Analysis of Risk Triggers in Public Tertiary Education Building Projects

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Key words: Construction, education building, Nigeria, performance, projects, risk factors.

SUMMARY

Risks are inherent in the construction of building projects which in turn affect the performance. However, with the increased cost and time overruns in tertiary education building projects occasioned by the risks, this paper assessed risk triggers in these projects. Questionnaire surveys were administered to consultants, contractors, and client representatives across five public tertiary education institutions in Ondo State, Nigeria, to elicit information from the respondents. Of 452 questionnaires administered to the respondents, 279 were retrieved and analyzed, representing a 62% return rate. Arising from the findings, the top three factors triggering risks in tertiary education building projects are financial constraints, location of the project, and project type. Besides, the respondents had convergent views on seven factors except for the complexity of the projects, project duration, economic requirements, and building use. Despite these, the results imply that the occurrence of risks in tertiary education building projects is a function of risk triggers. However, using principal component analysis of factor analysis, the study clustered eleven factors into four comprising project technical, project requirements, project characteristics, and project value. The client's adequate provision of funds for the projects and removal of administrative bottlenecks in releasing funds to the contractor could help minimize risk factors and enhance the performance of tertiary education building projects.

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1. INTRODUCTION

The importance of the university education system must be balanced because it is very strategic in the education arm of the country, being the apex of the tertiary education system (Onyeike & Eseyin, 2014). The classification of these buildings can be residential, education, institutional, assembly, business, mercantile, industrial, and storage buildings, depending upon the character of occupancy or the type of use. The education building design is for various activities, including living areas for students like dormitories, being an integral part of the student's formal education; the design and construction aim to enhance the potential of each student while also boosting the learning process. According to Rahman *et al.* (2019), tertiary education building projects are building projects initiated and undertaken within tertiary institutions such that teaching and learning can occur in a conducive environment. Due to the importance of facilities in tertiary education administration, the quantity and quality of projects should be such that they can contribute to the management of the education system (Onyeike & Eseyin, 2014). Reports from the universities indicated that available facilities such as Classrooms, Laboratories, Workshops, Libraries, Office Spaces, and Common Rooms need improvement for teachers and students. Therefore, adding value to teaching, learning, research, and community is the essence of any project in the university environment. While construction projects are predisposed to various risk factors (Ayegba *et al.*, 2014), these risks are inherent in both the design and construction, with corresponding effects on project objectives (Adafin *et al.*, 2016). Besides, the construction industry has a high-risk tendency (Adedokun & Agboola, 2018), and there is little research on tertiary education building projects (TEBP). Therefore, assessing risk triggers in public tertiary education building projects is imperative to reduce the likelihood of risk factors in these projects.

2. LITERATURE REVIEW

Risks have received extensive attention in the literature, being variables that are perceived to impact project objectives regarding cost, time, and quality performance (Adedokun *et al.*, 2019; Opawole & Kajimo-Shakantu, 2021). These construction projects comprise commercial, residential, and hospital building projects. Evidence from empirical studies indicates that initial contract sums usually exceed final accounts when completing tasks (Adafin *et al.*, 2016; Howell, 2014). The differential in costs between the initial contract sum and the final account is without any exemption to TEBP. For example, the variability between tender sum and final account is higher in education projects than in residential projects (Adafin *et al.*, 2016; Odeyinka *et al.*, 2010). However, the observable cost variability in construction projects is due to the inherent risk factors connected with the design and construction. While every construction work is risky for all parties, risk management is indispensable in dealing with potential exposure and vulnerabilities (Adedokun & Agboola, 2018). Therefore, risk management is described as a systematic way of looking at risk areas and consciously deciding on handling them (Zou *et al.*, 2007). However, risk cannot be avoided but must be recognized, assessed, and managed to reduce uncertainty and improve decision-making (Tipili & Ilyasu, 2014). To date, construction risk management has yet to produce the required results because of gut feeling or a series of rule-of-thumb (Tipili & Ilyasu, 2014). Arising from the preceding, the corresponding effect of ineffective risk management on construction projects is non-performance, as evident in projects falling below the success expectancy level (Opawole & Kajimo-Shakantu, 2021). Several responsive factors predispose construction projects to risks (figure 1). For instance, Adedokun and Agboola (2018) explained a project's complexity, location, terms of payment, and size of the project. In the same vein, Othman (2008); (Rezakhani, 2012) adduced the risky nature of the industry to the complex and time-consuming process of design and construction and the significant effort to coordinate people from different organizations' skills and interests and coordination of many related and non-related operations. Understanding the construction project's constraints at the outset could improve performance (Lau & Kong, 2019).

