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Identification and Analysis of Key Elements for Improving Construction Management Performance in Tanzania

Kamugisha Joseph Kajumulo

Department of Architecture and Art Design (DAAD), College of Architecture and Construction Technology (CoACT), Mbeya University of Science and Technology (MUST), Tanzania

Abstract Finding the essential components for enhancing construction management performance is a significant issue given the important role that the construction industry plays and the degree of performance of the sector. Therefore, the main goal of this research is to pinpoint crucial components for enhancing Tanzania's construction management performance. Management of building construction projects has been facing many challenges in Tanzania. This has led to the rise of construction complexities which have resulted in increasing delays, increasing construction scope, cost overrun, poor project quality, and generally poor performance of the construction projects. This has created a wake-up call for the country to implement different measures to improve the management of construction projects in Tanzania. But the lack of construction management skills in people involved in the construction industry has triggered the Construction Management Landscape to be difficult and to get worse. Several factors were reviewed and grouped within ten performance groups and using questionnaires, the respondents were asked to indicate the level of importance of those factors. Using Relative Importance Index (RII), MS Excel analyzed the data obtained from the respondents. The study revealed 7 key factors for improving Construction Management. Those factors are; Ability to solve problems, Project manager leadership skills, Site climatic conditions, Cost of materials and equipment, Project construction planned time, Site condition challenges, and Lack of competent staff. It is recommended that seven (7) elements identified by this study shall be considered the substantial elements by both government and private organizations for developing the construction industry and therefore they should collaborate in investing in worker capacity building for improving Construction Management performance. The results of this study give construction managers a way to use the key elements of construction management practices that have the biggest effects on construction management performance in the Tanzanian construction industry to address issues with poor project performance and delays in project completion.

Keywords Construction Management, Key elements, Performance indicators, Project performance

1. Introduction

The construction industry contributes a significant part to the improvement and accomplishment of the goals in society. It has complications in its nature because it embraces an enormous number of parties as clients, contractors, consultants, shareholders, and regulators. It is one of the biggest industries which adds to about 10% of the Gross National Product (GNP) in industrialized countries (Navon, 2005).

The construction industry in Tanzania was the primary economic engine of the nation in 2021. According to the Bank of Tanzania's annual report for 2021–2022, the GDP of the nation was made up of three main sectors: services (32%), industry and construction (31%), and agricultural (agriculture, forestry, and fishing) (27%). Construction contributed around 16% of Tanzania's GDP, followed by crops (14%), manufacturing (9%), wholesale and retail commerce (9%), repairs (9%), transport (8%), livestock (8%), mining and quarrying (5%), and wholesale and retail trade (9%). Due to the effects of the Covid-19 epidemic, tourism, another important sector of Tanzania's economy, had a decline in GDP from 10.6% in 2019 to 5.3% in 2020 before increasing to 5.7% in 2021 (BOT, 2022).

Despite its importance in the economy, the construction industry is full of unending challenges, demanding high energy and constant problem-solving (CRB, 2004). Most construction projects are facing major challenges which in one way or another lead to increasing project cost, poor

* Corresponding author:
kjkajumulo@gmail.com (Kamugisha Joseph Kajumulo)
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project quality, project delays, reduced productivity, loss of profit, and damage to business relationships (Jaffar et al., 2011; Levy, 2018; Rwelamila P.D., 2000).

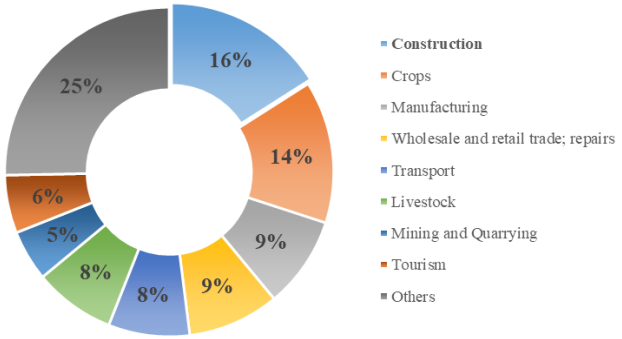

Figure 1. GDP contribution (Source; Bank of Tanzania 2022)

On the other hand, the escalation of construction management challenges as a result of unique construction projects such as poor resources, lack of specialization (knowledge and skills), poor technologies, poor local industries, weak construction companies, poor building regulations and standards available locally, many individual locations (two sites at the same time), high complexity and uncertainties have increased the consequences on managing the projects (Dainty & Leiringer, 2019; Windapo, 2013).

In addition to that, the industry is populated by small local firms with small market share (URT, 2003) due to few work opportunities, weak resource base, inadequate experience, difficult tender conditions, small capital base, delays in payments from clients, high hire rates and high prices which affect the way they manage the small project-based industry (CRB, 2004; Lu & Yan, 2013; Wang & Yuan, 2011).

Also, the existence of building production managers and staff who traditionally came from a trade background with the small trend towards staff from technical and degree courses has increased more problems in the industry while still there is a sophisticated system of registration of professionals such as architects, engineers, and quantity surveyors accompanied with mandatory large fee scale (Adjei et al., 2017; Chigara et al., 2013; Smith, 2014, 2016).

Also, a large part of the industry is still dominated by the dormant procurement option which is the traditional tender build process that preserves the sequential separation of design from production and therefore increases construction time and cost (Fellows et al., 2009; Mengistu & Mahesh, 2020).

Most of these challenges are associated with the capability and capacity of local contractors and consultants which has changed market share from local players (both consultants and contractors) by 20% (by value) as compared to 80% of the foreign contracting firms during 2003 (Anugwo et al., 2018; Boniface & Malongo, 2004).

However, one way of solving these challenges is to examine the way we can improve the construction management performance in Tanzania by identifying and analyzing the conditions which favor high productivity, to acquire the tangible benefits in all aspects of designing, planning, scheduling, monitoring, and construction of the project.

Due to the critical role which the construction industry plays in Tanzania and the level of performance of the industry in the country, identifying the key elements for improving construction management performance is a significant task. Therefore, the main objective of this study is to identify key elements for improving construction management performance in Tanzania.

1.1. Construction Management

In construction, the failure of any project is mostly associated with problems and failure in project performance (Khlaifat et al., 2019; KPI, 2000; Kuprenas, 2003; Nitithamyong & Skibniewski, 2006; Sage et al., 2014). To complete the construction process successfully and therefore succeed in project performance, the project has to meet the anticipated level of quality and also fit within the contractual terms. The process has to be well managed to permit the participants to accomplish their work competently, effectively, and safely (Nguyen et al., 2004; Robichaud & Anantatmula, 2011).

