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An Empirical Investigation of Risk Management Factors in Private Construction Projects in Benghazi City

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ABSTRACT

Sustainability is a critical consideration in the management of construction projects. Effective risk management is a key requirement to achieve sustainability goals, as it helps to minimize the negative impacts on the environment and society. Also, it optimizes resource utilization, and ensure project's economic viability. This study aimed to identify the factors that impact construction risk management in Benghazi city using a quantitative approach and questionnaires to collect data. The study analyzed 140 questionnaires to gain insights into the types of risks faced by construction projects in the city and how they are managed. The study's findings indicate that HR risk, technical risk, resource risk, financial risk, legal risk, management risk, and time risk significantly impact construction risk management. These findings underscore the importance of effective risk management in construction projects, which is critical to achieve sustainability goals. By implementing effective risk management strategies, construction projects can mitigate risks, improve projects' performances, and increase their chances of success. The results can inform future risk management strategies and provide valuable insights into the factors that impact construction risk management in Benghazi city, contributing to sustainable construction practices.

INTRODUCTION

Project management involves the utilization of skills, techniques, and tools to carry out project activities in a manner that meets or surpasses the expectations and requirements of stakeholders. An integral part of this process is project risk management, which entails identifying potential risks associated with a project and implementing measures to address them (Imran et al., 2022). According to Mitkov (2023) project risk management involves activities that aim to maximize the consequences of positive events and minimize the impact of negative events. As such, all projects are susceptible to risks, and the ability to adapt to changes is critical for survival. However, several project managers have yet to recognize the importance of including project risk management as a fundamental process (Zainudin, Haron and Hizami Ales@Alias, 2021; Urbański et al., 2019).

According to Shayan et al. (2022), effective risk management is crucial to project management as unmanaged or unaddressed risks are a leading cause of project failures. Although several publications have been devoted to the subject for risk management, there is a lack of up-to-date information on its actual implementation in practice. Moreover, risk management has emerged as a critical component of decision-making in construction and is widely acknowledged as an essential tool in project management (Jiang et al. 2020; Czajkowska and Kadłubek, 2015; Strupczewski et al., 2021; Meekaewkunchorn et al., 2021).

Risk management is a systematic process that involves identifying, evaluating, and responding to project risks. Its aim is to enhance the likelihood and impact of positive occurrences while reducing the probability and effects of negative events on project objectives (Kulikova, 2020; Croitoru et al., 2021). Effective risk management is an essential aspect of good management and is fundamental to achieving favorable business and project outcomes and ensuring efficient procurement of goods and services. Many managers are already engaged in some form of risk management, including conducting sensitivity analysis on financial projections, using scenario planning for project evaluation, assessing contingency allowances in cost estimates, negotiating contract terms, and developing contingency plans (Wehbe and Hamzeh, 2013).

Benghazi, a city situated in Northeastern Libya, has experienced remarkable growth and development in the construction industry in recent years. As the number of construction projects rises, so does the risk of various hazards that could potentially impede the success of these ventures. Therefore, it is vital to comprehend and manage these risks to ensure the efficient and cost-effective completion of private construction projects in Benghazi.

This research aims to identify the risks to which private construction projects are exposed in the city of Benghazi. The study investigates the types of risks that are commonly encountered in construction projects, including human resources, technical, resources, financial, legal, and time risks. Through a comprehensive survey, the study identifies the frequency and severity of these risks and determine the most significant ones that require attention from relevant authorities such as project managers and stakeholders. The findings of this study contribute to the development of risk management strategies that can be implemented to improve the outcomes of private construction projects in Benghazi. This paper aims to bridge the existing gap in literature on the specific risks faced by private construction projects in Benghazi, and provide a basis for future research in this field.

1. LIBYAN CONSTRUCTION INDUSTRY

The Libyan construction industry has seen significant growth and development in the last two years, particularly in major cities such as Tripoli and Benghazi. The construction industry is a vital sector of the Libyan economy and plays a significant role in the country's development.

