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DELAY MITIGATION STRATEGIES AND THE IMPLICATION ON THE CONSTRUCTION INDUSTRY: A SYSTEMATIC LITERATURE REVIEW

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Abstract

Every project's goal has always been to be successful. Failure to complete projects on time has become a major problem in the last few decades. Construction delays are a common and serious problem that needs to be investigated further. This issue has implications for the construction industry and the economy's growth, as well as the long-term development of countries. Many studies have not highlighted the strategies implemented by organisations to lessen the impact of project delays. As such, a systematic literature analysis (SLR) was performed in this study by selecting publications of articles from indexed journals on the Web of Science and Scopus to identify the efficacy of strategies utilised when mitigating problems that postpone the overall construction. The method applied for this SLR is using the Reporting Standards for Systematic Evidence Syntheses (ROSES) analysis protocol. Through this protocol, several steps need to be followed accordingly to acquire an accurate number of articles that have to be reviewed. The findings identified five leading aspects of strategies that should be adopted to reduce construction project delays, namely: communication; management; information systems and technology; enforcement of law and order; and financials. The implications of these strategies are also discussed in this research.

Keywords: Project, strategy, project delay, systematic literature review

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INTRODUCTION

Project management entails applying prior knowledge, expert capacity, wherewithal, and approaches to ensure that a project meets its requirements; thus, for the project to succeed, the project manager must directly regulate the project's scope, deadlines, and costs (Shakeri & Khalilzadeh, 2020). A good project manager and project participants must be excellent at practising the details suggested in project management to avoid any issues. Postponement of tasks in a project is among the commonplace complications encountered by the construction business (Bajjou & Chafi, 2020; Banobi & Jung, 2019; Durdyev et al., 2017; Mpofu et al., 2017).

Countless studies were carried out in various nations to assess the reasons for delaying construction projects. For example, studies conducted in Iran (Fallahnejad, 2013; Khoshgoftar et al., 2010; Rafieizonooz et al., 2015) listed the reasons for project delays as project management; technology; materials; financial, improper planning; ineffective site supervision; commitment; and lack of communication. In Malaysia, Hamzah et al. (2012) listed 22 factors of project delay for the year 2012. The top five factors are workers' output, on-site material deliveries, the greater cost of materials, malfunctioning equipment, and monetary constraints.

Existing Studies Related to Mitigation Strategies Taken by the Project Participants in the Construction Industry - The Research Gap

Researchers have studied the reasons that can cause project delays in the construction industry. Studies were also conducted to explore the project parties' strategies for reducing the project delay. In their studies, Rahman et al. (2013), Yap et al. (2018), and Yap and Shavarebi (2019) suggested several strategies to mitigate project delays in Malaysia. These strategies include improvement in contractors' site management; focusing on project communications and project learning; and focusing on human and managerial issues related to construction industry problems. Durdyev et al. (2017) also proposed a number of beneficial strategies for the Cambodian construction industry, such as ensuring adequate material delivery times on construction sites, providing accurate and comprehensive schedules for site supervisors, and enhancing workforce resources.

Even though some of the strategies were highlighted by the researchers in their studies, few studies stressed the impact and implications of the strategies in mitigating project delay. Thus, this study was conducted using a systematic literature review (SLR) to identify the effects of the strategies in mitigating project delay.

RESEARCH METHODOLOGY

Reporting Standards for Systematic Evidence Syntheses (ROSES) - The Review Procedure

This study employed the Reporting Standards for Systematic Evidence Syntheses (ROSES) analysis protocol to present its analysis. The processes of searching, selecting, data retrieval, and critical assessment are all covered in great detail in ROSES throughout the early and middle phases of the analysis process, but with little information on the synthesis (Haddaway et al., 2018).

Formulation of the Research Question

The PICo approach was used to formulate the research topic for this study. It is a tool that can help researchers come up with an appropriate research topic with three primary elements: population or challenge, interest, and context. These aspects guide the authors in formulating their central research issue. Two research questions for this paper are; 1) What are the strategies to mitigate the project delays? 2) What are the implications of delay mitigation strategies in the construction sector?

