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THE EFFECT OF RISK MANAGEMENT PRACTICES ON PROJECT PERFORMANCE: A CASE STUDY OF THE LIBYAN CONSTRUCTION INDUSTRY

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ABSTRACT

Purpose: The general aim of the study was to investigate the implementation of risk management in the construction industry in Libya.

Theoretical framework: The role of risk management in project management in the construction industry in Libya is described in this paper. The study involved more than three hundred construction companies located in Tripoli and Benghazi as these are two main cities in Libya where construction was most active and involved big projects and large investment.

Design/methodology/approach: Questionnaires which were designed based on cluster sampling were sent to respondents i.e., basically the company managers and 250 replies were obtained. Structured equation modelling was used to analysis the information by Smart-PLS program. The risk management processes defined by identification, assessment and monitoring which contributed to the project success was also related to the financial risk.

Findings: The study found that risk management practices had substantial and favourable effects on the success of the project's execution. Further the awareness of quality management in terms of risks was most encouraging.

Research, Practical & Social implications: The current findings of this research have shown that most studies focus on the effect of risk management practices as strong tool to improve the project performance. A productivity survey might give a better overview of risk management at other sectors as it concerns the actual output of the construction companies.

Originality/value: The systematic literature review approach was hardly found in study of risk management and project performance. At the same time, the exploratory method was applied to synthesize previous studies on risk management and project performance in construction companies.

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O EFEITO DAS PRÁTICAS DE GERENCIAMENTO DE RISCOS NO DESEMPENHO DO PROJETO: UM ESTUDO DE CASO DO SETOR DE CONSTRUÇÃO DA LÍBIA

RESUMO

Objetivo: O objetivo geral do estudo foi investigar a implementação do gerenciamento de riscos no setor de construção na Líbia.

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Estrutura teórica: O papel do gerenciamento de riscos no gerenciamento de projetos no setor de construção na Líbia é descrito neste documento. O estudo envolveu mais de trezentas empresas de construção localizadas em Trípoli e Benghazi, pois essas são as duas principais cidades da Líbia onde a construção era mais ativa e envolvia grandes projetos e grandes investimentos.
Projeto/metodologia/abordagem: Os questionários elaborados com base em amostragem por conglomerados foram enviados aos entrevistados, ou seja, basicamente aos gerentes das empresas, e foram obtidas 250 respostas. A modelagem de equações estruturadas foi usada para analisar as informações pelo programa Smart-PLS. Os processos de gerenciamento de risco definidos por identificação, avaliação e monitoramento que contribuíram para o sucesso do projeto também foram relacionados ao risco financeiro.
Conclusões: O estudo constatou que as práticas de gerenciamento de riscos tiveram efeitos substanciais e favoráveis sobre o sucesso da execução do projeto. Além disso, a conscientização do gerenciamento da qualidade em termos de riscos foi muito encorajadora.
Implicações sociais, práticas e de pesquisa: Os resultados atuais desta pesquisa mostraram que a maioria dos estudos se concentra no efeito das práticas de gerenciamento de riscos como uma ferramenta forte para melhorar o desempenho do projeto. Uma pesquisa de produtividade pode fornecer uma visão geral melhor do gerenciamento de riscos em outros setores, pois diz respeito à produção real das empresas de construção.
Originalidade/valor: A abordagem de revisão sistemática da literatura dificilmente foi encontrada no estudo do gerenciamento de riscos e do desempenho do projeto. Ao mesmo tempo, o método exploratório foi aplicado para sintetizar estudos anteriores sobre gerenciamento de riscos e desempenho de projetos em empresas de construção.

Palavras-chave: Gerenciamento de Riscos, Setor de Construção, Gerenciamento de Projetos, Smart-PLS.

EL EFECTO DE LAS PRÁCTICAS DE GESTIÓN DE RIESGOS EN EL RENDIMIENTO DE LOS PROYECTOS: UN ESTUDIO DE CASO DEL SECTOR LIBIO DE LA CONSTRUCCIÓN

RESUMEN
Objetivo: El objetivo general del estudio era investigar la aplicación de la gestión de riesgos en el sector de la construcción en Libia.
Marco teórico: En este trabajo se describe el papel de la gestión de riesgos en la dirección de proyectos del sector de la construcción en Libia. En el estudio participaron más de trescientas empresas de la construcción ubicadas en Trípoli y Bengasi, ya que son las dos principales ciudades de Libia donde la construcción era más activa e implicaba grandes proyectos y grandes inversiones.
Diseño/metodología/enfoque: Se enviaron cuestionarios diseñados a partir de un muestreo por conglomerados a los encuestados, es decir, básicamente los directivos de las empresas, y se obtuvieron 250 respuestas. Para analizar la información se utilizó el modelo de ecuaciones estructuradas mediante el programa Smart-PLS. Los procesos de gestión de riesgos definidos por la identificación, la evaluación y el seguimiento que contribuyeron al éxito del proyecto también se relacionaron con el riesgo financiero.
Conclusiones: El estudio constató que las prácticas de gestión de riesgos tuvieron efectos sustanciales y favorables en el éxito de la ejecución del proyecto. Además, la concienciación sobre la gestión de la calidad en términos de riesgos fue muy alentadora.
Implicaciones sociales, prácticas y de investigación: Los resultados actuales de esta investigación mostraron que la mayoría de los estudios se centran en el efecto de las prácticas de gestión de riesgos como herramienta sólida para mejorar el rendimiento de los proyectos. Un estudio sobre la productividad podría ofrecer una mejor visión de la gestión de riesgos en otros sectores, ya que se refiere al rendimiento real de las empresas de construcción.
Originalidad/valor: El enfoque de revisión sistemática de la literatura apenas se ha encontrado en el estudio de la gestión de riesgos y el rendimiento de los proyectos. Al mismo tiempo, se aplicó el método exploratorio para sintetizar los estudios anteriores sobre la gestión de riesgos y el rendimiento de los proyectos en las empresas de construcción.