However, the rise of challenges within construction projects has been a major hindrance toward the improvement of how construction projects are managed, produced, and performed (Alinaitwe et al., 2007; Enshassi et al., 2007). On the other hand, to achieve sustainable performance, there has been a substantial demand for a positive attempt to ensure that construction projects are managed accordingly, and to accomplish that, construction project participants should use their knowledge and managerial skills available to ensure they achieve the project objectives (Alaloul et al., 2020; Maylor et al., 2008).

For a long time, many construction project participants received training in Construction Management, to cater for the rising failures and challenges in the performance of the construction industry (Benz, 1997; Wong et al., 2011). These trainings involve the use of specific, project management procedures to manage the planning, design, and construction of a project, from beginning (pre-design) to end (closeout) (Dounavi et al., 2022; Niittymäki, 2015).

But despite all that, most of the projects are still undergoing the same construction management challenges clarified above and some even fail to meet their projected benefit or are even totally dismissed and abandoned before or after their completion (Portny, 2015). Unfortunately, participants in projects are expected to build several construction management skills, both organizational and individual, to succeed in improving the performance of construction management to benefit many construction projects against participating in repetitive ineffectual environments that lead to poor results and reprise these environments time and time again with poor outcomes (Atkinson et al., 2006).

1.2. Project Performance

In measuring and evaluating project performance, a large number of performance indicators may be used. Primary performance indicators are key performance indicators (KPIs) further known as three predominant performance evaluation dimensions which are time, cost, and quality. They are also termed "triple constraints," which traditionally consisted of only time, cost, and scope (Van Wyngaard et al., 2012).

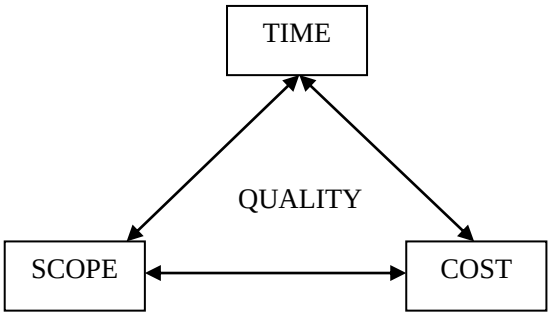

Figure 2. Project triple constraints (Source; Van Wyngaard et al., (2012))

In addition to that, performance dimensions may be motivated by several characteristics of the project and always may have one or more indicators. For example, Dissanayaka and Kumaraswamy (1999) revealed that the characteristics of the project, the system of procurement, the performance of the project team, the characteristics of client representations, the characteristics of the contractor, the characteristics of the design team, and all external conditions have much influence on the performances project time and cost dimensions (Dissanayaka & Kumaraswamy, 1999).

In the case of the time dimension, it has different implications in management. The time and its changes are monitored along with defining and assessing project success in the entire construction process (Chan et al., 2002; Shenhar et al., 2001).

The project cost performance is influenced by many elements. Iyer and Jha (2005) agreed on issues such as the competence of project managers, the support from top management, coordinating and leadership skills of project managers, participant's monitoring and feedback, decision making, project participants coordination, the competence of owner, the social condition of the project, the economic condition of the project, and site climatic condition as the major elements influencing cost performance (Iyer & Jha, 2005).

Harmonization among participants of the project was also selected as the most important of all the factors, having a maximum effect on cost performance. Excitingly, Love et al. (2005) inspected the project time-cost performance relationship, and their results indicate that cost is a poor predictor of time performance (Love et al., 2005). Besides that, project performance can be explained in a group of indicators. These are indicators explained by Cheung et al. (2004) such as performance on business, client changes, time, cost, quality, health and safety, and client satisfaction (Cheung et al., 2004).

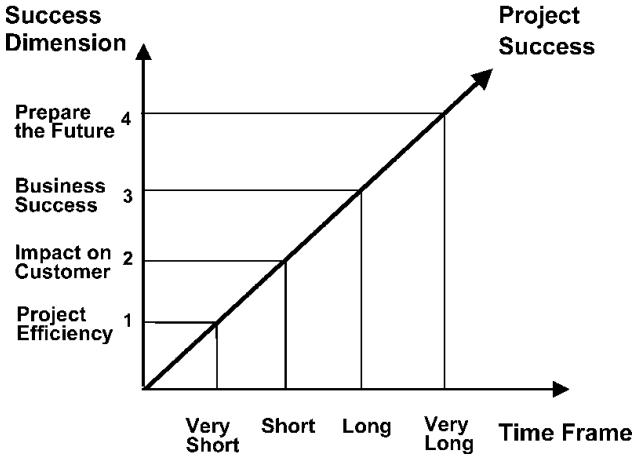

Figure 3. Project success (Source; Shenhar et al., 2001))

Table 1. Some of the previous literature on Construction management

Author	Objective	Category	Methods	Findings
(Brown & Adams, 2000)	Influence of project management on building project performance	UK Construction industry	The modeling strategy adopted	BMP doesn't add value to time, cost, and quality outputs
(Cheung et al., 2004)	The assistance of PPMS on project managers	Construction industry	World Wide Web and database technology	The 7-factor solution was established
(Iyer & Jha, 2005)	Factors affecting cost performance	Indian Construction projects	Factor analysis	7 critical success factors obtained
(Love et al., 2005)	Project time–cost relationships were	Australian Construction industry	Multiple regression techniques of weighted least squares	Cost is a poor predictor of time performance.
(Navon, 2005)	Real-time control of on-site construction	Construction industry	Automation of project performance	Four sought parameters were determined
(Okuwoga, 1998)	Cost—Time performance of Public Sector Housing Projects	Nigeria Construction industry	Exploratory model	cost overrun problem in the public sector could have been exaggerated
(Ugwu & Haupt, 2007)	Identify key performance indicators (KPI)	South African infrastructure sustainability	Weighted sum model	Design strategies and considerations were established

