

Study on Hybrid Project Management Implementation in the Construction Industry

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Abstract: Project management is one of the part in construction industry where it requires managing every stage of the project's life cycle, from conceptualization to completion of the project. However, in the construction project management, the increasing of material price, severe weather and other external problems has a number of consequences that lead to cost and time overruns, disputes, and project failure. Problems that arise during on-site production is a difficulty that caused by the construction project supply chain, inadequate project management and poor performance. This study on hybrid project management was conducted to identify the potential, key criteria and the strategies of hybrid project management implementation as they can be the new method in improving the activities in construction industry. In order to achieve the objectives, this research was conducted using qualitative method for primary data collection and gathering information from many sources such as books, journals, and articles as secondary data. Furthermore, semi-structured interview was conducted from four (4) respondent of G7 Contractors registered under CIDB and the focus spot was in Selangor area as primary data. Then, the data was analysed using content analysis to provide data information related in the hybrid project management from the respondents. The significant finding for the potential of hybrid project management is workplace culture, as for key criteria is software design and the strategies to implement hybrid project management were knowledge, develop solutions, also proposed and improved management. In conclusion, this research contributes to a better understanding of the uses of hybrid project management as it can be implemented in construction industry.

Keywords: Construction Industry, Hybrid, Implementation, Project Management

1. Introduction

The construction industry has the elements and features of multi-agent including multi-participant and multi-document from different systems and applications created, also multiprocessors with a long timeline (Zhou *et al.*, 2016). Other than that, the construction industry's multi-stakeholder environment causes issues including poor information compatibility and low productivity due to information reuse challenges (Zhou *et al.*, 2016). So, the success of a project is largely determined by how it is handled and controlled by planning, project implementation, cost and time overruns, and quality of non-achievement has been identified as major issues with project management approaches (Alias *et al.*, 2014). There are four types of project management and that are traditional, agile and lean as hybrid project management (Lalmi *et al.*, 2021). Other than that, miscommunication has caused construction projects are delayed such as critical delay, concurrent delay, independent delay, non-excusable delay, and excusable delay. The most prevalent cause of project delays is because the daily working period has been reduced Hybrid project management in construction industry is a type of project management in which different management that are combined into a single methodology by Ziółkowski & Deręgowski (2014). In hybrid construction projects, when a combination of on-site and off-site activities are taking place at the same time, the impact of uncertainty is significant (Arashpour *et al.*, 2016). On site project operations are frequently carried out in the face of various climate circumstances, job quality, and safety concerns (Zhou *et al.*, 2016). Therefore, the aim of this study is to investigate hybrid project management approach implementation in the construction industry.

In the construction industry, there are many problems that arise on every project implemented such as poor communication and uneven influence in decision-making. In the construction industry, poor communication has a number of implications and consequences, including cost and time overruns, disputes, and project failure. It has been demonstrated that miscommunication leads to unsuccessful results. Also, poor communication in the construction industry can occur on a large or small scale. Large scale ways of communication are between construction parties such as consultant, client, and contractor. However, on a small scale, it occurs between employees of the same firm or company. As a result, it has numerous unintended effects on a large or small scale which can have many effects on the work progress, accidents, and misunderstandings throughout the construction work (Gamil & Abdul Rahman, 2017). According to Thunberg, Rudberg and Gustavsson (2017), when it comes to construction project management, handling with problems that arise during on-site production is a difficulty and caused by the supply chain where the construction project process and the supply chain are tightly connected and will affect each other. According to Raoufi and Fayek (2020), many construction organisations are actually battling to deal with the economic consequences of the COVID-19 disease, such as market disruption and reduced investment and government spending on construction due to the pandemic's uncertainties. The purpose of a hybrid that comes from traditional, agile and lean project management is to maximise the benefits while eliminating their limitations and weaknesses. In a hybrid approach, all functions should interact and engage with each other while maintaining the predictability of the traditional approach (Lalmi *et al.*, 2021). According to Ozorhon, Cardak and Caglayan (2013) the need for the hybrid project management in construction industry is an improved project performance where the main barrier is a lack of awareness. Therefore, the aim of this study are to investigate the potentials, key criteria, and steps to promote hybrid project management implementation in the construction industry.