Table 1: Review of risk triggers in construction projects

Factors	**Reference Sources**
Location of the project	(Adedokun & Agboola, 2018; Akanni *et al.*, 2015; Aydogan & Koksal, 2013; Ayegba *et al.*, 2014; Bing & Tiong, 1999; Uher & Loosemore, 2004)
Financial constraints	(Abdul-Rahman *et al.*, 2011; Abdul Rahman *et al.*, 2013; Beck *et al.*, 2005; Lau & Kong, 2019; Musso & Schiavo, 2007)
Materials used	(Babu, 2015; Kuebutornye *et al.*, 2018; Nwachukwu & Emoh, 2011)
Complexity of the projects	(Adedokun & Agboola, 2018; Ayegba *et al.*, 2014; Ishtiaq & Jahanzaib, 2017; Kim & Wilemon, 2003; Lebcir & Choudrie, 2011; Luo *et al.*, 2016; Maylor *et al.*, 2008; Wood & Ashton, 2010)
Methods of construction	(Adeleke *et al.*, 2019; Ayegba *et al.*, 2014; Ehsan *et al.*, 2010; Obalola, 2017)
Project duration	(Adeleke *et al.*, 2019; Bing & Tiong, 1999; Ehsan *et al.*, 2010; Obalola, 2017)
Economic requirements	(Adedokun *et al.*, 2019; Adeleke *et al.*, 2019; Lester, 2006; Obalola, 2017)
Special and legal conditions	(Adeleke *et al.*, 2019; Jaafari, 2001; Obalola, 2017)
Contract type	(Bing & Tiong, 1999; Håkansson *et al.*, 2007; Osipova, 2008)
Use of the building	(Adedokun *et al.*, 2019; Ayegba *et al.*, 2014)
Contract value	(Adedokun *et al.*, 2019; Bing & Tiong, 1999)

3. RESEARCH METHOD

The study adopted a quantitative approach to ensure objectivity and generalizations of the findings. The structured questionnaires were used for the data collection (Adebisi *et al.*, 2020; Adedokun *et al.*, 2021b; Creswell, 2014) to ensure a consistent response basis while aiding coding prior to data analysis (Moser & Kalton, 2017). The literature review identifies the various risk factors predisposing TEBP to risks. The review outcome generated eleven factors presented on the instrument using a 5-point Likert scale, where five is very high, and one represents very low. The ease and uniformity of response formed the basis for adopting the Likert scale. The study included clients' representatives, contractors, and consultants collating from projects' records (files) belonging to each institution's physical planning unit. These participants were involved in the execution of TEBP. The study covers five public tertiary institutions in Ondo State, Nigeria. The participants were stakeholders who worked on completed building projects via the traditional procurement route. While the study population is 495 (Table 2), to ensure equal representation among the respondents, contractors and consultants that handled more than one project within each tertiary institution were identified, and the excess was deducted accordingly from the population to get the numbers in Table 3. After that, the study adopted a census method because the sampling frame (452) was manageable (Moser & Kalton, 2017). So, the researcher administered four hundred fifty-two (452) questionnaires to the respondents. The study transformed the rating of questionnaire variables into decision-making information using Statistical Package for Social Sciences (SPSS) version 24. The study used SPSS software for descriptive and inferential statistics like percentile, mean, Cronbach Alpha test, standard deviation, Kruskal Wallis test, and factor analysis for data reduction.