Table 2. Selected variables for the current study

	Variables	References		Variables	References
COST RELATED FACTORS			TIME-RELATED FACTORS		
A_1	Cost for project design	(Cunningham, 2013)	B_1	Project construction planned time	(Chin & Hamid, 2015)
A_2	Company market share	(Yan et al., 2019)	B_2	Lack of resources (Human, capital)	(A Kassem et al., 2020)
A_3	Project control system	(Chan et al., 2002)	B_3	Preparation of construction site	(Bisták et al., 2021)
A_4	Rework cost	(Forcada et al., 2017)	B_4	Labor shortage delay time	(Kim et al., 2020)
A_5	Project Cash flow	(Omopariola et al., 2020)	B_5	Material shortage delay time	(Gebrehiwet & Luo, 2017)
A_6	Overtime cost of the project	(Hanna & Sullivan, 2004)	B_6	Percentage of orders delivered late	(Enshassi et al., 2007)
A_7	Currency price differentiation	(Enshassi et al., 2007)	B_7	Claim approval average delay time	(Enshassi et al., 2007)
A_8	Material waste rate	(Vilventhan et al., 2019)	B_8	Regular payment av. delay time	(Agrawal & Halder, 2020)
A_9	Material price escalation	(Enshassi et al., 2007)	B_9	Time for implementation of variation orders	(Chin & Hamid, 2015)
A_{10}	Company Fluidity/Good cash flow	(Omopariola et al., 2020)	B_{10}	Defects rectification time	(Paton-Cole & Aibinu, 2021)
A_{11}	Project overhead costs	(Amin et al., 2014)	PRODUCTIVITY RELATED FACTORS		
A_{12}	Project profitability	(Jahan et al., 2022)	C_1	Project Top-down relationship	(Berroir et al., 2015)
A_{13}	The labor cost of the project	(Cunningham, 2013)	C_2	Project absence rate	(Ahn et al., 2013)
A_{14}	Cost of materials and equipment	(Cunningham, 2013)	C_3	Schedule to Work succession	(Perrenoud & Sullivan, 2017)
A_{15}	Updating project budget regularly	(Omopariola et al., 2020)	C_4	Project complexity	(Moza et al., 2022)
A_{16}	Project variations cost	(Noruwa et al., 2022)	C_5	The project acquired per year	(Enshassi et al., 2007)
A_{17}	Cost of motivation	(Enshassi et al., 2007)	CLIENT SATISFACTION-RELATED FACTORS		
A_{18}	Cost for replacement	Cost for replacement	E_1	Project manager leadership skills	(Khamaksorn, 2016)
QUALITY RELATED FACTORS			E_2	Owner-parties information coordination	(Bakhary et al., 2015)
D_1	Standard meeting/ training	(Tam et al., 2004)	E_3	Owner-parties' number of disputes	(Bakhary et al., 2015)
D_2	Standard equipment, raw materials	(Passer et al., 2012)	E_4	Rework incidents	(Forcada et al., 2017)
D_3	Specification conformance	(Lipman et al., 2011)	E_5	Service reliability and speed to client	(Bakhary et al., 2015)
D_4	Lack of competent staff	(Bakhary et al., 2015)	REGULAR AND COMMUNITY SATISFACTION-RELATED FACTORS		
D_5	The standard company assessment system	(Ali, 2014)	F_1	Non-compliance incidents	(Bakhary et al., 2015)
PEOPLE RELATED FACTORS			F_2	Regular requirement compliance costs	(Bakhary et al., 2015)
G_1	Workers motivation	(Enshassi et al., 2007)	F_3	Public requirement compliance cost	(Bakhary et al., 2015)
G_2	Work belongingness	(Willner et al., 2020)	F_4	Site condition challenges	(Sasitharan Nagapan et al., 2011)
G_3	Recruitment development	(Manap et al., 2018)	F_5	Standard regulator documentation	(Dobysheva & Gladkova, 2018)
G_4	Competence development	(Bakhary et al., 2015)	HEALTH AND SAFETY-RELATED FACTORS		
G_5	Workers attitudes	(Tam et al., 2004)	H_1	Organization safety and health program	(Lee et al., 2021)
INNOVATION AND LEARNING-RELATED FACTORS			H_2	Site Accessibility	(Yu et al., 2019)
J_1	Ability to review failures	(Bakhary et al., 2015)	H_3	Site safety	(Lee et al., 2021)
J_2	Ability to solve the problems	(Khamaksorn, 2016)	H_4	Project assurance rate	(Bakhary et al., 2015)
J_3	Ability to work in a group	(Bakhary et al., 2015)	H_5	Project accidents rate reported	(Lee et al., 2021)
J_4	Own past experience and history	(Tam et al., 2004)	ENVIRONMENTAL RELATED FACTORS		
J_5	Other past experiences and history	(Tam et al., 2004)	I_1	Site climatic conditions	(Rowlinson et al., 2014)
			I_2	Noise level around the site	(Kantová, 2017)
			I_3	Air quality level around the site	(Wieser et al., 2021)
			I_4	Presence of waste around the site	Sasitharan Nagapan et al., 2011)
			I_5	Moisture level around the site	(Wieser et al., 2021)

Also, another interesting way of evaluating project performance is through two mutual sets of indicators explained by Pheng and Chuan (2006) namely macro viewpoint and micro viewpoint. The first set is connected to people who will analyze the performance of any project from the macro viewpoint which includes the owner, users, stakeholders, and the general public, while the second set is the group which consists of the project developer and the project contractor. These are people who analyze project performance from the micro viewpoint (Pheng & Chuan, 2006). On the other hand, there are eight key skills (performance drivers), established by Jere and Sanders (2008) which together form a strong bonding structure that demonstrates how the construction projects should be governed (Jere Jacobs & Sanders, 2008).

Some researchers such as Okuwoga (1998), Brown and Adams(2000), Ugwu and Haupt, (2007), Navon (2005), Love, et al. (2005), Iyer and Jha (2005), and Cheung, et al. (2004) reviewed several factors involved in construction management performance (Brown & Adams, 2000; Cheung et al., 2004; Iyer & Jha, 2005; Love et al., 2005; Navon, 2005; Okuwoga, 1998; Ugwu & Haupt, 2007). Table 1 summarizes some of the other literature established for reviewing this study.

Sixty-eight (68) elements were submitted to the construction industry participants or respondents through questionnaires and allowed to identify and indicate the most important elements for improving construction management performance. Table 2 includes all chosen factors categorized into ten performance groups.

2. Main Body

2.1. Methodology and Data Analysis

The methodology used in this study is to identify and analyze characteristics of management practices through a literature review. The identified attributes were analyzed and the respondents were prioritized based on relative weighting. Data was collected using a structured questionnaire and conducted offline. The collected data was further analyzed using the MS Excel 2013 program. A quantitative research methodology was adopted to analyze the data collected and the following tools and techniques were applied to the data: reliability analysis to check the consistency of the data collected for this study, and a Relative Importance Index (RII) for the priorities and ranking of the attributes The data collected was used to evaluate the weighted average of the ratings given by the respondents.

$$RII = \frac{\sum W}{AN}$$

Where; W=weighting given to each factor by the respondents(ranging from 1 to 5)
A=the highest weight (i.e. 5 in this case)
N = The total number of respondents

The list of companies that create the population size of the study, came from construction stakeholders (i.e. clients, consultants, and contractors) based in Dar es Salaam City, Tanzania. The target populations of Clients were the recognized local real estate agents, consultants were local architectural consulting firms registered by the recognized board (in this case Architect and Quantity Surveyor Registration Board (AQRB) while contractors were the Class-V local contractors, with offices in Dar es Salaam City because 95% of the local firms are in small to medium-sized enterprises in classes 5-7 (largely class 5).