2. Literature Review

2.1 Project Management Implementation in The Construction Industry

Project management in the construction industry is the basis of any construction project such as project management where projects are always growing, evolving and developing from time to time. Although this link is currently mostly lacking, it is becoming increasingly relevant and necessary. In addition, depending on the nature, specifications, and requirements of the project, any of the variables within the constructs can be adapted to develop a comprehensive framework for an institution or for construction project management (Owusu *et al.*, 2019). Also, the building business has seen enormous transformation and improvement all over the world. The construction sector has transformed approaches, methods, and strategies by building greater and better things. Similarly, in order to address the shortage of qualified people, excessive labour hours, and poor quality work, the construction industry has leveraged technology and brand new implementations to better recruit and procedures in the construction profession (Ahmed, 2019).

(a) Traditional, Agile, Lean and Hybrid Project Management

Traditional project management is frequently linked with well-planned projects with clearly defined content that are carried out in compliance with defined parameters. This section seeks to provide the assistance required to determine which components of this strategy are most advantageous for project performance in building projects. Currently, project management is used for a variety of various types of projects (Lalmi *et al.*, 2021). Other than that, agile project management is a project management style that prioritizes flexible planning to change, rapid feedback, continuous development, and high participation and engagement of project members or stakeholders (Arefazar *et al.*, 2019). The agile method focuses the individuality and qualification level of the project team, which is consisted of fewer people than in the case of the traditional approach (Buganová *et al.*, 2019). Thus, construction is a project-based activity, with each project having its own setting. Dealing with delays, cost overruns, and quality flaws caused by unanticipated changes is a serious issue in reducing changes. Moreover, lean project management produce sustained customer value by removing waste throughout all company operations, and to approach the site in a different way by eliminating all waste, from material storage through structure acceptance whereby the construction sector is highlighted by waste generation, unclear safety conditions, and a high degree of variability in its building process (Lalmi *et al.*, 2021). Also, the lean approach to project management has proven to be extremely effective in potentially challenging and complex situations (Tamanini *et al.*, 2015). Typically, lean design accomplishes space requirements within the minimum floor area, resulting in fewer volumes to heat and ventilate, lower maintenance, and reduced circulation of building users due to shorter distances between components of the facility. Lean construction includes methods of designing production processes to minimise waste in time, effort, human, and material in order to deliver the most cost-effective value (Lalmi *et al.*, 2021). And the hybrid project management is the goals from traditional, agile and lean project management to leverage the strengths of each project management while eliminating their limitations where it can be a proper management method that could be an essential decision a project manager can make. All method should collaborate to maintain the predictability from the traditional project management.

2.2 Hybrid Project Management in The Construction Industry

Hybrid project management in the construction industry is an improved project performance where the main barrier is a lack of awareness of agile methods and practices and the main enabler is commitment and organisational learning. Furthermore, the most critical input in hybrid project management in construction industry are an autonomous, self and management-organised, and multidisciplinary team where the major improvement is better response to changes and the key project benefit is enhanced project performance (Ozorhon *et al.*, 2013). Before beginning the project activity, it is necessary to introduce the new hybrid approach and the acceptance of the project team, which is a little reasonable and increases the risk of project failure (Lalmi *et al.*, 2021).

(a) Definition

Hybrid is an implementation that combines systems that have been used into one new system. The merger can be upgraded with the use of the latest technologies, also the new information technology (IT). The more systems are combined; the more facilities can be used optimally. According to Arashpour (2016). According to Forcael and others (2020), this progress helped the construction industry, culminating in the name Construction 4.0, which has gained recognition in 2019. This approach was primarily founded on construction businesses' understanding of the construction industry's digitization and incorporated four major concepts: digital data, automation, connection, and digital access.