Table 2: Alpha value for reliability analysis of the constructs

Scale of measure	**Cronbach ∝-value**	**No of items**
Risk triggers in tertiary education building projects	0.763	11

Table 2 shows the reliability analysis of the construct advanced at the outset of this study. The construct, risk triggers in tertiary education building projects, has a Cronbach alpha value of 0.763 (11 items). This alpha value is more significant than the 0.7 thresholds; therefore, based on Sushil and Verma (2010), the collected data is acceptable, while the instrument used is significantly reliable and valid.

4. BACKGROUND INFORMATION OF THE RESPONDENTS

Out of 452 questionnaires administered to the respondents, 279 retrieved represented 62% of the total questionnaire administered and analyzed. The percentage was sufficient for this study based on Moser and Kalton (2017) assertion that the survey result could be biased and of little significance if the return rate were lower than 20 – 30%. The higher response rate than usual could be because the tertiary education building projects were publicly funded, thereby making these stakeholders involved accountable for issues arising from the projects. According to Table 3, the analysis shows that in terms of respondents' organizations, 41% and 34% were from consulting and contracting firms, respectively, while the least respondents, amounting to 25%, were from the clients' organizations. Regarding their professions, 34% of the respondents were Quantity Surveyors, 15% were Architects, and Builders accounted 17%. In addition, the Engineers comprising Structural/Civil and Electrical Engineers were 18% and 10%, respectively, while the Mechanical Engineers were 5%. In all, the respondents had an average of 13 years of working experience, making their information adequate and reliable for drawing inferences.

Table 3: Background information of the respondents

Category	Classification	Frequency	Percent
Type of Organization	Client organization	69	24.74
	Contracting firm	96	34.40
	Consulting firms	114	40.86
	Total	**279**	**100.00**
Profession of Respondents	Quantity Surveying	96	34.41
	Architecture	42	15.05
	Building	48	17.20
	Structural/Civil Engineering	51	18.28
	Electrical Engineering	27	9.68
	Mechanical Engineering	15	5.38
	Total	**279**	**100.00**
Years of Working Experience	0 – 5	42	15.05
	6 – 10	69	24.74
	11 – 15	63	22.58
	16 – 20	63	22.58
	Above 21	42	15.05
	Total	**279**	**100.00**
	Mean	**13.04**	

5. FINDINGS AND DISCUSSION

Table 4 shows the overall factors that predisposed tertiary educational building projects to risks, with the top three being financial constraints (MS = 4.02), location of the project (M.S = 3.96), and project type (M.S = 3.91). The least of the factors are economic requirements, special and legal conditions, and the building, with the corresponding mean values of 3.61, 3.44, and 3.34, respectively. Using the type of organization as the basis for testing the convergence or divergence in the respondents' opinions, it is evident from the Kruskal Wallis Test that the respondents had convergent views on seven factors out of 11 factors presented. The complexity of the projects (nature of design), project duration (time limit), economic requirements, and building use are four factors that the respondents had divergent views upon in triggering risks in tertiary educational building projects. The implication is that there are significant differences in the respondents' opinions (p-value < 0.05) about the four listed factors from consulting, contracting, and client organization firms. All eleven factors recorded high mean scores, with the least being 3.34; therefore, the factors are essential risk triggers in tertiary educational building projects.

Table 4: Risk triggers in tertiary education building projects

Factors	Overall			
	Mean	**Std. Deviation**	**Rank**	**Asymp. Sig.**
Financial constraints	4.02	0.881	1	0.530
Location of project	3.96	0.974	2	0.220
Project type	3.91	1.035	3	0.720
Complexity of the projects (nature of design)	3.90	0.968	4	0.021*
Materials used	3.83	1.024	5	0.606
Contract value	3.75	0.913	6	0.211
Methods of construction	3.75	1.014	7	0.628
Project duration (time limit)	3.71	1.124	8	0.010**
Economic requirements	3.61	0.997	9	0.000**
Special and legal conditions	3.44	1.023	10	0.292
Use of the building	3.34	1.104	11	0.005*

Test Statistics: a) Mean Item Score, b) Kruskal Wallis Test (Grouping Variable – Type of organization). ** significant at the 0.01 level, * significant at the 0.05 level.