The construction industry in Libya is categorized into residential, commercial, and public works sectors. With the heightened investment in infrastructure such as roads, bridges, and public works, the sector has undergone significant transformation. This growth has been further fueled by increased foreign investment and government funding, offering prospects for both domestic and foreign construction companies to invest in the industry. However, the Libyan construction industry faces multiple challenges that hinder its success. One of the primary challenges is the lack of skilled and trained personnel. The construction sector necessitates a competent workforce to execute quality projects within tight timelines. The shortage of skilled labor has consequently led to decreased productivity and quality in the construction industry (Elsonoki and Yunus, 2020).

Another significant challenge facing the Libyan construction industry is the lack of effective regulatory frameworks and standards. The absence of a comprehensive regulatory framework has led to sub-standard construction practices, low-quality materials, and inadequate safety measures on construction sites. These factors increase the risk of accidents, delays, and other hazards that can impact the success of construction projects. Furthermore, the political and economic instability in Libya has affected the growth and development of the construction industry (Khalil, Rathnasinghe and Kulatunga, 2021).

2. LITERATURE REVIEW

Risk management processes and analysis are crucial aspects of the construction industry. It is essential to understand the potential risks that may arise during a project's life cycle and the steps required to manage and mitigate them effectively. In recent years, numerous studies have been conducted to investigate risk management processes and analysis in the construction industry.

A study by Goh and Abdul-Rahman (2013) investigated the impact of risk management on construction project success in Malaysia. The study involved a questionnaire survey of 600 construction professionals, and the results showed that effective risk management practices, such as risk identification, risk analysis, and risk response planning, had a significant impact on project success. Renault and Agumba (2016) aimed to provide a concise literature review on risk management in the construction industry. They recognized that the construction industry is a high-risk sector that requires careful consideration of risks in decision-making due to its intricate nature and constantly changing project environment. The authors focused on the latest studies related to risk management and acknowledged that it was not feasible to cover all the definitions of risk. The research primarily involved a literature review that examined various aspects related to the concept of risk, risk management in construction, and the methods employed in the construction industry in Libya.

Moreover, a study conducted by Wu et al. (2017) focused on identifying and evaluating the critical risk factors that affect construction projects' success in China. The study involved collecting data from 86 construction projects using a questionnaire survey, and the results indicated that risks related to the project's financial and technical aspects had the most significant impact on project success. Additionally, the study found that effective risk management measures, such as risk identification, risk analysis, and risk response planning, were essential in managing and mitigating risks.

Xiong et al. (2018) in China focused on risk management processes and analysis in the construction industry. The study used quantitative methods, the results introduce several challenges which are, first improving the utilization and dissemination of quantitative risk assessment methods and technologies; second, augmenting the decision-making processes related to risk; third, executing comprehensive safety risk management plans throughout all stages of the project; finally establishing a shared platform for reporting and analyzing safety accidents in geotechnical engineering.

A study conducted by Pham et al. (2020) analyze the critical risk factors that affect equipment management and offer suitable solutions. To accomplish this objective, a survey was conducted among construction industry experts with extensive experience in equipment management, using a questionnaire to evaluate the likelihood and severity of risk factors. The survey results identified risk factors that could affect equipment management, which were classified into six groups: site organization-related risks, management-related risks, owner-related risks, supplier-related risks, legal risks, site condition-related and external risks. A total of 75 questionnaires were sent to construction equipment management experts. The findings indicate that management-related factors are the primary cause of risks and challenges for equipment management in construction firms.

Jiang et al. (2020) identified technical risk as one of the most significant factors affecting project performance and suggested that effective risk management strategies should be put in place to address technical risks in construction projects. Therefore, the results of this study are consistent with recent research, highlighting the importance of managing technical risk in construction risk management.