Palabras clave: Gestión de Riesgos, Sector de la Construcción, Gestión de Proyectos, Smart-PLS.

INTRODUCTION

To review the background of the study, construction industry is one of the main contributors of the Gross National Product (GNP) of a country especially in developing countries where infrastructural facilities are important. Despite its importance in terms of economy of scale where large investment is being put in, it is facing a multitude of problems in the planning, execution and maintenance during their life cycle. One of the problems that has been identified facing the construction industry is the implementation of risk management throughout the project life cycle. In this respect Libya being a developing country is facing big challenges in its effort to rebuild the infrastructures after the civil war. There was also a concern that the delay in many construction projects and project overrun were the results of improper implementation of risk management practices (Harvett, 2013).

To form the problem statement of the current study it's essential to review the literature regarding the main variables. Hasani & Abdullah (2019) defined risk as a result that might be assessed through assessing probabilities: a variable that was neither fundamentally good nor negative. Banaitiene and Banaitis (2012) stated that risk management was the identification of factors that could influence potentially negatively impact a project's cost. Some previous studies found that some processes of risk management had a direct impact on project performance, while other processes did not affect project performance directly (Tahir et al., 2019 Marinich, 2020; Obondi, 2020). Risk management is a planned and organised process that assists the project team in making the correct choice at the right time to identify, categorise, quantify, and manage risks (Project Management Institute, 2013; Urbański et al., 2019; (Pirwani et al., 2020) (Masengesho et al., 2020). According to Banaitiene and Banaitis (2012) "Managing risk" requires recognizing influential factors that might have an adverse effect on a project or investment, scheduling, and quality baselines, assessing the risk's potential impact, and putting control mechanisms in place to lessen that influence.

The failure to adopt proper risk management practices, resulted in the projects being delayed and took longer time to complete, increasing the project's budget (Chilumo et al. (2020; Pirwani et al, (2020) and Masengesho et al., (2020). This problem is especially acute in Libya and most developing nations ((Ali et al., (2018), Higham & Troug (2018), Pirwani et al., (2020) and Chilumo et al (2020)). The risk management process included risk identification, risk analysis (both quantitative and qualitative), risk response, and response and monitoring of risks (Fisher & Robson, (2006), Ali et al., (2018), Pirwani et al. (2020), and Chilumo et al. (2020). For example, Sabiel (2020) investigated the impact of formal RM practices on the

success of building projects in Qatar, and he discovered that the importance of formal RM practices has a significant impact on project success, Tahir (2015) and Tahir et al. (2019) found that RM methods had a substantial impact on the success of construction projects in Pakistan. Ali et al. (2018) performed a case study that involved the examination of recorded data and in-person interviews with key participants who held various roles and responsibilities to examine the effect of RM practise on the execution of building projects in Malaysia. They discovered that implementing good risk management techniques improved project results and resulted in project performance.

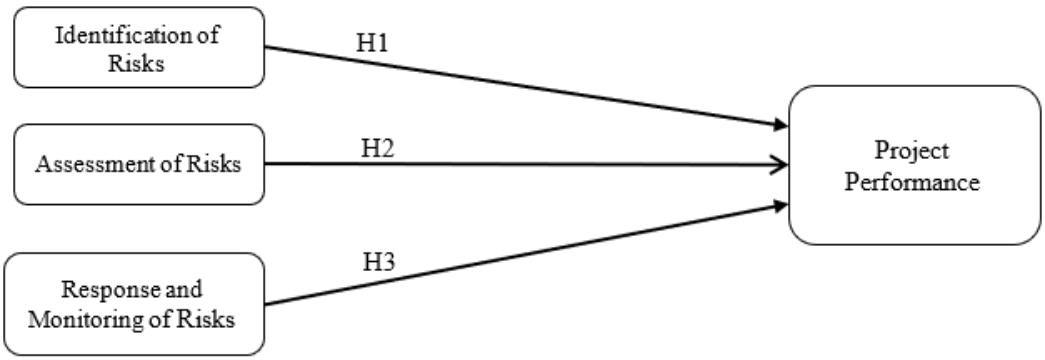
On the other hand, (Nguyen & Watanabe, 2017) used a qualitative study using semi-structured interviews to identify the contributions of risk management among SMEs in the construction industry from three EU nations (UK, Germany, and Italy) (Rostami, 2017). They discovered that the introduction and practice of RM improve an organization's competitiveness in three key areas: awareness, productivity, and profitability. Pirwani et al. (2020) conducted a similar study on the relationship between risk management practices and project management in Pakistan. He found that there was a positive and significant impact of risk management processes (i.e. risk identification, risk assessment and risk response) on overall control of risk and project success in construction. Similar findings were also obatined by other authors from several countries (Urbański et al. ,2019, Masengesho et al 2020, Marinich 2020, Sabiel 2020, Nguyen & Watanabe 2017, Ali et al 2018, Amoah and Pretrois 2019 , Chilumo et al. 2020).