Financial constraints, location of the project, and project type are the top three factors that trigger risks out of eleven presented in the literature. This finding agrees with Ayegba *et al.* (2014); (Bing & Tiong, 1999). Further, the project's location corroborates Kishan *et al.* (2014) that the complex and dynamic environment was responsible for the project's uncertainty and risk exposures. However, the least reported factors are economic requirements, special and legal conditions, and building use. The three significant factors predisposing tertiary education building projects to risk factors include project duration, economic requirements, and building use.

The structural validity of the estimated scale employed was undertaken using Kaiser-Meyer-Olkin (KMO) and Bartlett test analysis, as evidenced in Table 5. The analysis outcome gave a KMO value of 0.650, while the Bartlett test of sphericity is significant at 0.000. This outcome suggests that the scale used is legitimate for what it was intended to evaluate, as the ideal reach for a KMO is 0.500 or more and a p-value of under 0.05 for the Bartlett test (Field, 2005). Further, the Bartlett test outcome implies that the original matrix is not an identity matrix. There are some relationships between the variables included in the analysis.

Table 6 shows the total variance the eleven (11) factors explain. The four (4) components explained 68.474% variability, which has considerably reduced the complexity of the data set with only about 31.526% loss of information by the remaining components. The rotation of sums of squared loadings reveals a percentage of variance accounted for by the components listed in a uniformly distributed manner of 21.285%, 19.720%, 14.506%, and 12.963% when compared with the figures under initial eigenvalues. Table 7 shows the Rotated Component Matrix and the corresponding factor loadings for each variable. Moreover, four (4) components extracted from eleven variables were named accordingly. The study adopted the empiricism classification of knowledge in psychology, which is anchored on factor analysis (resemblance of variables) (Adedokun *et al.*, 2021a; Hj0rland, 1998).

Table 5: KMO and Bartlett's Test

		Statistics
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.650
Bartlett's Test of Sphericity	Approx. Chi-Square	934.442
	df	55
	Sig.	0.000

Table 6: Total variance explained

Component	Initial Eigenvalues[a]			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.325	30.230	30.230	2.341	21.285	21.285
2	1.836	16.691	46.921	2.169	19.720	41.006
3	1.248	11.348	58.269	1.596	14.506	55.511
4	1.123	10.205	68.474	1.426	12.963	68.474
5	0.860	7.818	76.292			
6	0.688	6.255	82.546			
7	0.575	5.227	87.774			
8	0.448	4.077	91.851			
9	0.384	3.487	95.338			
10	0.270	2.457	97.795			
11	0.243	2.205	100.00			

Table 7: Rotated Component Matrix

	Component			
	1	2	3	4
Complexity of the project (nature of design)	0.788			

Methods of construction	0.778			
Materials used	0.747			
The use to which building will be put	0.663			
Economic requirements		0.829		
Special & legal conditions		0.741		
Project duration (time limit)		0.674		
Financial constraint		0.543		
Project type			0.836	
Location of project			0.774	
Contract value				0.898
% Variances	*21.285*	*19.720*	*14.506*	*12.963*
Reliability scores (Cronbach's alpha)	*0.753*	*0.724*	*0.711*	-

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Table 7 shows the factor loadings of eleven variables identified from the literature, which were factored into four clusters using Principal Component Analysis. The interpretations were based on the observed inherent relationship among the variables in the cluster, as discussed below.

Component 1 – Project Technical Factors

In the first component, four variables are highly correlated. The factors are the complexity of the project (nature of design) (0.788), methods of construction (0.778), materials used (0.747), and the use of the building (0.663). The figures in parentheses represent the respective factor loadings. This cluster accounted for 21.285% of the variance in rotation sums of square loadings and the corresponding reliability analysis value of 0.753. The component is referred to as **Project Technical Factors**. As previously highlighted, improper management of project technical factors could predispose TEBP to risks. According to Chetty (2020), project technical factors like design and construction defects have a bearing on building maintenance such that imperfections could bring about considerable effects on the level of upkeep during habitation of the structures. The outturn effect could lead to high costs, causing user dissatisfaction (Chetty, 2020; Waziri, 2016). According to Adedokun *et al.* (2019), the complexity of the project is one of the severe triggers of risks in construction projects. Therefore, project technical factors concern the risk of cost overrun because it could increase the cost of construction. For instance, the use of the building could dictate the project's complexity (nature of design), materials to be used, and methods of construction to be adopted.