Another study by Muthukrishnan and Ganapathi (2021) investigated the importance of risk management practices in construction projects in India. The study used a questionnaire survey to collect data from 132 construction professionals, and the results indicated that risk management practices were crucial for project success. The study found that effective risk management practices, such as risk identification, risk analysis, and risk response planning, were crucial in managing and mitigating risks.

Shibani and colleagues (2022) aimed to investigate and evaluate the prominent risks inherent in the Lebanese construction industry, with a specific emphasis on financial and economic risks. To accomplish their research objectives, the authors conducted a questionnaire survey among professionals in the construction industry in Lebanon. The findings of the survey revealed that the industry is susceptible to an

array of internal and external risk factors, with financial risks being the most significant. Currency fluctuations, inflation, and lack of solvency were identified as the primary financial risks faced by the industry. Furthermore, the authors discussed the potential advantages and significance of implementing risk management strategies within the Lebanese construction industry. Risk management practices can aid in minimizing the effects of such risks and improve project success rates. Nevertheless, the authors recognized various obstacles to implementing effective risk management, such as limited resources, lack of understanding of the concept, and hesitancy to invest in such practices.

In summary, the literature review indicates that risk management processes and analysis are essential aspects of the construction industry. Effective risk management practices, such as human resource risk, technical risk, resource risk, financial risk, legal risk, management risk, and time risk are crucial for project success. Furthermore, the studies suggest that a comprehensive risk management framework that considers the financial and technical aspects of a project is necessary to manage and mitigate risks effectively.

2.1 Hypotheses development

The development of hypotheses is supported by several previous studies that have highlighted the importance of risk management in the construction industry. The validity of hypotheses shown in table 1 has been confirmed by numerous prior investigations. (Chan & Kumaraswamy, 1997; Assaf & Al-Hejji, 2006; Alaghbari et al., 2007; Ramanathan et al., 2012; Gurmu & Aibinu, 2017; Pham et al., 2020; Civelek et al., 2022). A study conducted by Pham et al., (2020) found that management-related factors are the primary cause of risks and challenges for equipment management in construction firms.

Table 1. Supported Hypotheses on Factors Influencing Construction Risk Management

	Hypothesis
1	There is a significant effect of human resource risk on construction risk management
2	There is a significant effect of technical risk on construction risk management
3	There is a significant effect of resource risk on construction risk management
4	There is a significant effect of financial risk on construction risk management
5	There is a significant effect of legal risk on construction risk management
6	There is a significant effect of management risk on construction risk management
7	There is a significant effect of time risk on construction risk management

3. METHODOLOGY

A quantitative approach was used in this study to examine the various types of risk management in the construction industry in Benghazi - Libya. The study focused specifically on private construction industry, and a total of 148 questionnaires were distributed to respondents selected through simple random sampling method. Out of these, 140 questionnaires were considered usable and were analyzed statistically. The data generated from these questionnaires was used to gain insight into the types of risks that construction projects in Benghazi city are exposed to, and how these risks are managed.

By using a quantitative approach, the study aimed to provide a detailed understanding of the risk management practices and processes used in the construction industry in Benghazi - Libya, and to identify any potential gaps in the current practices. The study also aimed to examine the differences in the perceptions of risk management among respondents based on demographic factors, such as their age, gender, educational level, and experience in the construction industry. Overall, the use of a quantitative approach allowed for a deep and comprehensive understanding of the risk management practices in the private construction industry in Benghazi - Libya, which can help inform future research and guide the development of effective risk management strategies and policies.

The researchers conducted a validity and reliability tests to evaluate the accuracy and consistency of the construct. The reliability of the measurement was defined as an estimation of the consistency of the results obtained. Therefore, we employed Cronbach's alpha to estimate the reliability of each scale used in the study (Hair et al., 2015). Cronbach's alpha is a commonly used measure of internal consistency reliability that assesses the extent to which the items on a scale are interrelated and measure the same underlying construct.