Identification

A set of keywords was chosen as search strings to conduct a literature search in databases such as Web of Science and Scopus. The identification method relies on an online thesaurus, keywords from previous research, keywords from Scopus, and keywords suggested by experts. The entire search string is shown in Table 1. A total of 444 papers were found after searching both databases.

Table 1: The search string

Database	Search string
Scopus	TITLE-ABS-KEY ((“mitigation strategy” OR “approach” OR “plan”) AND (“project delay” OR “postpone”) AND (“construction”))
Web of Science	TS= ((mitigation strategy* OR approach* OR action*) AND (project delay* OR “postpone*) AND (building construction*))

Screening

This study used the database’s sorting mechanism to automatically screen all 444 selected articles after specifying the article selection criteria. Since researchers cannot possibly review all currently published papers, Okoli (2015) proposed that researchers choose a time frame to review. The criteria used to choose the articles were based on the timeline (2017–2021), document type (article only), and language (English only).

Eligibility

The titles and abstracts of the papers were read as part of the screening process. Only 22 articles were analysed thoroughly after rejecting papers that were irrelevant to the study's scope.

Quality Appraisal

According to Mohamed Shaffril et al. (2019), a small number of journals are needed to conclude a particular investigation area using systematic reviews. In their study, Mohamed Shaffril et al. (2019) reviewed a total of 18 articles. Haris et al. (2020) reviewed 19 journals for their survey, and Mohamed Shaffril et al. (2020) reviewed 25 articles in their studies. After going through the screening process, 22 papers were chosen for this review.

Data Abstraction and Analysis

The current analysis took a qualitative approach, with the researcher reading all 22 articles in-depth, including the abstracts, conclusions, and discussion parts. A qualitative thematic analysis was used to perform a systematic review for this study. Figure 1 shows the diagram for journal searching strategies for this SLR paper.

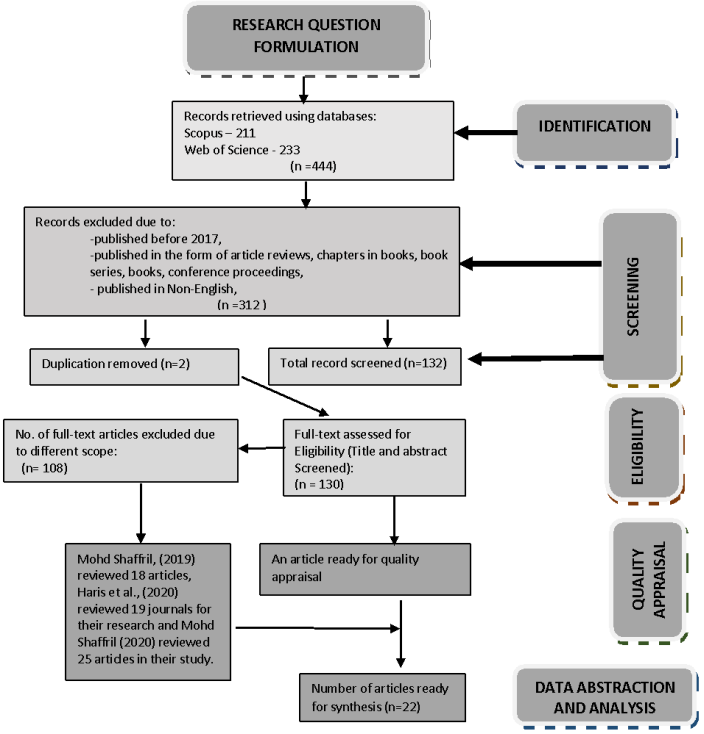

Figure 1: Flow diagram
Source: adapted from Mohamed Shaffril et al. (2020)

RESULTS OF THE STUDY

Background of the Studies

For this SLR, a total of twenty-two articles were selected after going through the whole article searching process previously. From this total, six articles were published in 2017. In 2018, only three articles were published on this subject. However, for the year 2019, the number of articles published increased to four. This increasing trend continued into the following year, 2020. Eight articles were published. This total number of articles is also the highest contribution to the published articles for five years from 2017 until 2021. For the current year 2021, one article managed to be published in Scopus. The details of the selected papers are recorded in Table 2.

