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Evaluation of Management of Cost Overrun in Selected Commercial Building Projects in Auchi, Edo State

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Abstract
Construction project is very essential in the economic development of any nation especially in an expanding economy like Nigeria. This paper explores an evaluation management of cost overrun in preferred commercial building developments in Auchi with a view to enhancing the effective delivery of projects. The study adopts mixed method research because survey and secondary data were used to collect data. A proforma was used to gather cost data on selected commercial building projects, since structured questionnaire was applied to harness information on the possible causes and mitigating measures of cost overrun. Out of 97 copies of questionnaires administered, 70 were completed, returned and found suitable for analysis. Paired sample t-test was applied to assess cost performance of building project, mean item score was engaged to analyse causes of cost overrun, and mitigating measures of cost overrun. The findings revealed that fluctuations in the cost of building materials and change in the scope of the project were the optimum causes of cost overrun. It further revealed that cost control and risk management during the project phase and timely availability of required finance were the top mitigating measures of cost overrun, the building projects in the study area experienced a fair cost performance of 90.1% and exposed to average time overrun of 9.90%. The study suggests among other aspects that projects sponsored must be financially committed to construction projects because without proper funding, projects will experience cost overrun and in some cases project abandonment.

Keywords: *Auchi, commercial building projects, cost overrun, management, measures.*

1.0 Introduction

Nigeria's building construction industry is essential for economic growth and employment but usually faces cost and time overruns (Baila, Raphael, Humphrey & Toure, 2023). Building sector provides to the socio-economic growth of any nation by improving the quality of life and providing infrastructures such as roads, hospitals, schools, and other basic facilities (Saidu & Shakantu, 2017). Hence, it is imperative that construction projects be completed within the scheduled time, within the budgeted cost, and meets the expected quality (Saidu & Shakantu, 2017). However, being a complex industry, it is faced with severe problems of cost overruns (Abdul-Rahman, Memon & Abd Karim, 2013; Love *et al*., 2016; Shoar, Chileshe & Edwards, 2022). According to Aljohani *et al* (2017) construction industry has an issue when it comes to cost overrun with a consistently poor history of finishing under budget. Cost overrun is a usual issue in both the developed and the developing nations, making it difficult to complete many projects within budget (Saidu & Shakantu, 2017). Overspending and dalays in project completion are widespread problems in the worldwide construction sector and Nigeria is the same (Ezekiel & Ejiofor, 2024). Being a regular issue, Allahaim & Liu (2012) posted that cost overruns were established across 20 nations and five continents. Cost overruns affect 90% of completed projects (Flyvbjerg, Holm & Buhl, 2004; Memon, 2013; Abdul-Rahman, Memon & Abd Karim, 2013; Love *et al*., 2016; Shoar, Chileshe, & Edwards, 2022). Although, the vast of developing countries experience overruns exceeding 100% of the initial budget (Memon, Abdul-Rahman, Zainun & Abd Karim, 2013). These overruns impact project goals, schedule, quality and productivity, possibly leading to bankruptcy (Alzizeiqi, Umar & Badr, 2020). Numerous sources of cost overrun are being identified such as shifts in the cost of building materials, further costs subject to modification work, increment of project costs and alteration in the scope of the project (Alzizeiqi *et al*., 2020).

Good management of construction cost is an essential task for the outstanding completion of a contract. Most of the time, it is difficult to achieve good cost management and the project experiences a very large amount of cost overruns (Ahady, Gupta, Malik, 2017). Effective cost planning relates the design of buildings to their cost so that while taking full consideration of quality, changes, risks, utility and appearance, the cost of a project is planned to be within the economic confines of the expenditure (Ahady, Gupta & Malik, 2017).

The management of project cost has been studied for a long time where most projects either fizzled or displayed cost overruns (Ahady, Gupta, Malik, 2017). Great cost management of project cost is an important undertaking for the effective finishing of a project. More often than not, it is hard to accomplish great cost management. Compelling cost planning relates the outline of structures to their cost so that while taking full thought of value, changes, risks, utility, and appearance, the cost of a project is wanted to be innards the monetary limit of the expenditure (Ahady, Gupta & Malik, 2017).