Based on the latirature review the researcher found it very essntial and justified to varify and explore the application of RM and its role in improving the project presentation of the Libyan building industry (Dakhil, 2013). The results of this examination would benefit the Libyan construction companies in context of preparing for the risk (Chen, 2018, Gyamfi, 2018).

LITERATURE REVIEW

The relationship between risks management practices and project performance is conceptually shown in Figure 1 with corresponding hypotheses related to each risk. H1, H2 and H3 were hypotheses relevant to the corresponding risks (described later) related to project management.

Figure 1: The research framework



Source: Prepared by the authors (2023).

H1: Practicing the identification of risks has a positive impact on Libyan construction projects' performance.

H2: Practicing the assessment of risks has a positive impact on Libyan construction projects' performance.

H3: Practicing the response and monitoring of risks has a positive impact on Libyan construction projects' performance.

MATERIALS AND METHODOLOGY

To accomplish these objectives, a quantitative methodology to data collection from executive directors of Libyan construction firms was employed. There were several studies where construction firms' executive directors were the main respondents (e.g., Ali et al., 2018, Shayan et al., 2019, Pirwani et al ,2020) among others. Some studies conducted in Africa found that the level of awareness of project managers about RM was low (Shibani & Gherbal, 2018, Al-Fakhri et al., 2018; Shibani & Gherbal, 2018). Therefore it was expected that managers of construction companies would be more familiar with the level of RM practice in their firms and project performance. The population comprised 450 building construction firms based on the statistics provided by the Libyan Chamber of Commerce and Industry (2020). Given the security situation in Libya, it was difficult for the researcher to choose all the cities for the data collection. Questionnaires were distributed to 312 Libyan construction companies in Tripoli and Benghazi. A total of 200 surveys were submitted, and 80% of them were answered.

In this study, the operationalization of the RM practices measurement was based on 24 items distributed over three elements of RM practices; which are risk identification (RMP_RI), risk assessment (RMP_RA), and response and Monitoring of Risks (RMP_RMR) drawn from Zhao et al. (2014) and later which were refined by Liu et al. (2016) and Boateng et al. (2020).

Additionally, the operationalization of the projects' performance dimension was based on four items drawn from Bassioni et al. (2004), Nassar and Abou Rizk (2014) which were refined by Ali et al. (2018) and (Unterhitzenberger & Bryde, 2019). All items were designed to be answered based on a five-point Likert scale (1= Strongly Disagree, 2= Disagree, 3= Neutral, 4=Agree, 5= Strongly Agree).

RESULTS AND DISCUSSION

In Table 1 most of the respondents in the Libyan construction industry who took part in this study were males (90/8%) (n= 227) while 9.2% of them (n= 23) were females. The majority of respondents (32.8%) were between the ages of 36 and 45 years followed by 26.4% aged between 26 and 35 years while the rest (22%) aged between 46 and 55 years. In terms of education background about 73.2% had bachelor degrees in various fields followed by masters with 18.4% and the rest (22.8%) finished high school. A small number of respondents i.e. about 4% had doctoral degrees. With regard to the respondents' position, 79.2% most of them were directors. In terms of building places value, most of the respondents (79.2%) had more than 10 years while about 28% of them had worked in the construction industry between 5 and 10 years. The participants' demographic makeup suggested that they possessed a respectable education level. This was important as they had important positions in their respective companies as managers and executive directors who made decisions and policies. Workers safety is also very important in the construction industry (Ranganathan, 2022).

All companies selected were involved in the construction industry in various projects ranging from residential, hotels, offices and shopping complexes. About 25% of them were involved in the construction of residential projects, shopping complexes (11.6%), residential projects (22.4%), offices (9.2%) and hotels (4.8%). About 30% of the firms had between 51 and 5 employees, followed by firms employing staff between 76 and 100 (18%), firms employing 25 and 50 people (17.6%) and firms employing between 101 and 125 was about 17.2 %. The two categories of companies employing between 126 and 150 people and 25 and below had the lowest percentages i.e. 7.2% and 3.2% respectively. The companies that were selected had been operating in Libya between 16 and 20 years (i.e. about with 33.6%) followed by those that had worked between 11 and 15 years (29.2 %). About 20% of the companies had been operating in Libya more than 20 years while a small number of them (about 14%) had worked between 5 and 10 years. Nearly two third of the companies selected were operating in Tripoli and the rest were in Benghazi.