Component 2 – Project Requirements and Constraints

The second component comprises four-factor loadings that are highly correlated, which include economic requirements (0.829), special & legal conditions (0.741), project duration (time limit) (0.674), and financial constraint (0.543). This cluster accounts for 19.720% of the variance, with a reliability score of 0.724. The component is tagged **Project Requirements and Constraints**. Evidence from the literature indicates that project requirements affect construction projects. For instance, the leading causes of disputes in construction projects involve delay and failure to accomplish the work in the specified cost and time frame (Abd El-

Karim *et al.*, 2017). Similarly, construction projects are predisposed to risks due to competing interests and the mixture of complex requirements from multiple disciplines and participants on the projects (Chetty, 2020; Gyourko & Molloy, 2015; Phillips-Alonge, 2019). Therefore, project requirements and constraints could lead to the risk of delay and cost overruns.

Component 3 – Project Characteristics/Attributes

The third component comprises two highly correlated factor loadings, which include project type and location of the project with the corresponding variances of (0.836) and (0.774), respectively, within the cluster. 14.506% is the variance for the cluster, and the reliability analysis result is 0.711. The component is identified as **Project Characteristics/Attributes.** Project characteristics are predictors of performance in construction projects. For instance, project characteristics like project location and type, among others, contribute to risks (Adedokun & Agboola, 2018; Forcada *et al.*, 2017; Oyewobi *et al.*, 2011). The risk was described as rework, which adversely affected the performance of the projects (Forcada *et al.*, 2017). Despite that, the project's location causes a delay with a resultant effect on performance (Aziz & Abdel-Hakam, 2016). In essence, project characteristics concern the risk of delay and cost overruns in tertiary education building projects.

Component 4 – Project Value/Worth

The last component comprises one-factor loading called contract value with the corresponding variance of (0.898) in the cluster. The component is named **Project Value/Worth.** The project value/worth could subject construction projects to risks, especially when the cost estimates upon which the value was derived need to be completed or accurate. Previous studies show incomplete or inaccurate cost estimates predisposed construction projects to risks (Adedokun *et al.*, 2019). Further, Adedokun *et al.* (2019) ranked incomplete or inaccurate cost estimates fifth out of twenty-seven factors concerning the level of severity of this factor in the project. In essence, project characteristics concern the risk of cost overrun in tertiary education building projects.

6. CONCLUSIONS AND FURTHER RESEARCH

The study assessed risk triggers in tertiary education building projects via questionnaire surveys administered to consultants, contractors, and client representatives across five public tertiary education institutions in Ondo State, Nigeria. Based on the findings, the study concludes that financial constraints, the location of the project, and the project type are the top three factors triggering risks in tertiary education building projects. These factors compare with other building projects in developing countries. In addition, the study clustered factors into four comprising project technical, project requirements, project characteristics, and project value factors. Also, the study recommends that the client make adequate provisions for funds while removing administrative bottlenecks in releasing these funds to the contractor to enhance cash flow. The study implies that having a forehand knowledge of risk triggers could reduce the likelihood of risks in tertiary education building projects. Besides, the prioritized risk triggers could assist stakeholders' (clients, consultants, and financiers of these building projects) decision-making in managing tertiary education building projects. However, there is a need to include more risk triggers to enable the generalization of findings. Moreover, further research should consider a non-linear assessment of risk triggers because risks do not exist in isolation.

REFERENCES

Abd El-Karim, M. S. B. A., Mosa El Nawawy, O. A., & Abdel-Alim, A. M. (2017). Identification and assessment of risk factors affecting construction projects. *HBRC journal*, *13*(2), 202-216.