The population samples were collected from the AQRB registry (as per November 2020 AQRB report) whereby there are 257 local registered architectural organizations and 24 foreign registered architectural organizations (65 firms located in Dar es Salaam), the Contractors Registration Board (CRB) registry of 2018 shows a total number of 725 class-V local building contractors (54 class-V local building contractors located in Dar Es Salaam) while for the case of real estate organization zoom Tanzania directory of 2020 indicate a total of 224 real estate agents (32 real estate organization located in Dar Es Salaam). Therefore, the population size of all the clients, consultants, and contractors is 151 respondents.

The target populations of clients, consultants, and contractors depend on the registered real estate organization, design (and consultancy services), and contractors located in Dar es Salaam City only. The sample size formula for the small and finite population is provided by (Kothari, 2004) and is given as;

$$n = \frac{Z^2 \times N \times pq}{<N-1>e^2 + Z^2 \times pq}$$

Where; Z=Z value from a table of confidence interval=CI=95%=1.96
N=Population size=184 respondents
p = Sample proportion=0.5, q=1-p = 0.5
e2=Margin error=5%=0.05

Therefore;

$$n = \frac{1.96^2 \times 151 \times 0.5^2}{< 151 - 1 > 0.05^2 + 1.96^2 \times 0.5^2}$$

$$n = \frac{145.0204}{1.3354} = 110$$

n = 110 respondents

2.2. Data Collection

Data for the research was collected through two sources, which are primary and secondary. Data collected through the primary source was through the administration of questionnaires and discussions with respondents. The questionnaire was designed in such a way that it answers the objective of the research.

Types of the respondents

The questionnaires were distributed to all clients (real estate organizations), consultants (architectural consulting firms), and contractors (Building contracting firms) which are located in Dar es Salaam. The population size is that of organizations located in Dar es Salaam which is 151 while the population sample is 110 which was identified using a

formula established by Kothari, (2004).

Table 3. Distribution and collection of questionnaires

Organization	Size	Distributed (sample)	Retrieved	Lost
Client	32	20	13	7
Consultant	65	58	52	6
Contractor	54	32	21	11
Total	151	110	86	24

The sample size of this research was 110 respondents with 86 retrieved questionnaires whereby clients were 13, consultants were 52 and contractors were 21. Table 3 indicates the number of clients, consultants, and contractors who responded to the questionnaire where the number of consultants was higher than the rest of the groups.

Respondent's designation

It should be noted that 29.7% of respondents worked at the Project manager/Deputy position, 15.1% as Site engineers/ Design engineers, 5.8% at the company manager /Deputy Level, and 51.2% at other managerial levels (Figure 4).

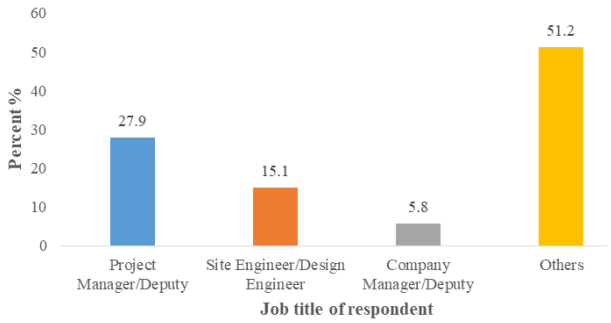

Figure 4. Job title of respondent

Years of experience

In selecting the research sample, respondents were guided by their broad and long-term experience in construction management-related activities, which enabled respondents to describe simply and accurately the characteristics influencing the effectiveness and to demonstrate the accuracy of the data collected.

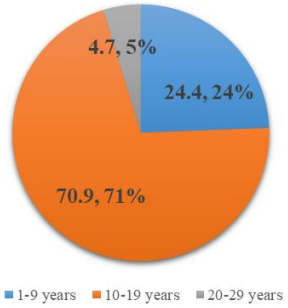

Figure 5. Years of experience

Respondent's education level

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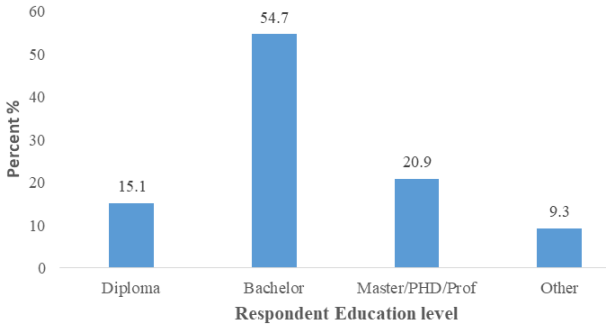

Figure 6. Respondents education level

The research aims to identify the most significant elements which if applied in the Tanzanian construction industry will contribute towards positive impacts and therefore improve construction projects in Tanzania. Using Microsoft Excel 2014, the analysis was conducted using the RII (Relative Importance Index) method where the ranks of elements in each group of respondents were determined. Then the elements with ranks between 1 to 10 in every responding group were recognized as the most preferred elements. The tables below (Tables 4 to 13) include 10 performance groups that have summarized the calculated RII of all the factors for improving construction management as selected by three responding groups (clients, consultants, and contractors). Then the elements with ranks between 1 to 10 in every responding group were recognized as the key elements.

Table 4. Cost Related Performance factors

Cost Related	Client		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
A_1	0.6769	33	0.8192	30	0.876	14
A_2	0.5385	50	0.5882	68	0.771	46
A_3	0.9385	5	0.8385	20	0.8	34
A_4	0.4462	64	0.7885	40	0.723	54
A_5	0.8	19	0.8038	36	0.876	14
A_6	0.6769	33	0.7231	58	0.923	2
A_7	0.6615	38	0.7577	51	0.761	47
A_8	0.6615	38	0.6231	67	0.723	54
A_9	0.7385	24	0.7654	50	0.714	63
A_{10}	0.6769	33	0.7462	53	0.838	24
A_{11}	0.5385	50	0.7846	43	0.723	54
A_{12}	0.4769	59	0.7961	38	0.885	8
A_{13}	0.6615	38	0.8077	35	0.876	14
A_{14}	0.9384	5	0.8961	5	0.923	2
A_{15}	0.8154	15	0.7961	38	0.876	14
A_{16}	0.8154	15	0.8423	18	0.876	14
A_{17}	0.4615	65	0.6846	63	0.838	24
A_{18}	0.3846	65	0.6538	65	0.8	34