With regard to the application of risk management (RM) practices (Shakatreh, 2023) of the investigated companies, it was found that they did it either in in a formal or informal way. More than half of the companies i.e. about 57.2% practiced RM informally while the rest practiced it formally. Almost half of the companies i.e. 50.4% have been practicing RM for less than 5 years. This was followed by 34.4% of the companies practicing RM between 5 and 10 years and 12.4% the companies selected practicing it between 11 and 15 years. Only a small number of the companies (2.4%) have been practicing RM for more than 16 years. It was also interesting to note that about 44.4% of the companies had Construction Projects Risk Management Strategy (CPRMS) although some improvement was needed. This was followed by 36.8% of them practicing CPRMS while 18.8% did not have plan for CPRMS.

Table 1: Profile of Respondents (N= 250)

Variable	Detailing	Frequencies	Percentage
Gender	Male	227	90.8
	Female	23	9.2
Age	18-25 years	0	0
	26-35 years	66	26.4
	36-45 years	82	32.8
	46-55 years	55	22
	56-64 years	31	12.4
	Over 64	16	6.4
Educational level	Below High School	0	0
	High School	0	0
	Bachelor	183	73.2
	Master	57	22.8
	Doctorate	10	4
Position of respondents	Company Director	226	90.4
	Supervisor	4	1.6
	Project manager	12	4.8
	Program Manager	8	3.2
Respondents' work-tenure in the construction industry	Less than 5 years	0	0
	5-10 years	52	20.8
	11 - 15 years	106	42.4
	More than 15 years	92	36.8
The nature of the building construction projects of the firm	Residential	56	22.4
	Hotel	12	4.8
	Office	23	9.2
	Infrastructure	0	0
	Shopping Canters	10	4
	Residential, Hotel, Office, and Shopping Centers	64	25.6
	Residential and Hotel	56	22.4
	Office and Shopping Centers	29	11.6
Firm employees' number	Below 25 Employees	8	3.2
	25-50 Employees	44	17.6
	51-75 Employees	75	30
	76-100 Employees	45	18
	101-125 Employees	43	17.2
	126-150 Employees	18	7.2
	More than 150 Employees	17	6.8

Firm's work tenure	Under 5 years	0	0
	5 - 10 years	36	14.4
	11 - 15 years	73	29.2
	16 - 20 years	84	33.6
	More than 20 Years	57	22.8
Location	Tripoli	165	66
	Benghazi	85	34
Firms' type of risk management (RM) practice	Formal	107	42.8
	Informal	143	57.2
Firm-RM practice tenure	Less than 5 years	126	50.4
	5-10 years	87	34.8
	11-15 years	31	12.4
	16 years and above	6	2.4
Does the firm have a construction projects risk management strategy?	Yes, implemented	92	36.8
	Yes, but needs improvement	111	44.4
	No, but have plans to develop one	47	18.8
	No	0	0

Source: Prepared by the authors (2023).

The Level of Risk Management (RM) Performs in Libyan Building Businesses

The conceptual model shown in Figure 1 and the data obtained shown in Table 1 were used to identify the level of Risk Management (RM) practices in Libya (Alfakhri, 2017). The risks included risk identification (RMP_RI), risk assessment (RMP_RA), and response and monitoring of risks (RMP_RMR). Likert scale measuring from 1 to 5 was used in the three risk management types to determine application of RM in project management. Noor and Kumar (2014) suggested the use of lowest value in the analysis which was 2.33 as representing 1.00 and the highest value of 3.67 representing 5.00 in the Likert scale. The results of analysis are shown in Table 2.

From Table 2 the level of risk management practices in Libyan construction companies were moderate in terms of Risk Identification (RMP_RI), Risk Assessment (RMP_RA), and Response and Monitoring of Risks (RMP_RMR) with their mean values ranging between 3.08 and 3.45 and the standard deviation was in the order between 1.03 and 1.18. This reflected that there was inconsistency of the interest of managers in Libyan construction companies in relation to the process of practicing risk management. The Risk Identification (RMP_RI) related to RM ranked first in terms of the interest of Libya construction company managers, with a moderate nasty of 3.45 and overall usual deviation of 1.17. The arithmetic means values for all risk identification items ranged between 3.20 and 3.63, and the standard deviation values ranged between 1.32 and 1.42. The response and monitoring of risks (RMP_RMR) in RM was rated second with a moderate total nasty of 3.31 and overall standard deviation of 1.18. For all RMP_RI items the corresponding values ranged between 3.26 and 3.38 and the standard

deviations between 1.34 and 1.42. Finally the risk assessment (RMP_RMR) of RM was placed third with a moderate mean of 3.08 overall typical deviation of 1.03. The arithmetic means for all RMP_RA items ranged from 2.93 to 3.35 while the standard deviations were between 1.35 and 1.41.