Abdul-Rahman, H., Wang, Chen, Takim, R., & Wong, S. (2011). Project schedule influenced by financial issues: Evidence in construction industry. *Scientific Research and Essays, 6*(1), 205 - 212. doi:10.5897/SRE10.989

Abdul Rahman, I., Memon, A., Azis, A., & Abdullah, N. H. (2013). Modeling Causes of Cost Overrun in Large Construction Projects with Partial Least Square-SEM Approach: Contractor's Perspective. *Research Journal of Applied Sciences, Engineering and Technology, 5*, 1963-1972. doi:10.19026/rjaset.5.4736

Adafin, J., Wilkinson, S., Rotimi, J., & Odeyinka, H. (2016). *Evaluating the Budgetary Reliability of Design Stage Elemental Cost Plan in Building Procurement: A New Zealand Study*.

Adebisi, E. O., Alao, O. O., & Ojo, S. O. (2020). Assessment of early warning signs predisposing building projects to failure in Nigeria. *Journal of Engineering, Design and Technology*, *18*(6), 1403-1423. doi:10.1108/jedt-08-2019-0214

Adedokun, D. O., & Agboola, J. O. (2018). Identifying Key Significant Factors Predisposing Building Projects to Risks in Rivers State, Nigeria. Retrieved from https://www.fig.net/resources/proceedings/fig_proceedings/fig2018/papers/ts02j/TS02J_adedokun_agboola_9231.pdf, accessed 14th July 2021

Adedokun, O. A., Aje, I. O., & Agboola, J. O. (2019). Investigation into the Severity of Factors Predisposing Construction Projects to Risks in Nigeria. *Journal of Building Performance*, *10*(1), 59 - 67.

Adedokun, O. A., Aje, I. O., Awodele, O. A., & Egbelakin, T. (2021a). Are the Public Tertiary Education Building Projects Devoid of Risks in the Nigerian Construction Context? *Journal of Financial Management of Property and Construction*. doi:10.1108/JFMPC-01-2021-0002

Adedokun, O. A., Egbelakin, T., Adedokun, D. O., & Adafin, J. K. (2021b). Success Criteria-Based Impacts of Risk Factors on Education Building Projects in Southwestern Nigeria. *Journal of Engineering, Design and Technology*. doi:10.1108/JEDT-09-2021-0458

Adeleke, A. Q., Bahaudin, A. Y., Kamaruddeen, A. M., Bamgbade, J.A. , Khan, A. M. W., Panda, S., & Afolabi, Y. A. (2019). An Empirical Analysis of Organizational External Factors on Construction Risk Management. *International Journal of Supply Chain Management*, *8*(1), 932 - 940.

Akanni, P. O., Oke, A. E., & Akpomiemie, O. A. (2015). Impact of environmental factors on building project performance in Delta State, Nigeria. *HBRC Journal*, *11*(1), 91-97. doi:10.1016/j.hbrcj.2014.02.010

Aydogan, G., & Koksal, A. (2013). *An Analysis of International Construction Risk Factors on Partner Selection by Applying ANP Approach*.