Table 5. Time-Related Performance factors

Time-Related	Client		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
B_1	0.9384	5	0.8962	5	0.8952	7
B_2	0.8769	12	0.7885	40	0.8762	14
B_3	0.6615	38	0.8385	20	0.8381	24
B_4	0.5231	54	0.7765	46	0.8476	23
B_5	0.7231	27	0.8385	20	0.9238	2
B_6	0.7	31	0.8577	14	0.8381	24
B_7	0.6769	33	0.8654	11	0.8286	31
B_9	0.7539	22	0.8269	26	0.8857	8
B_{10}	0.6923	32	0.7308	57	0.8762	14
B_{11}	0.6154	44	0.6692	64	0.8	34

Table 6. Productivity Related Performance factors

Productivity Related	Client		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
C_1	0.8153	15	0.8577	14	0.8857	8
C_2	0.5076	57	0.7115	60	0.8857	8
C_3	0.7538	22	0.8615	13	0.8	34
C_4	1	1	0.7846	43	0.7238	54
C_5	0.5385	50	0.7577	51	0.8381	24

Table 7. Quality-Related Performance factors

Quality-Related	Client		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
D_1	0.7231	27	0.8423	18	0.8	34
D_2	0.9846	2	0.8385	20	0.838	24
D_3	0.8769	12	0.9	4	0.8	34
D_4	0.9384	5	0.8885	7	0.886	8
D_5	0.7076	30	0.8269	26	0.8	34

Table 8. Client Satisfaction Related Performance factors

Client Satisfaction R.F.	Client		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
E_1	0.938	5	0.9115	2	0.9238	2
E_2	0.861	14	0.8154	33	0.7619	47
E_3	0.8	19	0.6885	62	0.7238	54
E_4	0.523	54	0.7461	53	0.7619	47
E_5	0.661	38	0.85	17	0.8	34

Table 9. Regular and Community Satisfaction Related Performance factors

Regular and Community Related	Client		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
F_1	0.5846	46	0.7462	53	0.8762	14
F_2	0.5230	54	0.7731	47	0.7143	63
F_3	0.5384	50	0.7885	40	0.6	67
F_4	0.9538	3	0.8769	9	0.8857	8
F_5	0.4769	59	0.7731	47	0.8762	14

Table 10. People Related Performance factors

People R.F.	Client		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
G_1	0.6153	44	0.8769	9	0.8381	24
G_2	0.5846	46	0.7	61	0.7238	54
G_3	0.5692	49	0.8269	26	0.7619	47
G_4	0.9384	5	0.8385	20	0.8285	31
G_5	0.7333	26	0.8192	30	0.7809	45

Table 11. Health and Safety-Related Performance Factors

Health and Safety R.F.	Client		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
H_1	0.8	19	0.8885	7	0.7523	53
H_2	0.3846	65	0.8115	34	0.7238	54
H_3	0.7166	29	0.8269	26	0.8	34
H_4	0.7384	24	0.7807	45	0.8	34
H_5	0.6461	43	0.8	37	0.7619	47

Table 12. Innovation and Learning Related Performance factors

Innovation and Learning Related	Client		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
J_1	0.8615	14	0.8156	32	0.8	34
J_2	0.9538	3	0.9269	1	0.933	1
J_3	0.5846	46	0.8654	11	0.819	33
J_4	0.8153	15	0.8385	20	0.762	47
J_5	0.6769	33	0.712	59	0.629	66

Table 13. Environmental Related Performance factors

Environmental Related	Client		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
I_1	0.938	5	0.9115	2	0.914	6
I_2	0.385	65	0.8577	14	0.724	54
I_3	0.477	49	0.7346	56	0.724	54
I_4	0.508	57	0.7731	47	0.676	65
I_5	0.477	59	0.6538	65	0.562	68

Table 14 below summarizes the key elements for improving construction management performance in Tanzania as selected by the respondents in the construction industry. The ability to solve the problems (J_2) is ranked first element because it was the first highly recommended element by participants to contribute most to the performance of the construction management with Relative importance index of 0.9538, 0.9269, and 0.933 of Client, Consultant, and Contractor respectively.

On the other hand, the Project manager leadership skills (E_1) is ranked second element because it was the second most highly recommended element by participants to contribute to the performance of the construction management with Relative importance index of 0.938, 0.9115 and 0.9238 of Client, Consultant, and Contractor respectively.

The site climatic conditions (I_1) is ranked third in the performance of the construction management with Relative importance index of 0.938, 0.9115, and 0.914 for the Client, Consultant, and Contractor respectively.

Furthermore, Cost of materials and equipment (A_{14}), Project construction planned time (B_1) Site condition challenges (F_4), and Lack of competent staff (D_4) are ranked fourth, fifth, sixth, and seventh in the performance of the construction management in Client, Consultant, and Contractor respectively and their Relative importance index are indicated within Table 14.

Table 14. Key elements for improving CM performance

Key elements	Client		Consultant		Contractor	
	RII	Rank	RII	Rank	RII	Rank
J_2	0.9538	3	0.9269	1	0.933	1
E_1	0.938	5	0.9115	2	0.9238	2
I_1	0.938	5	0.9115	2	0.914	6
A_{14}	0.9384	5	0.8961	5	0.923	2
B_1	0.9384	5	0.8962	5	0.8952	7
F_4	0.9538	3	0.8769	9	0.8857	8
D_4	0.9384	5	0.8885	7	0.886	8

Seven (7) key elements established in Table 14 were identified among 68 factors. Using Microsoft Excel sheets, analysis was conducted, RII was determined and ranks were compared. In the end, the findings indicated that there is significant agreement between clients, consultants, and contractors on key elements for improving construction management on 7 key elements namely; project construction planned time, cost of materials and equipment, lack of competent staff, project manager leadership skills, site condition challenges, ability to solve the problems and site climatic conditions.

This paper intended to find if there are common factors between clients, consultants, and contractors for improving construction management performance. The discussion conducted shows that the analysis was conducted on each performance group and the comparison of the RII was developed and the top-ranked factor on each group among ranks 1 to 10 between clients, consultants, and contractors was chosen. The findings indicated that there are 7 key elements for improving construction management.

3. Conclusions

This study revealed the seven key elements of construction management performance in Tanzania. All the variables selected for this study had been recommended by previous literature to have a significant impact on construction management in the construction industry. This study highlighted and established sixty-eight attributes to be used in the analysis of the research and help on establishing the base for identifying the key issues for this research.

With this research is concerned, the performance of construction management depends on several attributes and it is possible to complete the project within the time frame and the budget allocated to the project.

It requires a project team, led by managers who can solve the problems, with enough leadership skills, competent staff people who know the cost of materials and equipment, and how to deal with site condition challenges to meet a construction planned time.