Because of shoddy cost management nowadays, the construction industry is confronted with cost overruns (Morena & Amoah 2021). This has shifted toward becoming a significant issue for the construction industry. Poor cost management is one of the biggest and most intense issues when it comes to project cost (Shibani & Arumugam, 2015). According to Mulenga (2014), to maintain a strategic distance from construction cost overruns, the first and most critical factor is to distinguish and comprehend the variables in charge of the overruns. Revamps during development as a consequence of design changes, mistakes, and oversight are the major contributors to cost overruns in projects. The cost overruns can mean a negative reputation for the design team and loss of client certainty. The repercussions for contractors are comparable as they see their net revenues shrivel (Love, Sing, Wang, Irani & Thwala 2014).

Multiple of investigations had been implemented on the management of cost overrun, for instance (Alzizeiqi *et al.*, 2020 Baila, *et al.*, 2023; Ikwueze & Nnadi, 2024). However, there exists a gap on strategies for managing cost overrun in the commercial building projects because commercial building projects are often prone to cost overruns subject to changes in design, material price fluctuations, governing approvals and contractor inefficiencies. Consequently, this study is directed at evaluating the management of cost overrun in preferred commercial building in Auchi, Edo state, with the aim of proffering solution in appropriate to enhance the delivery of construction projects.

2.0 Materials and Methods

This study intended to evaluate cost overrun of a selected commercial building construction projects in Auchi, Edo State. Auchi was choosing because Auchi is the one of the major urban centres in Edo State and has experienced significant growth in commercial and infrastructural development. This makes it a relevant case study for cost overruns in construction. Commercial building construction projects was choosing due to frequent cost overruns, commercial building projects are often prone to cost overruns subject to alterations in design, material price fluctuations, regulatory approvals and contractor inefficiencies. The study adopts mixed method research because questionnaire and existing data were utilised for data collection. The population for the study were commercial building projects carried out from 2015 to 2023 in Auchi. This time was considered based on realistic time frame and effort that can be afforded. Ten selected projects were used after a thorough preliminary investigation which reveals that archival information was readily available. The respondents for the questionnaire part were the construction professionals and contractors that were involved in these selected projects. The findings from pilot survey showed the number of construction professionals and contractors (Architects, Quantity Surveyors, Engineers and Builders) that were engaged in the projects to be ninety-seven (97). This research makes use of purposive sampling in the selection of the commercial building projects. This approach was embraced since commercial building projects were selected based on the availability of adequate information. The set of questions was split into two sections; the preliminary section of the questionnaire emphasised on the general information of the respondents while the other section focused on matters relating to the research objectives. Questions inherent in the structured questionnaire were multiple-choice type with different checkboxes and tables posed on a 5-point likert-type scale for ease and uniformity of response. Out of ninety-seven (97) questionnaires administered to construction professionals, seventy (70) questionnaires were returned and considered suitable for analysis which represented a healthy return rate of seventy two percent (72%). The data collected was analysed applying percentiles, paired-sample t-test and mean item score. The general information of the respondents was analysed using percentiles, paired sample t-test was employed to test the significant difference between the earliest and the ultimate estimated cost since mean item score was applied to analyse identified causes of cost overrun and identified mitigating measures of cost overrun. Tabachnick and Fidell (2001) indicated that effect size also known as strength of association is a set of statistics which suggests the relative magnitude of the differences between means. That is it describes the amount of the total variance in the dependent variable that is predictable from the independent variable. There are various effect size statistics; the most common one is eta-squared. This study employed the eta-squared. For a paired t-test, eta-squared is calculated using the following formula:

$$n^2 = \frac{t^2}{t^2 + N - 1}$$

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Mean Item Score (MIS)

Mean item score was applied to rank the causes of cost overrun. The premise of decision for the ranking is that the causes with the maximum mean item score is ranked 1st and others in such subsequent descending order.