Table 2: Summary of Background of Studies

No.	Author (s)	Year	Country	Research Method		
				Quantitative	Qualitative	Mixed-method
1.	Babaeian et al.	2021	New Zealand		✓	
2.	Elabd et al.	2020	N.A		✓	
3.	Ali Shaikh et al.	2020	Pakistan	✓		
4.	Singla et al.	2020	India	✓		
5.	Yap et al.	2020	Malaysia			✓
6.	Yap et al.	2020	Malaysia	✓		
7.	Yap and Skitmore	2020	Malaysia		✓	
8.	Yap and Toh	2020	Malaysia	✓		
9.	Riazi et al.	2020	Malaysia		✓	
10.	Banobi et al.	2019	Tanzania	✓		
11.	Prasad et al	2019	India			✓
12.	Gurmu	2019	Australia			✓
13.	Soomro et al.	2019	Pakistan	✓		
14.	Riazi and Nawi	2018	Malaysia		✓	
15.	Ranawaka and Mallawaarachchi	2018	Sri Lanka	✓		
16.	Böhme et al.	2018	Australia		✓	
17.	Amoatey et al.	2017	Ghana	✓		
18.	Oyegoke and Al Kiyumi	2017	Oman	✓		
19.	Chokor et al.	2017	US	✓		
20.	Yap et al.	2017	Malaysia	✓		
21.	Al-Fadhali et al.	2017	Yemen	✓		

22.	Yap et al.	2017	Malaysia		✓

MAIN FINDINGS

This study analysed twenty-two articles in the inclusion stage by categorising the empirical studies' findings into several themes and sub-themes. The first identified theme and subthemes are strategies to mitigate construction delays; communication; management; enforcement of law and order; information systems and technology; and finances. The summary is shown in Table 3. The other theme highlighted in this SLR is the implication of these strategies on project delay; in the construction sector. The details of the implications of these strategies on project delay are indicated in Table 5.

Table 3: Summary of Delay Mitigation Strategies

No.	Author (s)	Strategies to Mitigate Project Delay				
		Communication	**Management**	**Enforcement Law & Order**	**Info. System &Technology**	**Financial**
1.	Babaeiaet al. (2021)	✓	✓			
2.	Elabd et al. (2020)				✓	
3.	Ali Shaikh et al. (2020)		✓	✓		
4.	Yap et al. (2017)	✓	✓			
5.	Yap et al. (2017)	✓	✓			
6.	Yap and Skitmore (2020)	✓	✓			
7.	Yap and Toh (2020)	✓	✓			
8.	Singla et al. (2020)	✓	✓			
9.	Riazi et al. (2020)				✓	
10.	Banobi and Jung (2019)	✓	✓			
11.	Prasad et al. (2019)	✓	✓		✓	
12.	Gurmu		✓			
13.	Soomro et al. (2019)		✓			✓
14.	Riazi and Nawi (2018)				✓	
15.	Ranawaka and Mallawaarachchi (2018)				✓	
16.	Böhme et al. (2018)				✓	
17.	Amoatey et al. (2017)				✓	

18.	Oyegoke and Al Kiyumi (2017)	✓	✓			
19.	Chokor et al. (2017)					✓
20.	Al-Fadhali et al. (2019)				✓	
21.	Yap et al. (2020)	✓	✓			
22.	Yap et al. (2020)	✓	✓			

IMPLICATION OF MITIGATION STRATEGIES ON PROJECT DELAY

Communication and management

Babaeian et al. (2021) discovered that proactive and reactive measures were introduced to mitigate project delays, especially on the contractor's side. The experts interviewed agreed that responding faster will save time and resources and reduce the risk to the project and the contractor's credibility for reasons that cannot be avoided entirely (Muthuveeran et al., 2022). Banobi and Jung (2019) suggested that project participants' close project supervision can help identify problems in the early stages. Incompetent firms hired can lead to many other problems, such as low quality and slow response (Zulkifli et al., 2021). Any method that can improve interaction and administration must be executed by the construction firm to lessen the detrimental effect of project delays (Banobi & Jung, 2019; Prasad et al., 2019; Babaeian et al., 2021; Yap et al., 2020; Yap & Skitmore, 2020; Yap & Toh, 2020; Yap et al., 2017).