(b) Challenges of Hybrid Project Management Implementation

In the recent decade, information technology (IT) has grown at an accelerating rate, also the implementation of any project management in construction industry (Jamous *et al.*, 2021). The challenges in hybrid project management implementation is included the most frequent danger is a lack of visibility and access to information, which eventually leads to inconsistent decision-making. it can be complicated when there are multiple teams working on one project (Schwaber & Sutherland, 2011). It can cause stress and heavy workloads in employees, making it difficult for them to efficiently complete all of their tasks. Although there is not a fixed relationship, the complexity of project management might be relative to the size of an organisation (Sohn, 2021). Smaller tasks, on the other hand, can be just as complicated. Furthermore, large and global projects frequently involve multiple sections of a company, such as distinct subsidiaries, legal organisations, joint ventures, and so on. However, it can increase the complexity of initiatives involving multiple entities. Table 1 shows the challenges of hybrid project management.

Table 1: The challenges of hybrid project management

No.	Challenges of Hybrid Project Management Implementation in the Construction Industry	Authors
1.	Lack of visibility and access to information	• Jamous <i>et al.</i> (2021)
2.	Multiple teams working on one project that cause difficult efficient work	• Schwaber & Sutherland (2011)
3.	The complexity of internal drivers	• Sohn (2021)

2.3 Potential of Hybrid Project Management Implementation in The Construction Industry

According to Kalanithi (2021), the potential of hybrid project management in construction industry is hybrid work will become the dominant force in workplace culture in the future. These improvements will create an office or indoor climate like no other, substantially increasing the number of individuals who will work remotely at least part of the week that compared with pre-pandemic numbers. Furthermore, hybrid project management implementation in the construction industry can get better functionality and versatility (Kaiser, 2020). Other than that, according to Kalanithi (2021), the construction companies are increasingly appreciating and relying on the convenience of use provided by these new technological solutions, which means they will remain in high demand for the foreseeable future. Companies with hybrid construction have a huge opportunity to attract and retain new talent and ideas. Table 2 shows the potential of hybrid project management implementation in the construction industry.

Table 2: The potential of hybrid project management implementation in the construction industry

No.	Potential of Hybrid Project Management Implementation in the Construction Industry	Authors
1.	Workplace Culture	• Kalanithi (2021)
2.	Functionality and Versatility	• Kaiser (2020)
3.	High Demand	• Kalanithi (2021)

2.4 Criteria of Hybrid Project Management Implementation in The Construction Industry

According to Constro Facilitator (2020), the first criteria is software design used by the architects, contractors, engineers and project managers to produce detailed drawings and designs that need to be presented of new buildings or project designs where it is an important element in hardware devices in hybrid project management with iterative procedures (The Project Group, 2022). Other than that, reduce maintenance and cost-effectiveness is one of the most significant advantage of creating components made from various types of works (Constro Facilitator, 2020). Moreover, the mobility and user satisfaction gives various content in hybrid structures to the traditional project management. This is due to the fact that hybrid project management combine many functions inside a single structure or complex (Constro Fasilitator, 2020). Table 3 shows the criteria of hybrid project management implementation in the construction industry.

Table 3: The criteria of hybrid project management implementation in the construction industry

No.	Criteria of Hybrid Project Management Implementation in the Construction Industry	Authors
1.	Software Design	• Constro Facilitator (2020) • The Project Group (2022)
2.	Reducing Maintenance and Cost-Effectiveness	• Constro Facilitator (2020)
3.	Mobility and User Satisfaction	• Constro Facilitator (2020)

2.5 Strategies of Hybrid Project Management Implementation in The Construction Industry

The first strategy of hybrid project management implementation in the construction industry is understanding the knowledge on how hybrid project management works in the construction industry (Nexvoo, 2021). To create and implement a hybrid work strategy, the construction sector must first define hybrid work as a blend of project management methodologies such as traditional, agile and lean project management. Secondly, by doing research and development on hybrid working methodologies and strategies that related to the construction industry (Nexvoo, 2021). Research in hybrid project management are required before starting it. Also, according to Nexvoo (2021), the next strategy is developing the solutions to achieve the implementation in the construction industry. In the development stage, a hybrid framework is repetitious in and of itself, but it begins sequentially, it will be easier to monitor and track the project's workflow (Teodesk, 2020). Last but not least, also according to Nexvoo (2021), the other strategy is by proposed and improved management in order to implement the hybrid project management. To construct a hybrid project management model and accompanying hybrid project management system, any construction company must develop a pilot plan that can be completely implemented. Table 4 shows the strategies of hybrid project management implementation in the construction industry.