The formula for mean score is = $\frac{\sum (FX)}{N}$

Then, X is the grading used per column
F is the sample size for each grading and
N is the entire sample size.

Since a Likert of 5-point scale was employed for the collection of data, the formula can thus be written as:

Mean Score = $\frac{5F_5 + 4F_4 + 3F_3 + 2F_2 + F_1}{N}$

Cronbach's reliability test was applied to check the reliability of the questionnaires. Creswell (2013) noted that for all the items of an instrument to be internally consistent and reliable, the result of the reliability test should produce a minimum Cronbach's Alpha of 0.7. In this study, all the items of the three variables were subjected to the reliability test. The results according to Creswell (2013) suggested that all the items are good and consistent internally because the Cronbach's Alpha coefficient for the items were 0.7 and above. The results are displayed in Table 1 below.

Table 1: Test of reliability for measuring scale

Scale of Measure	Cronbach α– Value
Identified causes of cost overrun of commercial building projects	0.843
Cost Performance of commercial building projects	0.895
Mitigating measures of cost overrun of commercial building projects	0.916

Source: Analysis of Field Data (2024)

3.0 Results and Discussion

Table 2: Summary of general information of the participants

Category	Classification	Frequency	Percent
Profession of Respondent	Quantity surveyor	15	21.43
	Architect	7	10.00
	Builder	17	24.29
	Engineer	30	42.86
	Others specify	1	1.43
	Total	**70**	**100.00**
Professional Body of Affiliation	NIA	6	8.57
	NIQS	14	20.00
	NIOB	16	22.86
	NSE/COREN	27	38.57
	Others	7	10.00
	Total	**70**	**100.00**
Professional Membership Type	Graduate/Probationer	10	14.29
	Corporate	57	81.43
	Fellow	3	4.29
Total		**70**	**100.00**
		Frequency	**Percent**
Maximum Academic	HND	10	14.29
	B.sc/B.Tech	32	45.71

Category	Classification	Frequency	Percent
Qualification of Respondent	PGD	7	10.00
	M.sc/M.Tech/M.Eng	19	27.14
	Phd	2	2.86
	Total	**70**	**100.00**
Years of working Experience	1-5 years	8	11.43
	6-10 years	25	35.71
	11-15 years	20	28.57
	16-20 years	8	11.43
	Over 20 years	9	12.86
	Total	**70**	**100.00**

Source: Analysis of Field Data (2024)

Table 2 displays that majority of the respondents 42.86% participated in survey were Engineers, followed by Builders with 24.29%, Quantity Surveyors were 21.43 and Architects were 10.00% of the respondents respectively. While others were 4% of the respondents. Table 2 shows all the respondents were affiliated to relevant professional bodies in their respective professions, out of which 4.29% of them have attained fellow, 81.43% of them have attained corporate membership grade while 14.29% of the respondents were graduate/probationer members of their respective bodies. It depicts that they are able to provide vital information on the objectives of this research. Table 2 also reveals that 45.71%, 27.14% and 10.00% of the respondents had B.Sc/B.Tech, M.Sc/M.Tech and PGD degrees respectively. About 14.29% were HND holders, while 2.86% have PhD. Table 2 also revealed that the respondents possessed a good number of years of experience. Therefore, the respondents are considered adequate and reliable for this research.