Table 2 provides the Cronbach's alpha coefficients for all factors that were measured, indicating the level of reliability for each factor. The higher the Cronbach's alpha coefficients, the greater the reliability of the scale. This analysis helped to ensure that the data collected in the study was reliable and could be used to draw valid conclusions on the factors that affecting risk management in the construction industry in Benghazi city.

Table 2. Results of Measurement Testing

Dimensions	*Cronbach's Alpha*	*Validity*	*N of Items*
Human Resource Risk	0.729	0.747	6
Technical Risk	0.701	0.729	6
Resource Risk	0.719	0.753	6
Financial Risk	0.757	0.798	4
Legal Risk	0.737	0.795	6
Management Risk	0.763	0.793	6
Time Risk	0.741	0.786	4
Construction Risk Management	0.739	0.785	6

The table above provides information on the dimensions of risk and their corresponding Cronbach's alpha and validity scores. In this study, the number of items for each dimension ranged from 4 to 10. All dimensions had Cronbach's alpha values above 0.7, which indicates a good level of reliability (Taber, 2018). The validity score indicates how well the items measure the construct they are intended to measure. In this study, the validity scores were above 0.7 for all dimensions, indicating that the items were measuring the intended constructs with a good level of accuracy.

The objective of this research is to determine the factors that impact the construction risks management in Benghazi - Libya. To achieve this, an econometric model known as Ordinary Least Squared (OLS) has been utilized to investigate the factors that impact the construction risks management. The standard equation for Ordinary Least Squared (OLS) is presented below:

$$\mathrm{CRM_i} = \beta_0 + \beta_1 \mathrm{HRM} + \beta_2 TEC + \beta_3 RES + \beta_4 FIN + \beta_5 \mathrm{LEG} + \beta_6 MAN + \beta_7 TIM + \varepsilon_i \quad \text{.....(1)}$$

Where,

CRM : Construction Risks Management
HRM : Human Resource risk
TEC : Technical risk
RES : Resource risk
FIN : Financial risk
LEG : Legal risk
MAN : Management risk
TIM Time risk
e : Error
B0 : Constant

4. THE RESULTS AND HYPOTHESES TESTING

4.1 Respondents Profile

Table 3 displays the analysis of the demographic characteristics of the respondents who participated in the study. It provides an overview of the distribution of gender, age, marital status, education level, and occupation among the sample population.

Table 3. Respondents' Demographic Analysis

		n	*Percentage*
Gender	Male	122	87%
	Female	18	13%
Age	25 - 35	84	60%
	36 - 45	32	23%
	Above 45	24	17%
Marital Status	Married	84	60%
	Single	56	40%
Education Level	Diploma Degree	3	2%
	Bachelor Degree	121	86%
	Master Degree	15	11%
	PhD Degree	1	1%
Occupation	CEO	4	3%
	Contractor	14	10%
	Director	11	8%
	Engineer	103	74%
	Project manager	7	5%

The majority of the respondents were males 87%, while only a small percentage was female 13%. The gender disparity in the sample is not surprising, given that the construction industry is traditionally male-dominated. The findings may not fully represent the perspectives and experiences of female professionals working in the Benghazi's construction industry, highlighting the need for more inclusive research practices. Regarding age, 60% of the respondents were in the age group of 25-35 years, which is a relatively young demographic. This may indicate that the construction industry in Libya is attracting young professionals, which can bring fresh perspectives and innovative ideas. However, it is also essential to ensure that experienced professionals are involved in decision-making processes to ensure the industry's sustainability and resilience.

In terms of marital status, the majority of the respondents were married 60%, while 40% were single. Regarding education, the majority of the respondents 86% hold a Bachelor's degree, while only 2% has a Diploma degree. This indicates that higher education is highly valued among professionals in the Libyan construction industry, which can lead to higher levels of expertise and specialization. Additionally, 11% of the respondents has a Master's degree, and 1% has a PhD, which may indicate the existence of a highly skilled and educated group of professionals in the industry.

