi: 10.1108/14635770610644628.