Table 3: Identified causes of cost overrun of commercial buildings in Auchi, Edo State

Identified Factors	Mean Score	Ranking
Fluctuations in the cost of building materials	4.43	1
Additional costs due to variations work	4.40	2
Errors during construction process resulting reworks	4.24	3
Inflation of project costs	3.96	4
Change in the scope of the project	3.93	5
Omissions and errors in the bills of quantities	3.89	6
Incorrect or poor miscalculation of actual cost	3.80	7
Additional works	3.69	8
Unexpected site conditions	3.58	9
Insufficient skilled contractors	3.57	10
Wrong method of estimation	3.50	11
Deficient contract management practices	3.39	12
Payment issues faced by contractor	3.37	13
Contractual claims	3.36	14
Inconsistent cash flows	3.34	15
Force majeure	3.25	16
Unsuitable construction equipment's and methods	2.92	17

Source: Analysis of Field Data (2024)

Table 3 showed the respondents assessment of the identified causes of cost overrun. Fluctuations in the cost of building materials ranked 1st with an average score of 4.43, additional costs due to variations work ranked 2nd with a average score of 4.40, errors during construction process resulting reworks with a mean score of 4.24 ranked 3rd, inflation of project costs ranked 4th with an average score of 3.96 and change in the scope of the project ranked 5th with an average score of 3.93 and while the least ranking factors were inconsistent cash flows, force majeure and unsuitable construction equipment's and methods with an average scores of 3.34, 3.25 and 2.92 respectively. The finding of this study is in consonance with findings of Abdulaziz and Al-Juwairah (2002) who discovered that shift in the prices of materials has susbtantial effect on the cost of construction. Omoregie and Radford (2006) came to the same conclusion after they study the contributory factors for project set back and construction cost escalation in Nigeria. This is also in line with the findings of Oladipo *et al.* (2015) who stressed that cost of materials and extra works, shift in the prices of materials were the most pivotal factors influencing cost of project in Nigeria. Alade *et al.* (2016) concluded that deficient management of site and supervision, contractor inexperience and client's financial difficulties

are the most causes of cost overruns in Akure. This is in line with Love *et al.* (2016); Durdyer, Omarov and Ismail (2017); Ikwueze and Nnadi (2024) who argued that shortage of materials on site, shortage of skilled labour, complexity of project, late payment by the owner for the completed work and deficient management of site are the main causes of project cost overruns. This outcome substantiates the findings of Fugar and Agyyakwah-Baah (2010) that ranked the aforementioned factors as one of the most influencing causes of construction project cost overrun in Ghana. The most serious factors contribute to cost overrun was incorrect or miscalculation of true cost. Cost is among the major consideration throughout the project management life cycle and can be referred to as one of the most essential parameters of a project and the driving force of project success (Ali & Kamaruzzaman, 2010; Alzizeiqi, Umar & Badr, 2020; Baila *et al*., 2023; Ikwueze & Nnadi, 2024).

Table 4: Cost performance of commercial building projects in Auchi, Edo State

Project Type	Final Contract sum (₦)	Initial Contract Sum(₦)	Deviation	Percent (%)
Warehouse 1	15,250,000.00	15,000,000.00	250,000.00	1.67
Warehouse 2	49,875,000.00	45,500,000.00	4,375,000.00	9.62
Hotel 1	29,980,000.00	22,000,000.00	7,980,000.00	36.27
Hotel 2	110,005,000.00	100,000,000.00	10,005,000.00	10.01
Eatery 1	4,980,000.00	5,000,000.00	-20,000.00	-04.00
Eatery 2	12,500,000.00	12,000,000.00	500,000.00	4.17
Eatery 3	9,875,000.00	9,875,000.00	0	0.00
Shopping 1	12,000,000.00	10, 150,000.00	1,850,000.00	18.23
Shopping 2	7,950,000.00	7,000,000.00	950,000.00	13.57
Shopping 3	17,200,000.00	16,253,000.00	947,000.00	5.83
Total	**269,615,000.00**	**242,778,000.00**	**26,837,000.00**	**98.97**
Mean	**26,961,500.00**	**24,277,800.00**	**2,683,700.00**	**9.90**