This research added value to the existing knowledge bank by identifying and analyzing the important factors of construction management practices/techniques on the construction performance of building construction projects.

This study provided a solution to the construction managers and project managers to apply the findings of this study in their projects to control the issues of poor project performance and delays in the completion of the projects using the identified most significant attributes of construction management practices affecting construction management performance in the Tanzanian construction industry. The scope of the current study was limited to the Tanzanian building industry, and the analytical unit was chosen to conduct research and collect data at the project/site level located in different parts of the country.

REFERENCES

[1] A Kassem, M., Khoiry, M. A., & Hamzah, N. (2020). Theoretical review on critical risk factors in oil and gas construction projects in Yemen. *Engineering, Construction, and Architectural Management*, *28*(4), 934–968. https://doi.org/10.1108/ECAM-03-2019-0123.

[2] Adjei, K. O., Aigbavboa, C. O., & Thwala, W. (2017). The Challenges of Cost Control Practice in the Construction Industry: A Literature Review. *International Conference on Applied Sciences and Technology (ICAST), 2020*(March), 14–24. https://conference.kstu.edu.gh/index.php/proceedings/article/view/97.

[3] Agrawal, A., & Halder, S. (2020). Identifying factors affecting construction labor productivity in India and measures to improve productivity. *Asian Journal of Civil Engineering*, *21*(4), 569–579. https://doi.org/10.1007/s42107-019-00212-3.

[4] Ahn, S., Lee, S., & Steel, R. P. (2013). Effects of Workers' Social Learning: Focusing on Absence Behavior. *Journal of Construction Engineering and Management*, *139*(8), 1015–1025. https://doi.org/10.1061/(ASCE)co.1943-7862.0000680.

[5] Alaloul, W. S., Liew, M. S., Zawawi, N. A. W., Mohammed, B. S., Adamu, M., & Musharat, M. A. (2020). Structural equation modeling of construction project performance based on coordination factors. *Cogent Engineering*, *7*(1). https://doi.org/10.1080/23311916.2020.1726069.

[6] Ali, M. C. (2014). Exploring the potential of integration quality assessment system in construction (classic) with ISO 9001 quality management system (QMS). *International Journal for Quality Research*, *8*(1), 73–86.

[7] Alinaitwe, H. M., Mwakali, J. A., & Hansson, B. (2007). Factors affecting the productivity of building craftsmen - studies of Uganda. *Journal of Civil Engineering and Management*, *13*(3), 169–176. https://doi.org/10.1080/13923730.2007.9636434.

[8] Amin, S., Hesami, S., & Amin Lavasani, S. (2014). Identifying and Classifying Effective Factors Affecting Overhead Costs in Constructing Projects in Iran. *International Journal of Construction Engineering and Management*, *3*(1), 24–41. https://doi.org/10.5923/j.ijcem.20140301.03.

[9] Anugwo, I. C., Shakantu, W., Saidu, I., & Adamu, A. (2018). Potentiality of the South African Construction SMME Contractors Globalising within and Beyond the SADC Construction Markets. *Journal of Construction Business and Management*, 2(1), 41–49. https://doi.org/10.15641/jcbm.2.1.73.

[10] Atkinson, R., Crawford, L., And, & Ward, S. (2006). Fundamental uncertainties in projects and the scope of project management. *International Journal of Project Management*, *24*(8), 687–698.https://doi.org/10.1016/j.ijproman.2006.09.011.

[11] Bakhary, N. A., Adnan, H., & Ibrahim, A. (2015). A Study of Construction Claim Management Problems in Malaysia. *Procedia Economics and Finance*, *23*(October 2014), 63–70. https://doi.org/10.1016/s2212-5671(15)00327-5.

[12] Benz, S. M. (1997). The Project Manager's CADD Survival Guide. *The Project Manager's CADD Survival Guide*, *May*. https://doi.org/10.1061/9780784402474.

[13] Berroir, F., Harbouche, L., And, & Boton, C. (2015). Top down vs. Bottom up approaches regarding the implementation of lean construction through a French case study. *In 23rd Annual Conference of the International Group for Lean Construction*, 73–82.

[14] Bisták, A., Hulínová, Z., & Neštiak, M. (2021). Simulation Modelling of Aerial Works and Its Role in the Preparation of Construction. *Slovak Journal of Civil Engineering*, *29*(1), 20–26. https://doi.org/10.2478/sjce-2021-0004.

[15] Boniface, M., & Malongo, J. (2004). Globalisation: A Challenge To The Tanzanian Construction Industry. *Globalisation and Construction*, 69–79.

[16] BOT. (2022). *Bank of Tanzania annual report: Economic update*. *18*.

[17] Brown, A., & Adams, J. (2000). Measuring the effect of project management on construction outputs: a new approach. *International Journal of Project Management*, *18*, 327–335.

[18] Chan, A. P. C., Scott, D., & Lam, E. W. M. (2002). Framework of Success Criteria for Design/Build Projects. *Journal of Management in Engineering*, *18*(3), 120–128. https://doi.org/10.1061/(asce)0742-597x(2002)18:3(120).

[19] Cheung, S. O., Suen, H. C. H., And, & Cheung, K. K. W. (2004). PPMS: a Web-based construction project performance monitoring system. *Automation in Construction*, *13*, 361–376.

[20] Chigara, B., Moyo, T., & Mudzengerere, F. H. (2013). An analysis of cost management strategies employed By building contractors on projects in Zimbabwe. *International Journal of Sustainable Construction Engineering & Technology*, *4*(2), 2180–3242. https://www.researchgate.net/publication/349311913.

[21] Chin, L. S., & Hamid, A. R. A. (2015). The practice of time management on construction project. *Procedia Engineering*, *125*, 32–39. https://doi.org/10.1016/j.proeng.2015.11.006.

[22] CRB. (2004). Contractors Annual Returns. *Contractors Registration Board Registry*.

[23] Cunningham, T. (2013). Factors Affecting The Cost of Building Work - An Overview. *Dublin Institute of Technology*, 0–21.

[24] Dainty, A., & Leiringer, R. (2019). Maintaining a relevant construction management and economics research community. *Construction Management and Economics*, *37*(12), 693–696. https://doi.org/10.1080/01446193.2019.1687992.

[25] Dissanayaka, S. M., & Kumaraswamy, M. M. (1999). Comparing contributors to time and cost performance in building projects. *Building and Environment*, *34*, 31–42.

[26] Dobysheva, T., & Gladkova, E. (2018). Improvement of methods for determining the cost of design documentation in construction. *MATEC Web of Conferences*, *212*. https://doi.org/10.1051/matecconf/201821209005.