Ayegba, C., Ijigah, A. E., & Agbo, A. E. (2014). Stakeholders Perspective of the Impact of Risk Factors on Cost, Time and Quality of Building Construction Projects. *International Journal of Engineering Research & Technology (IJERT), 3*(1), 16 - 24.
Aziz, R. F., & Abdel-Hakam, A. A. (2016). Exploring delay causes of road construction projects in Egypt. *Alexandria Engineering Journal, 55*(2), 1515-1539. doi:https://doi.org/10.1016/j.aej.2016.03.006
Babu, N. J. (2015). Factors Affecting Success of Construction Project. *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) 12*(2), 17 - 26. doi:10.9790/1684-12251726
Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2005). Financial and Legal Constraints to Growth: Does Firm Size Matter? *The Journal of Finance, 60*(1), 137-177. doi:10.1111/j.1540-6261.2005.00727.x
Bing, L., & Tiong, R. L. K. (1999). Risk Management Model for International Construction Joint Ventures. *Journal of Construction Engineering and Management, 125*(5), 377 - 384.
Chetty, P. (2020). Technical factors that affect building construction and a building collapse. Knowledge Tank; Project Guru. Retrieved from https://www.projectguru.in/technical-factors-that-affect-building-construction-and-a-building-collapse/, accessed 5th November, 2022
Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (V. Knight Ed. 4 ed.). United States of America: SAGE Publications, Inc.
Ehsan, N., Mirza, E., Alam, M., & Ishaque, A. (2010). *Notice of Retraction Risk management in construction industry* (Vol. 9).
Field, A. P. (2005). Discovering Statistics using SPSS (2nd edition). London: Sage. Retrieved from http://users.sussex.ac.uk/~andyf/factor.pdf, accessed 16th April, 2021
Forcada, N., Gangolells, M., Casals, M., & Macarulla, M. (2017). Factors affecting rework costs in construction. *Journal of Construction Engineering and Management, 143*(8), 04017032.
Gyourko, J., & Molloy, R. (2015). Regulation and housing supply. In *Handbook of regional and urban economics* (Vol. 5, pp. 1289-1337): Elsevier.
Håkansson, U., Hässler, L., & Bröchner, J. (2007). Risk exposure in design-build contracts. *Byggteknik, 1*, 33-34.
Hj0rland, B. (1998). The Classification of Psychology: A Case Study in the Classification of a Knowledge Field. *Knowledge Organization, 25*(4), 62-201. doi:10.5771/0943-7444-1998-4-162
Howell, L. D. (2014). Evaluating political risk forecasting models: What works? *Thunderbird International Business Review, 56*(4), 305-316.
Ishtiaq, F., & Jahanzaib, M. (2017). Impact of Project Complexity and Environmental Factors on Project Success: A Case of Oil and Gas Sector of Pakistan. *Journal of Basic & Applied Sciences, 13*, 351-358. doi:10.6000/1927-5129.2017.13.58
Jaafari, A. (2001). Management of risks, uncertainties and opportunities on projects: time for a fundamental shift. *International Journal of Project Management, 19*(2), 89-101. doi:10.1016/s0263-7863(99)00047-2
Kim, J., & Wilemon, D. (2003). Sources and Assessment of Complexity in NPD Projects. *R&D Management, 33*. doi:10.1111/1467-9310.00278

Kishan, P., Bhatt, R., & Bhavsar, J. J. (2014). A Study of Risk Factors Affecting Building Construction Projects. *International Journal of Engineering Research & Technology (IJERT), 3*(12), 831 - 835.

Kuebutornye, N., Eugene, A. S., Joseph, A. A., Asigri, T., & Alubokin, A. (2018). Effects of material management techniques on construction project success: Perspective of material managers in northern region of ghana. *International Journal of Scientific and Technology Research, 7*, 183-188.

Lau, H., & Kong, J. J. (2019). Identification of Constraints in Construction Projects to Improve Performance. Retrieved from https://www.irbnet.de/daten/iconda/CIB4451.pdf, accessed 12th July 2021

Lebcir, R. M., & Choudrie, J. (2011). A Dynamic Model of the Effects of Project Complexity on Time to Complete Construction Projects. *International Journal of Innovation, Management and Technology, 2*(6), 477 - 483.

Lester, A. (2006). *Project management, planning and control: managing engineering, construction and manufacturing projects to PMI, APM and BSI standards*: Elsevier.

Luo, L., He, Q., Xie, J., Yang, D., & Guangdong, W. (2016). Investigating the Relationship between Project Complexity and Success in Complex Construction Projects. *Journal of Management in Engineering, 33*, 04016036. doi:10.1061/(ASCE)ME.1943-5479.0000471

Maylor, H., Vidgen, R., & Carver, S. (2008). Managerial Complexity in Project-Based Operations: A Grounded Model and Its Implications for Practice. *Project Management Journal, 39*, S15-S26. doi:10.1002/pmj.20057

Moser, C. A., & Kalton, G. (2017). Survey Methods in Social Investigation. Retrieved from https://doi.org/10.4324/9781315241999

Musso, P., & Schiavo, S. (2007). *The Impact of Financial Constraints on Firms Survival and Growth*. Retrieved from https://EconPapers.repec.org/RePEc:hal:wpaper:hal-00973115

Nwachukwu, C., & Emoh, F. (2011). Building construction project management success as a critical issue in real estate development and investment. *American Journal of Social and Management Sciences, 2*(1), 56-75. doi:10.5251/ajsms.2011.2.1.56.75

Obalola, T. F. (2017). Project environment factors contributing to time overruns of projects delivery in Lagos and Abuja, Nigeria. *International Journal of Science, Engineering & Environmental Technology (IJOSEET), 2*(12), 84 - 93.