Table 4: The strategies of hybrid project management implementation in the construction industry

No.	Strategies of Hybrid Project Management Implementation in the Construction Industry	Authors
1.	Knowledge	• Nexvoo (2021)
2.	Research and Development (R&D)	• Nexvoo (2021)
3.	Develop Solutions	• Nexvoo (2021)
		• Teodesk (2020)
4.	Proposed and Improved Management	• Nexvoo (2021)

2.6 Summary of Literature Review

In summary, from the literature review that has been carried out the first objective is to identify the potential of hybrid project management implementation in the construction industry. The second objective is to determine the criteria of hybrid project management implementation in the construction industry. And lastly, the third objective is to identify the steps to promote hybrid project management implementation in the construction industry. The objectives related to this research shows in Table 5.

Table 5: Summary of the literature review

Potentials of Hybrid Project Management Implementation in The Construction Industry	Criteria of Hybrid Project Management Implementation in The Construction Industry	Strategies of Hybrid Project Management Implementation in The Construction Industry
<ul style="list-style-type: none"> • Workplace Culture • Functionality and Versatility • High Demand 	<ul style="list-style-type: none"> • Software Design • Reduce Maintenance and Cost-Effectiveness • Mobility and User Satisfaction 	<ul style="list-style-type: none"> • Knowledge • Research and Development (R&D) • Develop Solutions • Proposed and Improved Management

3. Research Methodology

3.1 Research Design

Qualitative method was used in this study whereby the data collection was conducted from the interview session with someone who have the positions held in a related construction company. According to Choy (2014), qualitative method allows researchers to investigate the perspectives of identical as well as different groups of people helps in understanding these differences within a community. Typically, the qualitative researcher does not have a predetermined, limited set of issues to investigate (Choy, 2014). To achieve the objectives of this research, the secondary data were obtained by analysing using the source of the data such as books, online journals, articles, webpages and any report that related to the study on hybrid project management implementation in the construction industry. Research design method shows in Table 6.

Table 6: Research Design Method

No.	Research Objectives	Method
1.	To identify the potentials of hybrid project management implementation in the construction industry.	• Literature Review
2.	To determine the key criteria of hybrid project management implementation in the construction industry.	• Qualitative (Semi-structured Interview)
3.	To identify the strategies of hybrid project management implementation in the construction industry.	

Other than that, in this study, the research processes for this study can be referred in Appendix A and it is separated into five phases. The Phase 1 consists of investigating and evaluating the title in the problem statement. Each of it describes the entire technique and activities from start to the end such as the research background, problem statement, research questions, research aims, research scope, research methodology, and the significance of research. Next, the Phase 2 is the literature review. The title of this research is the study on hybrid project management implementation in the construction industry. The information can be gathered from literature reviews through many sources and resources such as journals, articles, references, papers, related books to achieve the research objectives. Moreover, the Phase 3 for this study is the method of data collecting. The two methods of data that can be acquired are primary data and secondary data. In the primary data, which consists of a qualitative, quantitative and mix method of research. The secondary data is the material gathered from a range of sources, such as books, online journal papers, internet articles, and research publications. Contractors and any related positions held in the construction company can understand better the value of the study on hybrid project management implementation in the construction industry with the help of literature research. Furthermore, the Phase 4 is the data analysis and results. The results from the interviews will be used to examine recorded information in the form of texts, media, or even physical objects. To employ this strategy is determined by the research questions. Interviewee responses are typically analysed using content analysis. The broad observations regarding what the data revealed for each theme. For example, reoccurring points of agreement or disagreement, patterns and trends, and individual replies that were particularly relevant to this study question may be mentioned. And the Phase 5 is the conclusion and recommendations. All data analysis was summarised at this phase and it was provided recommendations and proposals for any further research.