Table 2: Descriptive statistics of the level of RM practices

Variable	Item	Mean	Std. Deviation	Rank	RM practice's Level
Risk Identification (RMP_RI)	RMP_RI1	3.49	1.32	3	Moderate
	RMP_RI2	3.60	1.33	2	Moderate
	RMP_RI3	3.40	1.32	6	Moderate
	RMP_RI4	3.48	1.34	4	Moderate
	RMP_RI5	3.63	1.38	1	Moderate
	RMP_RI6	3.31	1.37	7	Moderate
	RMP_RI7	3.47	1.37	5	Moderate
	RMP_RI8	3.20	1.42	8	Moderate
Mean		3.45	1.17	**(1)**	Moderate
Risk Assessment (RMP_RA)	RMP_RA1	2.93	1.40	4	Moderate
	RMP_RA2	3.05	1.41	3	Moderate
	RMP_RA3	2.82	1.38	5	Moderate
	RMP_RA4	3.23	1.37	2	Moderate
	RMP_RA5	3.35	1.35	1	Moderate
Mean		3.08	1.03	**(3)**	Moderate
Response and Monitoring of Risks (RMP_RMR)	RMP_RMR1	3.31	1.37	4	Moderate
	RMP_RMR2	3.38	1.40	1	Moderate
	RMP_RMR3	3.26	1.39	7	Moderate
	RMP_RMR4	3.31	1.38	4	Moderate
	RMP_RMR5	3.28	1.37	6	Moderate
	RMP_RMR6	3.26	1.34	7	Moderate
	RMP_RMR7	3.34	1.39	3	Moderate
	RMP_RMR8	3.30	1.38	5	Moderate
	RMP_RMR9	3.26	1.37	7	Moderate
	RMP_RMR10	3.34	1.38	3	Moderate
	RMP_RMR11	3.35	1.42	2	Moderate
Mean		3.31	1.18	**(2)**	Moderate

Source: Prepared by the authors (2023).

Formulation of Model

The model formulated in this this study looked at the measurement-model with an emphasis on "a concept, convergent, and discriminant validity" following suggestion of Hair et al (2019) criteria. Use of the findings is referred to as construct-validity obtained to develop a test using measure and relevance. This concept could be explained more clearly by looking at the item's factor loadings in the measurement model's content validity (Chin (2010). Factor loading is the main factor used in this paper, with a cutoff value of 0.50 based on Hair et al (2010). The loadings of all items surpassed 0.50, as shown in Table 3. This outcome therefore validates "the measurement model's" content. Factor loadings, composite reliability (CR), and extracted average variance (AVE) may be used to analyze the construct under concern ((Hair

et al., (2014), (2019)). According to Hair et al. (2019), CR should be greater than 0.70 and AVE should be greater than 0.50 which were the limits often used. According to the findings in Table 3, CR findings were higher than 0.70 and AVE findings were higher than 0.50. Divergent the measurement model's validity was thus attained.

After validating the convergent validity, the Heterotrait-Monotrait (HTMT) ratio of correlations technique was used to investigate discriminant validity. HTMT was provided in cases when the multitrait-multimethod matrix was utilized to examine the strength of correlations between and within components or variables (Gold et al., 2001; Henseler et al., 2015; Garson, 2016; Hair et al., 2019). The discriminant validity would be at risk if the value of HTMT was above 0.9. ((Gold et al., (2001), Henseler et al. (2015) and Garson (2016)). Table 4 shows the values of Discriminant Validity and they are all below 0.90 and hence discriminant validity was established.

Table 3: Loading-factor and convergent-validity results

Model Construct	Measurement Item	Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)
Risk Identification (RMP_RI)	RMP_RI1	0.88	0.939	0.746
	RMP_RI2	0.91		
	RMP_RI3	0.88		
	RMP_RI4	0.89		
	RMP_RI5	0.89		
	RMP_RI6	0.82		
	RMP_RI7	0.88		
	RMP_RI8	0.77		
Risk Assessment (RMP_RA)	RMP_RA1	0.56	0.825	0.514
	RMP_RA2	0.61		
	RMP_RA3	0.59		
	RMP_RA4	0.83		
	RMP_RA5	0.86		
Response and Monitoring of Risks (RMP_RMR)	RMP_RMR1	0.82	0.938	0.734
	RMP_RMR2	0.83		
	RMP_RMR3	0.87		
	RMP_RMR4	0.91		
	RMP_RMR5	0.88		
	RMP_RMR6	0.86		
	RMP_RMR7	0.87		
	RMP_RMR8	0.89		
	RMP_RMR9	0.87		
	RMP_RMR10	0.84		
	RMP_RMR11	0.80		
Project Performance (PP)	PP1	0.90	0.937	0.788
	PP2	0.92		
	PP3	0.92		
	PP4	0.81		

Source: Prepared by the authors (2023).