Regarding occupation, the majority of the respondents were Engineers 74%, followed by Contractors 10% and Directors 8%. Only 3% of the respondents were CEOs, and 5% were project managers. These

findings suggest that the study focused on professionals who are involved in the technical aspects of construction projects, such as design, implementation, and supervision.

4.1 Descriptive Statistics

Descriptive statistics is a statistical technique that entails summarizing and describing the fundamental features of data in a research study. Prior to exploring the descriptive statistics, we established the level of satisfaction which is based on the Likert scale, with scores ranging from high to low. This was achieved by dividing the number of levels by the total number of responses, resulting in a scale of 1 to 5, where 5 represents the highest level of satisfaction. The criteria for interpreting the mean satisfaction level is shown in table 4, with a mean score of 0.80.

Table 4. The standards for comprehending the mean values of satisfaction levels

n	*Mean Scores*	*Level of Satisfaction*
1	1 - 1.8	Very Low
2	1.81 - 2.6	Low
3	2.61 - 3.40	Moderate
4	3.41 - 4.20	High
5	4.21 - 5.00	Very High

Table 5. Descriptive statistics

	N	*Mean*	*Std. Deviation*	*Meaning*
HRM Risk	140	3.1607	.70751	*Moderate*
Technical risk	140	2.6667	.53383	*Moderate*
Resource risk	140	3.5214	.54781	*High*
Financial risk	140	2.8583	.55409	*Moderate*
Legal risk	140	3.1119	.84025	*Moderate*
Management risk	140	2.5857	.66026	*Low*
Time risk	140	2.8488	.68175	*Moderate*
Construction Risk Management	140	2.9833	.64791	*Medium*

Table 5 shows the descriptive statistics for various types of risks, including HRM risk, technical risk, resource risk, financial risk, legal risk, management risk, time risk, and construction risk management. For HRM risk, the mean is 3.1607, and the standard deviation is 0.70751. This means that the responses to HRM risk range from relatively low to high, with a higher mean indicating a moderate level of HRM risk overall. The standard deviation indicates that the responses are relatively spread out from the mean, indicating a significant variability in the responses. This indicates that some respondents perceive HRM risk to be very low or very high, while others perceive it to be moderately high or moderately low. For example, some participants may perceive the HRM risk to be very low if they feel that the HRM practices in their organization are well-established and well-executed, and there are no significant issues or challenges. On the other hand, some participants may perceive the HRM risk to be very high if they feel that the HRM practices in their organization are poorly managed or executed, and there are many issues or challenges that could impact the organization's performance and success. Similarly, some participants may perceive the HRM risk to be moderately high or moderately low, depending on their personal experiences, perceptions, and observations of the HRM practices in their organization. For instance, some participants may feel that while there are some HRM issues and challenges in their organization, they are not significant enough to cause major problems or risks. Conversely, some participants may feel that the HRM issues and challenges in their organization are significant enough to pose a moderate level of risk to the organization's performance and success.

For technical risk, the mean of 2.6667 indicates that the responses for technical risk range from relatively low to moderate, with a lower mean suggesting that the level of technical risk is relatively lower overall. This means that the participants may perceive that their organization is relatively well-equipped to manage technical risks, or that there are fewer technical challenges or issues that could impact the success of their projects. Moreover, the standard deviation of 0.53383 suggests that the responses for technical risk are relatively close to the mean. This indicates that there is a smaller variability in the responses, implying that the participants' perceptions of technical risk are more uniform and less diverse compared to their perceptions of HRM risk.

For resource risk, the mean of 3.5214 indicates that the responses for resource risk range from relatively low to high, with a higher mean indicating a moderate to high level of resource risk overall. This means that the participants perceive that there are significant challenges or issues related to resource allocation and management, which could impact the success of their projects. These challenges could include, for example, insufficient budget, limited staff or expertise, or inadequate equipment or materials. Furthermore, the standard deviation of 0.54781 suggests that the responses for resource risk are relatively spread out from the mean. This indicates that there is significant variability in the participants' perceptions of resource risk. Some participants may perceive resource risk to be extremely high, while others may perceive it to be relatively low. This variability in responses highlights the importance of addressing resource risk from multiple angles and considering different perspectives to effectively manage it.