Source: Analysis of Field Data, 2024

It can be observed from the analysis in Table 4 that out of the 10 commercial building projects assessed, 2 were completed within budget, where 8 projects experienced cost overrun ranging from 1.67% to 36.27%. On the average, there is an increase of estimated 9.90% on all commercial projects assessed which is above the range of acceptable deviation of final cost from initial cost estimate of 2% to 3% as proposed by the National Institute of Building Science (2013). This infers that most commercial building developments in the research area were not concluded within the estimated budget thus have cost overruns. This authenticates Olawale and Sun's perspective that cost overruns in construction projects are not abnormal all over the world (Olawale & Sun, 2010). And it is indeed a serious issue in the Nigerian built environment. It is also agreeing with the findings of Flyvberg, Holm and Buhl (2003); Shoar *et al.* (2022) that 9 out of 10 projects face cost overrun. When compared to the findings of Omoregie and Radford (2006) which confirmed that the minimum average percentage escalation cost of public projects in Nigeria was 14%. The study also buttressed the findings of Lekan, Dosunmu and Opeyemi (2017) that on Nigerian construction site, cost overrun of 0-20% cost increase was recorded on the site. This is also in line with Aftab, Ismail and Ade (2012) who asserted that construction works in Southern and Central regions of Penisular Malaysia experiences average cost overrun between 5-10% of contract price. In Nigeria, cost and time overruns was 38.25% in building projects (Love *et al*., 2016).

Table 5: Paired sample t-test for cost performance of commercial building Projects in Auchi, Edo State

	Paired Differences							
				95% Confidence level of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1 Final Contract Sum –Initial Contract sum	2683700.000	3596808.803	1137410.812	110697.983	5256702.01	2.359	9	.043

Source: Analysis of Field Data (2024)

Table 5 explains the result of a paired sample t-test conducted to assess the significant difference in the initial and final cost of the identified building projects. Result shows an average mean of 2683700.000 with t-value of 2.359 and sig. p-value of 0.43 at a 95% confidence level, since this P-value is less than 0.05; it therefore means that there is a notable difference between the final construction cost and the initially

estimated cost. The eta squared which represents the proportion of variance of the dependent variable (final cost of construction) that is explained by the independent variable (initial estimated cost) was further calculated as 0.38. This indicated a large effect size as it is above the 0.14 suggested for a large effect (Cohen, 1988). This means that a larger portion of variance of the final cost of construction of commercial building projects is predictable from the knowledge of the initial estimated cost.

Table 6: Identified management remedies to mitigate cost overrun of Commercial building Projects in Auchi, Edo State

Identified Measures	Mean Score	Ranking
Cost management and risk control during the project phase	4.15	1
Having adequate resources to deal with the difficulties	4.00	2
Retain competent labour	3.89	3
Evaluation of work carried out	3.83	4
Choose experienced subcontractor with good reputation	3.76	5
Prompt availability of required finance	3.71	6
Efficient communication among the stakeholders	3.69	7
Schedule rental equipment in an efficient manner as to prevent squandering cost	3.56	8
Trustworthy Contractor	3.54	9
Inspection of works	3.44	10
Making use of expertise subcontractors and suppliers	3.25	11
Progress payment of subcontractor/suppliers must be made on time	3.16	12
Frequent progress meetings	3.03	13
Having enough number of labour	3.00	14
Proper motivation and safety system	2.86	15

Source: Analysis of Field Data (2024)

Table 6 showed the mitigating measures of cost overrun of commercial building projects. Cost control and risk management during the project phase ranked 1st with an average score of 4.15, having enough resources to tackle the complexity ranked 2nd with an average score of 4.00, hire competent labour ranked 3rd with an average score of 3.89, evaluation of work carried out ranked 4th with an average score of 3.83. The least ranking mitigating measures were inspection of works, use of experienced sub-contractors and suppliers and progress payment of sub-contractor/suppliers must be made on time with a mean score of 3.25, 3.16 and 3.03 respectively. This study is aligned with the findings of Oladipo *et al*. (2015); Baila *et al*. (2020); Ikwueze *et al.* (2024) who confirmed that adequate site supervision, hiring experienced contractor and labour are the most effective ways of mitigating the cost escalation of construction projects. Ali and Kamaruzzaman (2010) discovered that the most important method of control construction cost is proper project costing and financing. According to Seidu *et al.* (2020) cost management must be utilised when dealing with project cost control as to be able to manage all necessary cost connected with the project to amend the effect of cost overruns.