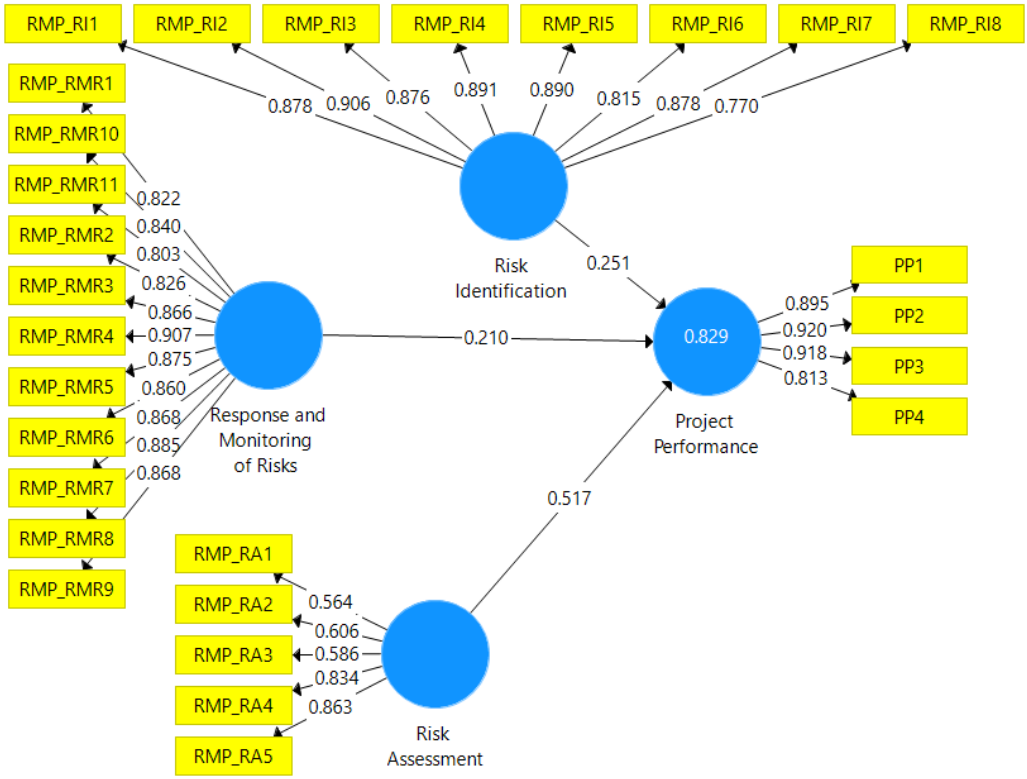
Table 4. Results of discriminant validity analysis by HTMT

Construct	PP	RMP_RMR	RMP_RA	RMP_RI
PP				
RMP_RMR	0.882			
RMP_RA	0.820	0.731		
RMP_RI	0.876	0.873	0.701	

Source: Prepared by the authors (2023).

The results which reinforced RMP_RI, RMP_RA, and RMP_RMR reflected first-order constructs to measure RM practice are shown in Figure 2. This approach was comparable to other research by Zhao et al. (2014), Liu et al. (2016), and Boateng et al. (2016) that looked at these variables as "a reflecting first-order constructs" (2020). Instead of using numerous variables to represent the overall performance of the project, the analysis of performance measurement was employed in this study as a group (Ali et al., 2018; Unterhitzenberger & Bryde, 2019). To better understand project performance, the influence of RM practises (RMP RI, RMP RA, and RMP RMR) was taken into consideration as a single construct. Figure 2 displays the measurement instrument that took into account R^2 and the loaded outcomes for all items.

Figure 2: A measurement-model and Path-coefficient results



Source: Prepared by the authors (2023).

Evaluation of the Structural Model

After the measurement model has been validated, the structural model was examined by using the Smart-PLS 3.3.3 program to look at the links between the various variables (Ismail, 2018). Table 6 and Figure 3 provide the findings. According to Hair et al., (2019) R^2 is a significant metric to evaluate the structural model. R^2 indicates the proportion of the change inside and outside the structure that internal construction variance might be able to capture ((Sarstedt et al., (2014) and (Hair et al., (2019)0. A greater R^2 value improves the forecasting capability of the structural model (Hair et al., 2019). It was essential that the R^2 values of the model were high enough to account for at least some of the changes. R^2 values for describing the variance of a dependent should not be less than 0.10 (Falk and Miller (1992) and Urbach and Ahlemann (2010)). R^2 must be greater than 0.75 to be considered significant and the acceptable value must be greater than 0.25 Hair et al., (2014) and (2019). Based on the R^2 values for the three underlying dependent variables RMP_RI, RMP_RA, and RMP_RMR with the performance of construction projects as shown in Figure 3, it is clear that the research model (RMP_RI, RMP_RA, and RMP_RMR) explained nearly 83% of the total variance in the performance of Libyan construction projects, with an R^2 value that was quite high (Hair et al., 2019).

The model was also assessed to see if it were of sufficient quality using the blindfold approach (Henseler et al., 2015). A generated model's prediction validity could blindfold a subject (Henseler et al., 2015). Sarsted et al (2017) stated that the predictive relevance (Q^2) used a benchmark to assess how well the model forecast the information from the excluded cases, which was regarded as having predictive significance. According Sarstedt et al. (2017) the suggested model had predictive validity for a certain dependent construct if the value of predictive relevance Q^2 was greater than 0.0. According to Fernandes (2012) Stone-test Geisser's Q^2 was calculated from the following formula;

Q^2 =1- SSE/SSO ……Eq (1)

Where,

Q^2 = Predictive Relevance
SSE= sum of squares of errors
SSO= sum of squares of observations

Sarstedt et al., (2017) advised blindfolding the subject and used d values between 5 and 10 to generate Q^2. The current study employed d = 7 to calculate mutual repetition metrics for

the dependent variables. Sarstedt et al., (2017) stated that the Q^2 values should be 0.35 (large), 0.15 (medium), and 0.02 (small). Table 5 shows that the performance of construction projects has a significant predictive value as a comparative measure of predictive importance. As a result, it was concluded that the model's predictions are of sufficient quality, where the Q^2 value was close to 0.6.