Information Systems and Technology

In favour of a remote management system, Elabd et al. (2020) suggested that integrating new technology may be the best way to enable remote supervision of worksites. Technology advancement is vital in all organisations, although much can be improved through efficient information technology governance (Henriques et al. 2020). One of the systems similar to technology is information technology (IT). Information Systems (IS), which are characterised as functional systems, are another crucial concept. IS processes and activities mainly involve information processing, which includes capturing and transmitting, storing, retrieving, manipulating, and displaying data. Riazi and Nawi (2018) and Riazi et al. (2020) suggested these strategies based on the results of the interviews and focus group sessions with the industry experts in Malaysia. They concluded that most construction problems stem from a weak system of supply chain management in the organisation.

Enforcement of Law and Order and Financial

According to Ali Shaikh et al. (2020), project delays can also be avoided by enforcing law and order in the organisation as a control measure for the organisational behaviour and attitudes of the project participants. Regarding financial expenditure, Soomro et al. (2019) specified that any complications which lead to a delayed construction project are usually associated with monetary constraints. Financial assistance provided by the government can also improve the project's performance (Akhmadi & Himawan, 2021). Table 4 summarises the details of the implications of the strategies implemented.

Table 4: Summary of strategies and implications

Author (s)	Strategies	Implications
Babaeian et al. (2021), Ali Shaikh et al. (2020), Yap et al. (2020), Yap et al. (2020), Yap and Skitmore, (2020), Yap and Toh, (2020), Yap et al. (2017), Singla et al. (2020), Banobi and Jung, (2019), Prasad et al. (2019), Gurmu, (2019), Soomro et al. (2019), Oyegoke and Al Kiyumi, (2017)	Communication and management	● Project participants will take action immediately once problems are identified to reduce time, resources, and risk. ● Strong contact networks are established. ● Organisational, preventive, preventive-corrective, and corrective approaches reduce project delays. ● Effective collaboration between project parties might reduce problems in the future.
Elabd et al., (2020), Riazi & Nawi (2018), Riazi et al. (2020), Prasad et al. (2019), Ranawaka and Mallawaarachchi (2018), Böhme et al. (2018), Amoatey and Ankrah (2017), Al-Fadhali et al. (2019)	Information systems and technology	● New technology is introduced to improve site monitoring. ● Technological advancements ensure that information flow is managed efficiently. ● IIF helps remove delay problems. ● Causes of delay can be avoided in the early stages through a risk-responsive framework.
Ali Shaikh et al. (2020), Soomro et al. (2019), Chokor et al. (2017)	Enforcement of Law and Order and financial	● Project participants' behaviour at the workplace can be controlled through punishment and compounds. ● Financial problems might cause project delays. Therefore, the organisation must ensure that the fund is always sufficient, and experienced contractors must be hired to reduce financial problems. ● Cost-based incentives improve the motivation of the project team.

CONCLUSION

Numerous factors frequently cause construction projects to be delayed, all of which can have a significant financial impact. While a number of studies have been conducted to ascertain the root of delays in project completion, only a few have concentrated on the methods of mitigating project delays within

organisations. Focusing on an organisation's strategies might help in identifying the underlying cause of project delays and the corresponding solutions. Among the strategies identified are communication, management, enforcement of law and order, information systems and technology, and finance. These strategies also have a positive effect on the organisation, as the delays in actual progress can be diminished. However, the scope of this SLR is limited to primarily developing countries. Thus, it is recommended that other researchers focus on the strategies of developed countries because results may vary. It is also recommended that future research use a variety of databases to broaden and diversify the search.

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