4.0 Conclusion

This study explores an evaluation of management of cost overrun with a view to enhancing the prompt delivery of commercial building projects, using 10 selected commercial building projects completed in Auchi City. After a careful literature review, several causes and mitigating measures of time overrun were identified and ranked by the study sample. Furthermore, evaluation of ten completed commercial building projects was implemented to decide the degree of cost performance of each building project. From the result, the following conclusions emerge. Building projects in the study area experienced a good cost performance of 90.1% but exposed to an average cost overrun of 9.90%. Also, there is significant difference between the initial estimated cost and completion cost of the projects executed. Delays in delivery projects on budget have become serious for both parties involved. The impact of project cost overruns includes construction cost which is out of control and add to investment pressure, investment decision making, wastage of national finance might result in corruption or offence. Regarding the factors that cause cost overrun of commercial building projects, it was discovered that the major causes are fluctuations in the cost of building materials, additional costs due to variation work, inflation of project costs and change in the scope of the project. Also, cost control and risk management during the project phase, having enough resources to deal with the complexity and timely availability of required finance are the most significant measures to lessen the impact of cost overrun of commercial building developments in Auchi.

Considering the discussion, findings, implications, and the conclusions, the following recommendations are hereby coined. Full attention ought to be given to projects from beginning to completion, adequate and effective consultancy services for clients, as well as strict follow up of programme of study will help construction firms to reduce the high incidence of delays in the achievement of projects and thereby increase efficiency in the use of resources. Projects sponsored must be financially committed to construction projects because without proper funding, projects will experience cost overrun and in some cases project abandonment. Ensure that the scope includes all the work required and only the work required to complete the project successfully and much attention should be placed on the major factors influencing cost of commercial building projects as to minimise the cost of construction, improving the construction performance and generate a great confidence within the built environment. This study bridge knowledge gaps by focusing on Auchi and commercial building projects, thus provide empirical data to inform better project planning, project production management and financial control in the construction sector.

References

Abdul-Azis, A. A., Memon, A. H., Addul Rahman, I. S., & Abd Karim, A. T. (2013). Controlling cost overrun factors in construction projects in Malaysia. *Research Journal of Applied Sciences, Engineering and Technology,* 5(8), 2621-2629.

Abdulaziz, A. & Al-Juwairah, A. (2002). Factors contributing to construction costs in Saudi Arabia. *Cost Engineering Morganto, West Virginia,* 44(5), 30-34.

Afshari, H., Khosraui, S, Ghorbanali, A, Borzabadi, M. & Valipour, M. (2010). Identification of Causes of Non-Excusable Delays of construction project. *International Conference on E-Business Management and Economics,* 28-38, 42-46.

Aftab, H. M., Ismail, A. R., & Ade, A. A. (2012). Time and cost performance in Construction projects in Southern and central region of Penisular Malaysia. *International Journal of Advances in Applied Sciences*, 1(1), 45-52.

Ahady, S., Gupta, S., & Malik, R. (2017). A critical overview of the causes of cost overrun in construction industries in developing Countries. *International Research Journal of Engineering and Technology,* 4(3), 2250-2558.

Ahmed, S.M.; Azhar, S.; Kappagntula, P.; and Gollapudil, D. (2017). Delays in construction: a brief study of the Florida construction industry. Paper presented at the *Proceedings of the 39th Annual ASC Conference.* Clemson University, Clemson, SC, 257-266.

Alade, K.T., Lawal, A.F., Omonori, A. A., & Olowokere, E. N. (2016). Causes and effects of delays in construction projects in Akure, Ondo State, Nigeria. *FUTA Journal of Management and Technology Maiden Edition,* 29-38.

Albtoush, A.M.F.; and Doh, S.I. (2019). A Review on causes of cost overrun in the construction projects. *International Journal of New Innovations in Engineering and Technology*, 12(3), 15-22.