3.2 Data Collection

Data collection is the process of acquiring and measuring information on certain variables in an existing system, allowing one to answer applicable questions and evaluate outcomes. Data gathering is an essential component of research in all fields of study, including physical and social sciences. According to Taherdoost (2016), there is a requirement to select a sample where the population refers to the complete set of cases from which the researcher sample is drawn. This is because the researchers did not have more time of the resources to analyse the entire population. So, it can be used by sampling techniques to decrease the number of cases. This research is suitable to use using qualitative method as primary data because according to Basias and Pollalis (2018), qualitative research is a naturalistic approach, a numerous and complex technique of concentration that encouraging research in relatively new areas of study that linked to the study on hybrid project management implementation in the construction industry. The core data for this study were acquired utilising qualitative methods by interviewing to target respondents in their company. The question that was asked in the interview sessions and focused on the research's objectives. Secondary data means of gathering information from many sources such as books, journals, and various articles on the manufacturing industry sectors were considered. This secondary data was gathered and collected based on the objectives which is to identify the potentials, the criteria and the strategies of hybrid project management implementation in the construction industry. The secondary data sources, such as company manual reports, management documentations, and other sources were obtained through literature reviews related to the study on hybrid project management approach implementation in the construction industry. Then, this research was utilised by content analysis. Researchers used content analysis to measure and analyse the presence, meanings, and correlations of specific words, themes, or concepts. It will be expanded on the level of abstraction and degree of interpretation employed in developing categories, descriptive themes, and meaning themes (Graneheim, 2017). A number of non-probability sampling procedures are referred to as purposeful sampling where the study sample will be selected by from the population and the G7 Contractors. In addition, the targeted population for this research is focused on the construction industry

that located in Selangor because Selangor had the highest value of construction work done at RM6.9 billion (Kaur, 2022). For the pilot study or pilot test, it is a small-scale preliminary study performed prior to the performance of a full-scale research project to determine effectiveness, time, cost, adverse events, and enhance the study design where it allows researchers to assess how probable the research procedure is to work in real life, which helps them decide how to best perform the final research study. Additionally, according to Van Teillingen and Hundley (2010), an advantage of performing a pilot study is that it may provide early warning about areas where the main research project may fail, where research protocols may not be followed, or whether planned methodologies or instruments are inappropriate or overly complicated. This pilot study was conducted and tested to the UTHM Lecturers of Faculty of Technology Management and Business (FTMB) and a G7 Contractor from the construction industry.

3.3 Data Analysis

Data analysis is the activity of analysing, cleansing and modelling data in order to identify usable information, make conclusions, and support decision-making. For this study, qualitative content analysis (QCA) will be used as this is an excellent for qualitative sampling approaches like purposive or snowball sampling, which select individuals who are very likely to be relevant to the research in some way (Lowe *et al.*, 2018). Qualitative content analysis is a powerful analytical method used for the subjective interpretation of the contents of qualitative data in a systematic and context dependent manner, and it is increasingly being used by researchers in a wide range of disciplines where content analysis is a research technique used to assess the existence of specific words, topics, or concepts in qualitative data (Selvi, 2019) and it is a self-contained method that may be applied at various levels of abstraction and interpretation (Graneheim *et al.*, 2017). Researchers then reach inferences about the contents in the texts, the writer, the audience, and even the culture and time period in which the work was written.

4. Results and Discussion

The data was collected through the in-person interview and virtual interview session that includes communication by mobile phone, WhatsApp, Google Meet and any other tool that contributes in the data collection using hybrid method. Microsoft Word was one of the software that was used to transcribe the data collected. But, after the COVID-19 pandemic, the construction industry is rapidly developing and it has caused many contractors and the large companies to handle many related and delayed projects. At the same time, hybrid project management is a new method in the construction industry. Therefore, it is quite difficult to get data from the respondent who are the G7 Contractors in Selangor. During the early stages of this study, the researcher contacted more than 30 companies to answer the interview questions and arrange the interview appointments. Those 30 companies were construction companies, which has been registered and classed as a G7 Contractor by the Construction Industry Development Board (CIDB). In spite of that, only four respondents provided the data to give feedback and information related to the researcher and were scheduled an interview. The majority of the companies send a representative to the interview session. The analysis was based on the information given and provided by those four respondents who consented to cooperate where it gave the result of this interview session. Moreover, the findings of this study were gathered using a set of interview questions that were send and give to the selected respondents where they worked for the construction company which had been registered as a G7 Contractors by the Contractor of the Construction Industry Development Board (CIDB). The collected data were obtained for two months and five days from 21st October 2022 until 26th December 2022 as of all the four respondents' data information gathered and were analysed using the content analysis approach.