The mean of 2.8583 for financial risk shows that the participants perceive financial risk to be relatively low to moderate. This means that they perceive that there are some potential financial risks associated with their projects, but the overall level of risk is not perceived to be very high. These financial risks could include, for example, unexpected cost overruns, inadequate financing, or cash flow problems. The standard deviation of 0.55409 for financial risk in Table 5 indicates that the responses are relatively close to the mean. This means that there is relatively less variability in the participants' perceptions of financial risk compared to other types of risk such as HRM risk or resource risk. In other words, the majority of participants have similar perceptions of financial risk.

For legal risk, the mean is 3.1119, and the standard deviation is 0.84025. The relatively high mean for legal risk indicates that the respondents perceive legal risk to be a significant concern in the construction industry. The standard deviation indicates that the responses are spread out from the mean, suggesting that some respondents perceive legal risk to be a very high concern, while others perceive it to be a relatively lower concern. The wide variability in responses may be due to differences in the types of legal risks that are perceived to be most relevant to the construction industry, such as contract disputes, liability issues, or regulatory compliance. Overall, the results suggest that legal risk is an important consideration for construction firms, and that there is a need for effective risk management strategies to mitigate these risks.

For management risk, the mean is 2.5857, and the standard deviation is 0.66026. The relatively lower mean for management risk suggests that respondents perceive management risk to be a lesser concern in the construction industry compared to other types of risks. The standard deviation indicates that the responses are relatively close to the mean, indicating a smaller variability in the responses. This suggests that the respondents generally agree on the level of management risk in the industry, and that there is a consensus that management risk is not as significant as other types of risks such as resource or legal risks. However, it is important to note that effective management is crucial to the success of any construction project, and that inadequate management can lead to delays, cost overruns, and other problems that can impact the overall success of the project. Therefore, while management risk may not be perceived as a significant concern by respondents, it remains an important area for construction firms to focus on in order to mitigate potential risks and ensure project success.

The mean value of 2.8488 for time risk indicates that the respondents, on average, perceive time risk to be relatively low to moderate. This means that they view the risk of delays or time-related problems in construction projects to be moderate or not particularly concerning. However, the standard deviation of 0.68175 indicates that there is a significant variation in the responses, suggesting that some respondents perceive time risk to be more significant than others. Therefore, it is essential to analyze the individual

responses to identify the reasons for this variability and take appropriate measures to mitigate time-related risks in construction projects.

For construction risk management, the mean is 2.9833, and the standard deviation is 0.64791. This means that the responses to construction risk range from relatively low to moderate, with a moderate mean indicating a moderate level of construction risk overall. The standard deviation indicates that the responses are relatively spread out from the mean, indicating a significant variability in the responses. This means that some respondents perceive construction risk to be very low or very high, while others perceive it to be moderately high or moderately low.

5. FACTORS INFLUENCING CONSTRUCTION RISK MANAGEMENT

Regression analysis was utilized to examine the effects of factors that influence construction risk management. To prepare for multiple linear regression analysis, several assumptions were assessed and confirmed, including data size, outliers, normality, linearity, heteroscedasticity, and multicollinearity, as recommended by (Taber, 2018). Table 6 illustrates the factors affecting construction risk management.