Ali, A. S. & Kamaruzzaman, S. N. (2010). Cost performance for building construction projects in Klang Valley. *Journal of Building Performance*, 1 (1), 110-118.

Aljohani, A. (2017). Construction projects cost overrun: What does the literature tell us? *International Journal of Innovation, Management and Technology*, 137-143.

Allahaim, F. S. & Liu, L. (2012). Toward a typology: Cost overrun causes framework in infrastructure projects. *Paper presented at the 37th annual conference of Australasian*, 4-6 July, University of Technology, Sdyney, 1-15.

Ameh, O.J., Soyingbe, A. A., & Odusami, K. T. (2010). Significant factors causing cost overruns in Tele communication projects in Nigeria. *Journal of Construction in Developing Countries,* 15

Angelo, W. J., & Reina, P. (2002). Megaprojects need more study up front to avoid cost overruns. Retrievedon:*http//flyvberg.plan.aau.dk/news%20%English/ENR%20Costlies%20150702.pdf*

Alzizeiqi, R. K., Umar, A. A., & Badr, A. (2020). Major causes assessment of construction of construction delays. *Journal of Engineering, Project and Production Management*, 10 (3), 179-186.

Assaf, S.A. & Al-Heji, S. (2006). Causes of Delay in Large Construction Projects. *International Journal of Project Management*, 24(4), 349-357.

Azhar, N.; Farooqui, R.U.; and Ahmed, S.M. (2008). Cost overrun factors in construction industry of Pakistan. *First International Conference on Construction in Developing Countries (ICCIDC–I), Advancing and Integrating Construction Education, Research & Practice.* Karachi,, Pakistan, 499-508.

Baila, M., Rapael, N. M., Humphrey, D., & Toure, A.(2023). Assessment of the factors contributing to cost and time overrun in building construction project. A case study of Mauritania. *International Journal of Innovative Science and Research Technology*, 8 (11), 978-993.

Baloi, D.; and Price, A.D. (2009). Modelling global risk factors affecting construction cost performance. *International Journal of Project Management*, 21(4), 261-269.

Chimwaso, D.K. (2000). An evaluation of cost performance of public projects: Case of Botswana, *proceedings of the 2nd International Conference of the CIB*, http://buildnet.csir.co.za/cdcproc/docs.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences*. Hillsdale, NJ: Erlbaum

Creswell, J.W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches.* USA: Sag.

Doloi, A. (2011): "*The rising cost of building construction". Shelter for Nigerians*, NIA Publication, May Edition, pp. 18 – 19.

Durdyer, S., Omarov, M. & Ismail, S. (2017). Causes of delay in residential construction projects in Cambodia. *Cogent Engineering*, 4(1), 1-12.

Endut, I. R., Akintoye, A. & Kelly, J. (2009). Cost and time overruns of projects in Malaysia. Available on: *http://www.irbnet.de/daten/iconda/CIBI0633.pdf 243-252*

Endut, I.R. (2015). *Framework for minimising time overruns of Malaysian construction projects*. Glasgow Caledonian University, UK: Ph. D Thesis.

Flyvberg, M. K. S., Holm, & Buhl, (2003). How common and how large are cost overruns in transport infrastructure projects. *Transport Reviews*, 23, 71-88.

Frimpong, Y., Oluwoye, J. & Crawford, L. (2003). Causes of delay and cost overruns in construction of ground water projects in a developing countries; Ghana as a case study. *International Journal of Project Management*, 21, 321-326.

Fugar, F.D.K & Agyyakwah-Baah, A. B. (2010). Delays in building construction projects in Ghana. Australasian *Journal of Construction Economics and Building*, 10, 103-116, Doi:10.5130/AJCEB.V10i1-2.1592.

Gido, J. & Clements, J. P. (2003). *Successful project management*. New york: South-Western

Hussin, J.M., Abdul-Rahman, I.A. & Memon, A.H., (2013). The way forward in sustainable construction: issues and challenges. *international Journal of Advances in Applied science*, 2 (1), 31-42.