[27] Dounavi, L. E., Dermitzakis, E., Chatzistelios, G., & Kirytopoulos, K. (2022). Project Management for Corporate Events: A Set of Tools to Manage Risk and Increase Quality Outcomes. *Sustainability (Switzerland)*, *14*(4). https://doi.org/10.3390/su14042009.

[28] Enshassi, A., Mohamed, S., Mustafa, Z. A., And, & Mayer, P. E. (2007). Factors affecting labour productivity in building projects in the Gaza strip. *Journal of Civil Engineering and Management*, *13*(4), 245–254. https://doi.org/10.1080/13923730.2007.9636444.

[29] Fellows, R. F., Langford, D., Newcombe, R., & Urry, S. (2009). *Construction management in practice.* John Wiley & Sons.

[30] Forcada, N., Gangolells, M., Casals, M., & Macarulla, M. (2017). Factors Affecting Rework Costs in Construction. *Journal of Construction Engineering and Management*, *143*(8). https://doi.org/10.1061/(asce)co.1943-7862.0001324.

[31] Gebrehiwet, T., & Luo, H. (2017). Analysis of Delay Impact on Construction Project Based on RII and Correlation Coefficient: Empirical Study. *Procedia Engineering*, *196* (June), 366–374.https://doi.org/10.1016/j.proeng.2017.07.212.

[32] Hanna, A. S., & Sullivan, K. T. (2004). Impact of overtime on construction labor productivity. *Cost Engineering (Morgantown, West Virginia)*, *46*(4), 20–27.

[33] Iyer, K. C. ., & Jha, K. N. (2005). Factors affecting cost performance: evidence from Indian construction projects. *International Journal of Project Management*, *23*, 283–295.

[34] Jaffar, N., Tharim, A. H. A., & Shuib, M. N. (2011). Factors of Conflict in Construction Industry: A Literature Review. *Procedia Engineering*, *20*, 193–202. https://doi.org/10.1016/j.proeng.2011.11.156.

[35] Jahan, S., Khan, K. I. A., Thaheem, M. J., Ullah, F.,

Alqurashi, M., & Alsulami, B. T. (2022). Modeling Profitability-Influencing Risk Factors for Construction Projects: A System Dynamics Approach. *Buildings*, *12*(6). https://doi.org/10.3390/buildings12060701.

[36] Jere Jacobs, & Sanders, S. (2008). Construction Management Performance;Readness Assessment for managing large projects. *ScottMadden Management Consultants-North Carolina,USA*.

[37] Kantová, R. (2017). Construction Machines as a Source of Construction noise. *Procedia Engineering*, *190*, 92–99. https://doi.org/10.1016/j.proeng.2017.05.312.

[38] Khamaksorn, A. (2016). *Project Management Knowledge and Skills for the Construction Industry*. 72–77. https://doi.org/10.15242/iicbe.dir1216416.

[39] Khlaifat, D. M., Alyagoub, R. E., Sweis, R. J., & Sweis, G. J. (2019). Factors leading to construction projects' failure in Jordon. *International Journal of Construction Management*, *19*(1), 65–78. https://doi.org/10.1080/15623599.2017.1382092.

[40] Kim, S., Chang, S., & Castro-Lacouture, D. (2020). Dynamic Modeling for Analyzing Impacts of Skilled Labor Shortage on Construction Project Management. *Journal of Management in Engineering*, *36*(1), 1–13. https://doi.org/10.1061/(asce)me.1943-5479.0000720.

[41] Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.

[42] KPI. (2000). KPI Report for Minister for Construction. *Department of the Environment, Transport and the Regions-The KPI Working Group*, *January*.

[43] Kuprenas, J. A. (2003). *Project management actions to improve design phase cost performance*, *Journal of Management in Engineering*. *19*(1), 25–32.

[44] Lee, J. S., Son, S., Kim, S., & Son, K. (2021). Correlation analysis of safety climate and construction productivity in South Korea. *International Journal of Occupational Safety and Ergonomics*, *27*(2), 589–596. https://doi.org/10.1080/10803548.2020.1741279.

[45] Levy, S. M. (2018). *Project management in construction*. McGraw-Hill Education.

[46] Lipman, R., Palmer, M., & Palacios, S. (2011). Assessment of conformance and interoperability testing methods used for construction industry product models. *Automation in Construction*, *20*(4), 418–428.https://doi.org/10.1016/j.autcon.2010.11.011.

[47] Love, P. E. D., Tse, R. Y. C., And, & Edwards, D. J. (2005). Time-cost relationships in australian building construction projects. *Journal of Construction Engineering and Management*, *131*(2), 187–194.

[48] Lu, S., & Yan, H. (2013). A comparative study of the measurements of perceived risk among contractors in China. *International Journal of Project Management*, *31*(2), 307–312. https://doi.org/10.1016/j.ijproman.2012.06.001.

[49] Manap, N., Mohd Noh, N. H., & Syahrom, N. (2018). Recruitment criteria and attraction strategies for local trained labour in Malaysia's construction industry. *IOP Conference Series: Earth and Environmental Science*, *109*(1). https://doi.org/10.1088/1755-1315/109/1/012011.

[50] Maylor, H., Vidgen, R., And, & Carver., S. (2008). Managerial complexity in project-based operations: A grounded model and its implications for practice. *Project Management Journal*, *39*(1), 15-26.

[51] Mengistu, D. G., & Mahesh, G. (2020). Dimensions for improvement of construction management practice in Ethiopian construction industry. *Journal of Engineering, Design and Technology*, *18*(1), 21–39. https://doi.org/10.1108/JEDT-10-2018-0175.

[52] Moza, A., Paul, V. K., & Solanki, S. K. (2022). Evaluating Project Complexity in Construction Sector in India. *Journal of Engineering Research and Sciences*, *1*(5), 198–212. https://doi.org/10.55708/js0105021.

[53] Navon, R. (2005). Automated project performance control of construction projects. *Automation in Construction*, *14*, 467–476.

[54] Nguyen, L. D., Ogunlana, S. O., & Lan, D. T. X. (2004). A study on project success factors in large construction projects in Vietnam. *Engineering, Construction and Architectural Management*, *11*(6), 404–413. https://doi.org/10.1108/09699980410570166.

[55] Niittymäki, O. I. & S. (2015). *CONSTRUCTION MANAGEMENT Study Book*. Häme University of Applied Sciences.

[56] Nitithamyong, P., & Skibniewski, M. J. (2006). Success/Failure Factors and Performance Measures of Web-Based Construction Project Management Systems: Professionals' Viewpoint. *Journal of Construction Engineering and Management*, *132*(1), 80–87.https://doi.org/10.1061/(asce)0733-9364(2006)132: 1(80).