Odeyinka, H., Weatherup, R., Cunninghan, G., McKane, M., & Larkin, K. (2010). Assessing Risk Impacts on the Variability between Tender Sum and Final Account Retrieved from https://www.researchgate.net/publication/277847049_Assessing_risk_impacts_on_the_variability_between_tender_sum_and_final_account, accessed 17th March, 2021

Onyeike, V. C., & Eseyin, E. O. (2014). Tertiary Education Trust Fund (Tetfund) and the Management of University Education in Nigeria. *Global Journal of Educational Research, 13*, 63-72. doi:10.4314/gjer.v13i2.2

Opawole, A., & Kajimo-Shakantu, K. (2021). Analysis of risk occurrence in projects executed by small and medium sized contracting firms. *IOP Conference Series: Earth and Environmental Science, 654*, 012023. doi:10.1088/1755-1315/654/1/012023

Osipova, E. (2008). Risk Management in Construction Projects: A Comparative Study of the Different Procurement Options in Sweden. Retrieved from https://www.diva-portal.org/smash/get/diva2:999456/FULLTEXT01.pdf, accessed 13th July 2021

Othman, A. (2008). Incorporating Value and Risk Management Concepts in Developing Low Cost Housing Projects. *Emirates Journal for Engineering Research*, *11*, 45-52.

Oyewobi, L. O., Oke, A. A., Ganiyu, B. O., Shittu, A. A., Isa, R. B., & Nwokobia, L. (2011). The effect of project types on the occurrence of rework in expanding economy. *Journal of Civil Engineering and Construction Technology*, *2*(6), 119-124.

Phillips-Alonge, O. K. (2019). The influence of partnering on the occurrence of construction requirement conflicts and disputes. *International Journal of Construction Management*, *19*(4), 291-306. doi:10.1080/15623599.2018.1435236

Rahman, T., Nakata, S., Nagashima, Y., Rahman, M. M., Sharma, U., & Rahman, M. A. (2019). Bangladesh Tertiary Education Sector Review: Skills and Innovation for Growth. Retrieved from https://documents1.worldbank.org/curated/en/303961553747212653/pdf/Bangladesh-Tertiary-Education-Sector-Review-Skills-and-Innovation-for-Growth.pdf, accessed 12th July 2021

Rezakhani, P. (2012). Classifying key risk factors in construction projects. *Bul. Inst. Polit. Iaşi, 62*(2), 27 - 38.

Sushil, S., & Verma, N. (2010). Questionnaire validation made easy. *Eur J Sci Res, 46*, 172-178.

Tipili, L. G., & Ilyasu, M. S. a. (2014). Evaluating the impact of risk factors on construction projects cost in Nigeria. *The International Journal Of Engineering And Science (IJES), 3*(6), 10-15.

Uher, T. E., & Loosemore, M. (2004). *Essentials of construction project management*. Sydney: UNSW Press.

Waziri, B. S. (2016). Design and Construction Defects Influencing Residential Building Maintenance in Nigeria. *Jordan Journal of Civil Engineering*, *10*(3), 313-323.

Wood, H. L., & Ashton, P. (2010). Modelling Project Complexity. Retrieved from https://www.arcom.ac.uk/-docs/proceedings/ar2010-1111-1120_Wood_and_Ashton.pdf, accessed 13th July 2021

Zou, P., Zhang, G., & Wang, J. (2007). Understanding the key risks in construction projects in China. *International Journal of Project Management, 25*, 601-614. doi:10.1016/j.ijproman.2007.03.001

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