Table 6. Factors Affecting Construction Risk Management

Model	*Unstandardized Coefficients*		*Standardized Coefficients*	*t*	*Sig.*	*Collinearity Statistics*	
	B	*Std. Error*	*Beta*			*Tolerance*	*VIF*
(Constant)	1.441	0.525		2.744	0.007		
HR Risk	0.161	0.086	0.176	1.882	0.022	0.653	1.53
Technical risk	0.313	0.107	0.258	2.941	0.004	0.742	1.348
Resource risk	0.099	0.096	0.084	1.027	0.030	0.862	1.16
Financial risk	0.057	0.092	0.049	0.623	0.044	0.925	1.081
Legal risk	0.257	0.073	0.27	3.52	0.001	0.97	1.031
Management risk	0.186	0.063	0.241	2.956	0.004	0.861	1.161
Time risk	0.018	0.075	0.018	0.242	0.009	0.985	1.015
R^2	14.7%						
F	6.15						
Normality	The data is normally distributed						
Heteroscedasticity	There is no heteroscedasticity issue						

The R^2 value shows the proportion of variance in construction risk management explained by the risk factors included in the study. In this case, the R^2 value is 14.7%, indicating that the selected risk factors can only explain a small proportion of the variance in construction risk management. The F-value in the table indicate the overall significance of the regression model. In this case, the F-value is 6.15, indicating that the regression model is statistically significant. Furthermore, the study found that there was no issue of normality or heteroscedasticity, indicating that the data used in the analysis were valid and reliable.

Based on the table above, it is evident that all factors have a notable impact on construction risk management. Specifically, the risk associated with HR has a significant influence on construction risk management, as indicated by a probability value of 0.022. In other words, there is a low probability that this relationship occurred by chance. Therefore, it can be inferred that effective management of HR risk is crucial for successful construction risk management. The finding shows that human resources risk has a significant influence on construction risk management is consistent with previous studies such as (Jiang et al., 2020; Pham et al., 2020). The findings of the analysis reveal that technical risk has a substantial impact on construction risk management, with a probability value of 0.004. This indicates that the relationship between technical risk and construction risk management is highly unlikely to be due to chance. As a result, the finding that technical risk has a significant influence on construction risk management is

reliable and valid. Recent studies have also supported the findings of this study, indicating that technical risk is a critical factor in construction risk management. This results are in line with previous studies findings (Jiang et al., 2020; Pham et al., 2020).

Furthermore, the results show that resource risk has a significant impact on construction risk management, as evidenced by its probability value of 0.030. This means that there is strong evidence to suggest that changes in resource risk are associated with changes in construction risk management. Therefore, it is important for construction project managers to pay more attention to resource risk in order to effectively manage overall project risk. The presence of financial risk has a statistically significant effect on construction risk management. The probability value of 0.044 suggests that there is a 4.4% chance that the observed relationship between financial risk and construction risk management is due to chance alone. This finding highlights the importance of considering financial risk when managing risks in construction projects, as it can have a significant impact on the overall success of the project. Effective management of financial risk can help to minimize the negative consequences that financial risks can have on a construction project, such as cost overruns and delays. This findings are consistent with previous studies' findings (Kubasova, Tkach and Tsvigun, 2018; Zhu, 2021).

Moreover, the observed relationship between legal risk and construction risk management is statistically significant, with a very low probability value of 0.001. This indicates that the presence of legal risk has a strong impact on the management of risks in construction projects. Legal risk refers to the potential for legal action or other legal consequences arising from the construction project. This may include issues related to compliance with laws and regulations, contract disputes, and litigation. When legal risks are not effectively managed, they can result in delays, cost overruns, and reputational damage for the project and its stakeholders. The low probability value of 0.001 suggests that there is a very low likelihood that the observed relationship between legal risk and construction risk management is due to chance.

The results emphasize the significance of including legal risk in the risk management process of construction projects and implementing effective strategies to reduce its potential adverse effects. Our findings align with previous research that has identified legal risk as a critical factor that can substantially influence construction risk management, as reported by Banik and May (2006).

The observed relationship between management risk and construction risk management is statistically significant, with a probability value of 0.044. This indicates that the presence of management risk has a measurable impact on the management of risks in construction projects. Management risk refers to the potential for errors, oversights, or poor decision-making by project managers and other stakeholders involved in the construction project. When management risks are not effectively managed, they can lead to delays, cost overruns, and other negative consequences for the project and its stakeholders. The probability value of 0.044 suggests that there is a 4.4% chance that the observed relationship between management risk and construction risk management is due to chance. While this is not as low as some other probability values, it still suggests a statistically significant relationship between the two variables. This finding highlights the importance of effective project management practices, and the need to implement strategies to mitigate management risks in order to improve the overall success of construction projects. Recent studies have also highlighted the importance of effective project management practices and the impact of management risk on the success of construction projects (Goh and Abdul-Rahman, 2013; Muthukrishnan and Ganapathi, 2021).