Ikwueze, S. N. & Nnadi, E. E. (2024). Impact of project management practices on cost and time overruns in construction projects in Nigeria. *New port International Journal of Scientific and Experimental Sciences*, 5 (2), 26-34.

Itsiao, L-H. & Lin, Y.C. (2003). Development of Construction Collaboration-based knowledge management systems. *Journals of Strategic information systems*, Elsevier.

Kissi, E.; Adjei-Kumi, T.; and Badu, E. (2016). Critical barriers to the practice of effective cost planning in the Ghanaian construction industry. *Journal of Construction Engineering and Project Management,* 6(2), 8-15.

Koushki, P. A., Al-Rashid, K. & Kartam, N. (2005). Delays and cost increases in the construction of private residential projects in Kuwait. *Construction Management and Economics*, 23, 285-294.

Lekan, A., Dosunmu, D., & Opeyemi, J. (2017). Cost and time performance information of building projects in developing economy. *International Journal of Mechanical Engineering and Technology*, 8(10), 918-927.

Love, P. E., Tse, R. Y. C. & Edwards, D. J. (2005). Time-cost relationship in Austrialian building construction projects. *Journal of Construction Engineering and Management,* 13(2), 187-194.

Love, P. E. D., Ahiaga-Dagbui, D. D., & Irani, Z. (2016). Cost overrun in transportation infrastructure projects: Sowing the seeds for a probabilistic theory of causation. *Transportation Research : Policy and Practice*, 92, 184-194.

Memon, A.H.; Rahman, I.A.; Aziz, A.A.; Ravish, K.V.; and Hamas, N.M. (2011). Identifying construction resource factors affecting construction cost: Case of johor. *Paper presented at the Malaysian Technical Universities International Conference on Engineering & Technology* (MUiCET 2011). Johor, Malaysia, 1-7.

Oladipo, F.O., Fatuki, A. M., & Aluko, A.T. (2015). An assessment of major factors affecting construction project cost in Nigeria. *International Journal of Sciences, Basic and Applied Research*, 24 (4), 308-318.

Olawale, Y., & Sun, M. (2010). Cost and time control of construction projects: Inhibiting factors and mitigating measures in practice. *Construction Management and Economics*, 28(5), 509-526.

Peeters, W. & Madauss, B. (2008). A proposed strategy against cost overruns in the space sector: The 5C approach. *Space Policy*, 24, 80-89.

Pourrostam, T.; and Ismail, A. (2011). Significant factors causing and effects of delay in Iranian construction projects. *Australian Journal of Basic and Applied Sciences*, 5(7), 450-456.

Saidu, I.; and Shakantu, W. (2017). An investigation into cost overruns for on-going building projects in Abuja, Nigeria. *Acta Structilia*, 24(1), 53-72.

Seidu, R. D., Young, B.E., Robinson, H., & Ryan, M. (2020). The impact of infrastructure investment on economic growth in the United Kingdom. *Journal of Infrastructure, Policy and Development,* 4(2), 217-227. Dio:10.24294/jipd.v412.1206.

Shoar, S., Chileshe, N., & Edwards, J. D. (2022). Machine learning aided engineering services cost overruns prediction in high rise residential building projects: Application of random forest regression. *Journal of Building Engineering*, 50, 104102, doi:10.1016/JJOBE.2022.104102.

Sriprasert, E. (2000). Assessment of cost control system: A case study of Thai construction organisations. *Asian Institute of Technology, Bangkok*.

Tabachnick, B. G. & Fidell, L. S. (2001). *Using multivariate statistics* (4th edn). New York: Harper Collins.

Torp, O.; Belay, A.M.; Thodesen, C.; and Klakegg, O.J. (2016). Cost development over-time at construction planning phase: Empirical evidence from Norwegian construction projects. *Procedia Engineering*, 145, 1177-1184.

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