As part of the structural model study, the path coefficients—which demonstrate the strength of the relationship between the independent and dependent variables—were also examined. A bootstrap resampling method was used to calculate T-statistics and the standard errors. The bootstrap approach analysis is different from conventional computations. The path coefficients, standard error and t values as given in Table 6 and Figure 3. The three hypotheses H1, H2 and H3 were supported. The results of the current study were in agreement with earlier studies on RM practices (RMP_RI, RMP_RA, and RMP_RMR) and project performance particularly in building projects.

Table 5: Prediction relevance of the model

	SSO	SSE	Q^2 (=1-SSE/SSO)
Construction Projects' Performance	1000	355.332	0.645

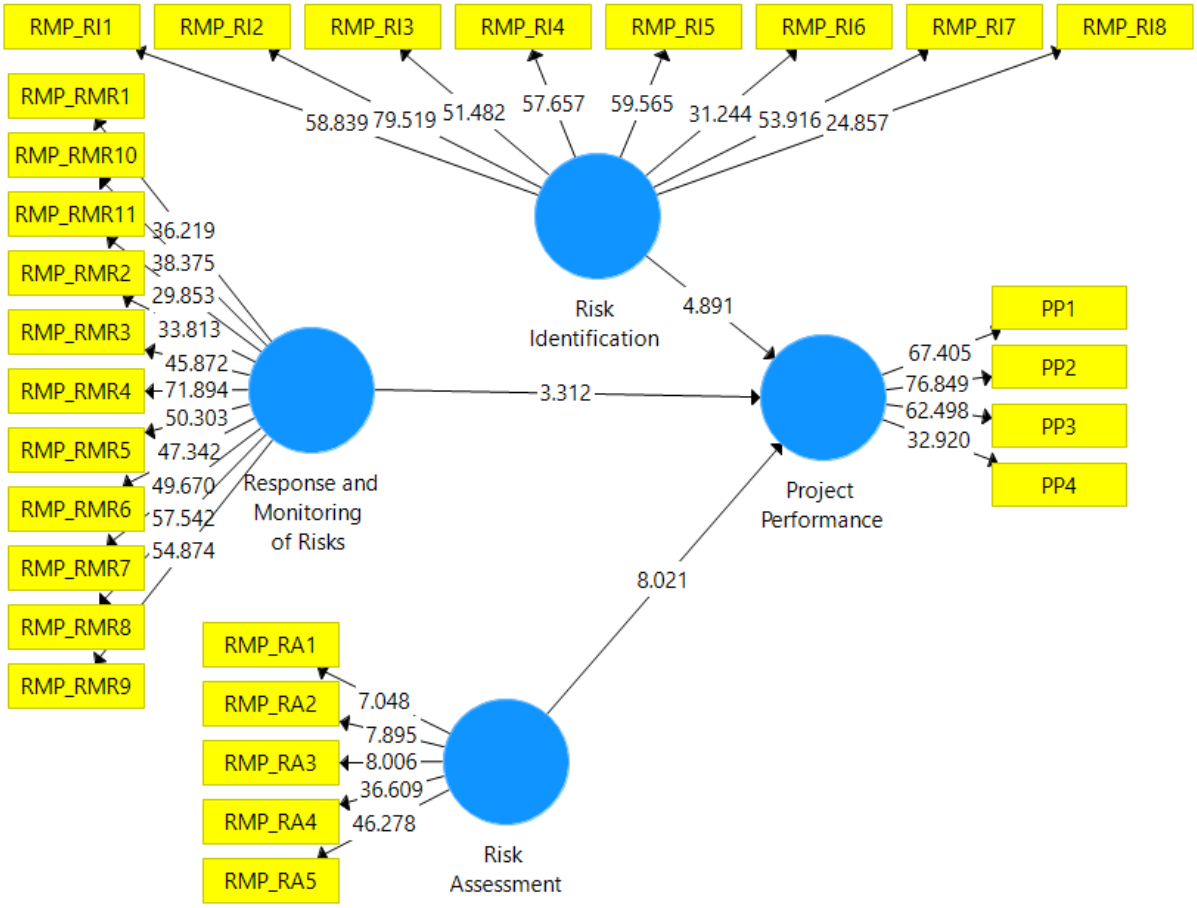
Source: Prepared by the authors (2023).

Table 6: Hypotheses test results

	Hypotheses	Path Coefficient	Standard error	T Statistics	P Values	Results
H1	RMP_RI -> Construction PP	0.251	0.051	4.891	0.000	Supported
H2	RMP_RA -> Construction PP	0.517	0.064	8.021	0.000	Supported
H3	RMP_RMR -> Construction PP	0.210	0.064	3.312	0.000	Supported

Source: Prepared by the authors (2023).