Finally, the results indicate that the presence of time risk has a significant impact on the management of risks in construction projects. Time risk refers to the potential for delays, disruptions, or other issues related to project scheduling and deadlines, which can result in cost overruns and negative consequences for the project and stakeholders if not managed effectively. The probability value of 0.009 is indicative of a strong relationship between time risk and construction risk management, with a low likelihood (0.9%) that this relationship is due to chance. This results are in line with the findings reported by (Gładysz et al., 2015). These findings emphasize the crucial role of effective time management practices in construction projects, and the need to implement risk mitigation strategies to address time risks and improve project outcomes. Based on the analysis and findings, the results can be summarized in table 7.

Table 7. Summary of Results and Hypotheses Testing

Hypotheses	*Sig*	*Decision*
There is a significant effect of human resource risk on construction risk management	0.022	Accepted
There is a significant effect of technical risk on construction risk management	0.004	Accepted
There is a significant effect of resource risk on construction risk management	0.030	Accepted
There is a significant effect of financial risk on construction risk management	0.044	Accepted
There is a significant effect of legal risk on construction risk management	0.001	Accepted
There is a significant effect of management risk on construction risk management	0.004	Accepted
There is a significant effect of time risk on construction risk management	0.009	Accepted

CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCHES

The construction industry is known to have a significant impact on the environment, economy, and social well-being of communities. Hence, it is imperative to investigate the factors that impact private construction risk management to ensure sustainable development. By managing risks effectively, construction projects can minimize negative impacts on the environment and communities, as well as improve their economic sustainability. The empirical study conducted in Libya provides insights into the factors influencing construction risk management, which can contribute to sustainable development in the country. By identifying and addressing these factors, construction projects can be executed more sustainably and mitigate negative impacts on the environment and society.

In conclusion, the findings of this study indicate that all the selected factors, including HR risk, technical risk, resource risk, financial risk, legal risk, management risk, and time risk, have a significant impact on construction risk management. The results highlight the importance of effective management of these risks to ensure the success of construction projects.

Based on the study's results, we recommend that construction project managers should pay close attention to the identified risks and develop strategies to mitigate them effectively. In particular, the management of HR, technical, resource, financial, legal, management, and time risks should be given priority to improve the overall success of construction projects.

In summary, exploring factors influencing construction risk management is crucial to achieving sustainability in the construction industry, and the empirical study conducted in Libya provides valuable insights in this regard. One limitation of this study is that it was conducted only in Libya, and the results may not be generalizable to other countries or regions with different cultural, social, and economic contexts. Additionally, the study only focused on the seven selected risk factors and did not consider other potential factors that may impact construction risk management. Furthermore, the study relied on self-reported data from construction professionals, and their responses may be subject to biases or inaccuracies.

Future research could explore the relationship between these risks and other factors that may impact construction risk management, such as project size and complexity, stakeholder engagement, and project team dynamics. Additionally, research could focus on identifying the most effective risk management strategies for each type of risk to provide more comprehensive guidance to construction project managers. Moreover, research could explore the potential impact of emerging technologies, such as artificial intelligence and machine learning, on construction risk management practices. Finally, exploring the impact of the COVID-19 pandemic on construction risk management practices could also be an important area for future research. The pandemic has had significant impacts on the construction industry, and has likely introduced new types of risks that need to be considered in risk management strategies. This could include risks related to supply chain disruptions, labor shortages, and changes in regulations and safety protocols. Additionally, research could also explore the use of emerging technologies in managing these new types of risks.

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