[57] Noruwa, B. I., Arewa, A. O., & Merschbrock, C. (2022). Effects of emerging technologies in minimising variations in construction projects in the UK. *International Journal of Construction Management*, *22*(11), 2199–2206. https://doi.org/10.1080/15623599.2020.1772530.

[58] Okuwoga, A. A. (1998). Cost-time performance of public sector housing projects in Nigeria. *Habitat Intl.*, *22*(4), 389–395.

[59] Omopariola, E. D., Windapo, A., Edwards, D. J., & Thwala, W. D. (2020). Contractors' perceptions of the effects of cash flow on construction projects. *Journal of Engineering, Design and Technology*, *18*(2), 308–325. https://doi.org/10.1108/JEDT-04-2019-0099.

[60] Passer, A., Kreiner, H., & Maydl, P. (2012). Assessment of the environmental performance of buildings: A critical evaluation of the influence of technical building equipment on residential buildings. *International Journal of Life Cycle Assessment*, *17*(9), 1116–1130. https://doi.org/10.1007/s11367-012-0435-6.

[61] Paton-Cole, V. P., & Aibinu, A. A. (2021). Construction Defects and Disputes in Low-Rise Residential Buildings. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, *13*(1).https://doi.org/10.1061/(asce)la.1943-4170.0000433.

[62] Perrenoud, A. J., & Sullivan, K. T. (2017). Analysis of Executive Succession Planning in 12 Construction Companies. *International Journal of Construction Education and Research*, *13*(1), 64–80. https://doi.org/10.1080/15578771.2016.1143892.

[63] Pheng, L. S., & Chuan, Q. T. (2006). Environmental factors and work performance of project managers in the construction industry. *International Journal of Project Management*, *24*, 24–37.

[64] Portny, S. E. (2015). Project Management For Dummies. In *Wiley Publishing* (Vol. 14, Issue 1).

[65] Robichaud, L. B., & Anantatmula, V. S. (2011). Greening Project Management Practices for Sustainable Construction. *Journal of Management in Engineering*, *27*(1), 48–57. https://doi.org/10.1061/(asce)me.1943-5479.0000030.

[66] Rowlinson, S., Yunyanjia, A., Li, B., & Chuanjingju, C. (2014). Management of climatic heat stress risk in construction: A review of practices, methodologies, and future research. *Accident Analysis and Prevention*, *66*, 187–198. https://doi.org/10.1016/j.aap.2013.08.011.

[67] Rwelamila P.D. (2000). African Construction Industries in Turmoil?. *The Implications for NEPAD. Proceedings of the CIB W107 1st International Conference., Stellenboch South Africa.*

[68] Sage, D., Dainty, A., & Brookes, N. (2014). A critical argument in favor of theoretical pluralism: Project failure and the many and varied limitations of project management. *International Journal of Project Management*, *32*(4), 544–555. https://doi.org/10.1016/j.ijproman.2013.08.005.

[69] Sasitharan Nagapan, Ismail Abdul Rahman, & Ade Asmi. (2011). A Review of Construction Waste Cause Factors. *Conference of Real Estate: Sustainable Growth Managing Challenges, Johor Bahru, Malaysia*. http://eprints.uthm.edu.my/2665/.

[70] Shenhar, A., Dvir, D., Levy, O., & Maltz, A. (2001). Project Success:a multidimentional strategic concept. *Long Range Planning*, *no 34*, 699–725.

[71] Smith, P. (2014). Project Cost Management – Global Issues and Challenges. *Procedia - Social and Behavioral Sciences*, *119*, 485–494. https://doi.org/10.1016/j.sbspro.2014.03.054.

[72] Smith, P. (2016). Global Professional Standards for Project Cost Management. *Procedia - Social and Behavioral Sciences*, *226* (October 2015), 124–131.https://doi.org/10.1016/j.sbspro.2016.06.170.

[73] Tam, C. M., Zeng, S. X., & Deng, Z. M. (2004). Identifying elements of poor construction safety management in China. *Safety Science*, *42*(7), 569–586. https://doi.org/10.1016/j.ssci.2003.09.001.

[74] Ugwu, O. O., & Haupt, T. C. (2007). Key performance indicators and assessment methods for infrastructure sustainability – a South African construction industry perspective. *Building and Environment*, *42*, 665–680.

[75] URT. (2003). Construction Industry Policy. *National Construction Council(NCC)*.

[76] Van Wyngaard, C. J., Pretorius, J. H. C., & Pretorius, L. (2012). Theory of the triple constraint -A conceptual review. *IEEE International Conference on Industrial Engineering and Engineering Management*, 1991–1997. https://doi.org/10.1109/IEEM.2012.6838095.

[77] Vilventhan, A., Ram, V. G., & Sugumaran, S. (2019). Value stream mapping for identification and assessment of material waste in construction: A case study. *Waste Management and Research*, *37*(8), 815–825. https://doi.org/10.1177/0734242X19855429.

[78] Wang, J., & Yuan, H. (2011). Factors affecting contractors' risk attitudes in construction projects: Case study from China. *International Journal of Project Management*, *29*(2), 209–219. https://doi.org/10.1016/j.ijproman.2010.02.006.

[79] Wieser, A. A., Scherz, M., Passer, A., & Kreiner, H. (2021). Challenges of a healthy built environment: Air pollution in construction industry. *Sustainability (Switzerland)*, *13*(18). https://doi.org/10.3390/su131810469.

[80] Willner, T., Lipshits-Braziler, Y., & Gati, I. (2020). Construction and Initial Validation of the Work Orientation Questionnaire. *Journal of Career Assessment*, *28*(1), 109–127. https://doi.org/10.1177/1069072719830293.

[81] Windapo, D. A. (2013). Fundamentals of construction management. In *Construction management & Economics* (1st ed.).

[82] Wong, K. D. A., Wong, K. W. F., & Nadeem, A. (2011). Building information modelling for tertiary construction education in Hong Kong. *Electronic Journal of Information Technology in Construction*, *16*, 467–476.

[83] Yan, H., Elzarka, H., Gao, C., Zhang, F., & Tang, W. (2019). Critical Success Criteria for Programs in China: Construction Companies' Perspectives. *Journal of Management in Engineering*, *35*(1). https://doi.org/10.1061/(asce)me.1943-5479.0000659.

[84] Yu, Z., Peng, H., Zeng, X., Sofi, M., Xing, H., & Zhou, Z. (2019). Smarter construction site management using the latest information technology. *Proceedings of the Institution of Civil Engineers: Civil Engineering*, *172*(2), 89–95. https://doi.org/10.1680/jcien.18.00030.