Figure 3: Hypotheses test results



Source: Prepared by the authors (2023).

CONCLUSIONS

This study examined the relationship between risk management practices (RM) (identification of risks, assessment of risks and response and monitoring of risks), and construction project performance in Libya. The study was undertaken due to the concern of progress of many construction projects in Libya which were below expectation due to many factors prevailing in the country. One of the approaches to address the issues was to investigate the risks faced by many construction companies as the construction business was the most risky especially during the COVID-19 pandemic and the country was ravaged by the civil war. The research attempted to investigate the level of risk management practices in Libyan construction companies by categorizing them into risk identification, risk response ad monitoring and lastly risk assessment. This was found sensible and in line with risk management hierarchy in that it began with a simple process (identification) and progressing to more difficult scenario.

To achieve the research objectives the researcher tried to answer the following questions:

RQ1: What is the level of risk management (RM) practices in Libyan construction companies?

RQ2: Do the risk management (RM) practices (Identification of Risks, Assessment of Risks, and Response and Monitoring of Risks) have an effect on projects' performance of Libyan construction?

The first objective which was to determine the level of management practice showed the awareness (indicated by RMP-RI) had a mean of 3.45 and standard deviation of 1.17 which was the highest among the three categories of risk management. This was followed by the risk management with regard to response and monitoring (RMP-RMR) ranked second with a mean of 3.31 and 1.18 average standard deviation. Lastly risk management with respect to assessment (RMP-RA) was placed third with an overall mean of 3.08 and standard deviation of 1.03. These results agreed with some previous studies' results that were conducted in an environment similar to the Libyan environment and in the construction firms as well (Al-Mhdawi et al. 2020, Boateng et al. 2020).

The second goal of this research was concerned with the impact of RM practice (risk identification (RMP-RI), risk assessment (RMP-RA), and response and monitoring of risks (RMP-RMR)) on the performance of construction projects in Libya. Three hypotheses were formulated to address the issue.

The first hypothesis was about the influence of risk identification (RMP-RI) on Libyan construction projects' performance. it was found that RMP-RI has positive impact and was significant in construction projects' performance with $\beta = 0.251$, $t = 4.891$, $p < 0.001$ In this respect RMP-RI practices by construction firms in Libya has contributed their projects' performance by 25%, which corresponded to the findings of Nguyen and Watanabe (2017),

The second hypothesis deal with the influence of risk assessment (RMP-RA) on Libyan construction projects' performance. It was found that that similarly with hypothesis 1, RMP-RA has a positive impact and significant on construction projects' performance with values of $\beta = 0.517$, $t = 8.021$, $p < 0.001$. The effect was the RMP-RA practice by construction firms in Libya has improved the projects' performance by almost 252%. These findings were in agreement with Renault et al (2018), Tahir et al. (2015) and Obondi (2020).

The influence of response and monitoring of risks (RMP-RMR) on Libyan construction projects' performance was formulated through hypothesis 3, and it was found that discovered that RMP-RMR also gave positive impact on the construction projects' performance with corresponding values of $\beta = 0.210$, $t = 3.312$, $p < 0.001$. The effect of RMP-RMR was the

improvement of performance by almost 21% which agreed with the findings of the study of ((Nguyen & Watanabe (2017), Shibani and Gherbal (2018) and Marinich (2020)).

In conclusion the above findings supported ((Shibani & Gherbal (2018), Marinich, (2020) and Ekung et al., (2021)) that the RM practices (RMP-RI, RMP-RA, and RMP-RMR) had positive effects on enhancing projects performance. By adopting these practices, the performance of the studied Libyan construction companies has increased to almost 83% overall. This clearly indicated that all parties involved in construction should apply risks management in their activities.

The first limitation is related to sample size and unit of analysis. The study focused on all kinds of Libyan construction firms, residential, hotel, office, shopping centers in Tripoli and Benghazi, and obtained 250 valid questionnaires for analysis. Thus, if the same of this study were conducted throughout all construction companies in all Libya governorates, it could obtain a higher response which might provide a better scenario of the relations among RM practices (RI, RA, and RMR), and Libyan construction projects' performance. Additionally, future studies could investigate the relationships proposed in this study to see if it would be appropriate for other companies in Libya.

Secondly, because the study was cross-sectional in design, any changes that may have occurred during the implementation of RM (RI, RA, and RMR) were not included in the data set. It also employed a quantitative technique to achieve its goals. Therefore, to understand the changes that occur when the RM (RI, RA, and RMR) are being implemented, longitudinal studies might be conducted by future researchers to investigate the relationship between RM practices and Libyan construction projects' performance as well as using another method, such as qualitative techniques, to provide in-depth knowledge of the issues.

Finally, this study only examined the relationships between RM practices and construction projects' performance. Future research should investigate other factors that might affect the association between RM practices, and projects' performance, such as external environmental factors, and construction firms and projects attributes, as well, in this study we took RM practices separately, in this regard, we can examine the RM practices as a group in the future studies.

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