Table 7: The improvement of the pilot study

No.	The Fault	The Improvement
1.	No CIDB Class Registration in the respondent’s background (Section A)	The improvement by put the new column for CIDB Class Registration in the respondent’s background (Section A)
2.	Confused flow arrangement in the respondent’s background (Section A)	Corrected the arrangement of the questions in the respondent’s background (Section A)
3.	No introduction of the understanding of the hybrid project management in the construction industry questions	Adding the new section as the introduction of the hybrid project management in the construction industry
4.	Need to correct the sentence in some of the question in Section E	The sentence was corrected in some of the question in Section E
5.	Need to check the grammatical error	The grammatical error in every questions has been corrected

4.1 Respondent’s Background

Respondents are very important and vital for this qualitative method approach because that will be ensured that all data that have been gathered from the respondents were accurate and genuine. Also, it allows the respondents to answer the interview questions based on their job experience. The respondents’ background had included the company’s name, CIDB class registration, the position of the respondents, respondents’ years of experience and their experience in project management, also respondents’ scope of work which contributed in determining the demographic status. Besides that, the demographic data is statistical information gathered regarding the characteristics of the population of G7 Contractors. However, only four respondents from the companies were responded. Those respondents play an important and significant role in the organisation and it is directly involved in project management in the construction industry. According to this analysis, the respondents have adequate and sufficient experience and knowledge to engage in this study.

Table 8: Respondents’ background

Respondents (R)	Organisations	Positions	Experience in Construction Industry	Experience in Project Management	Scope of Work
R1	Company A	Contract Manager	22 years	5 years	<ul style="list-style-type: none"> • Manage Project • Manage Contract • Claiming and Purchasing Order
R2	Company B	Senior Construction Manager	20 years	10 years	<ul style="list-style-type: none"> • Manage Project • Manage Project Quality • Manage Project Cost
R3	Company C	Project Manager	15 years	11 years	<ul style="list-style-type: none"> • Implement Project • Planning and Scheduling • Financial Planning • Execution Site

R4	Company D	Executive Director	12 years	7 years	<ul style="list-style-type: none"> • Manage Project • Manage Contract • Company's Procurement
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4.2 Introduction to Understanding Traditional, Agile, Lean as Hybrid Method of Project Management Implementation in The Construction Industry

In order to achieve the objective, it is important to find out and determine whether the respondents have knowledge and experiences in hybrid project management implementation in the construction industry, so that they are able to understand the questions and the data provided from the respondents are answering the questions. This is because to ensure and verify that the respondents have knowledge and opinion about what is hybrid project management is. Also, there are few questions concerning from their experiences in traditional, agile, lean and hybrid project management in the construction industry were been asked during the interview session. Based on their experiences and expertise, the majority of the respondents knew the use of the traditional, agile and lean as hybrid method in project management in the construction industry. This shows that the respondents' experiences and expertise assisted the researcher in learning and know more about the management and project used in the construction industry so that this method can be implemented effectively and efficiently. Respondents R1, R2, R3 and R4, they expressed the same respond on the introduction to traditional, agile, lean as hybrid project management implementation in the construction industry. This proves that the respondents actually have known all the activities that carried out in traditional project management including agile project management and lean project management as hybrid project management. But, they did not use it frequently because they implement their project activities with the use of traditional project management in the construction industry. Therefore, all of the respondents are actually know about the meaning and activities related of the traditional, agile and lean project management as hybrid project management but they did not know the new terms as hybrid project management used in the construction industry.

Table 9: Respondents' background

Question	R1	R2	R3	R4
Understand what is traditional, agile, lean in hybrid project management	<ul style="list-style-type: none"> • Mostly using traditional method • Sometimes use agile and lean in traditional method 	<ul style="list-style-type: none"> • Mostly using traditional method • Sometimes use agile and lean in traditional method 	<ul style="list-style-type: none"> • Mostly using traditional method • Sometimes use agile and lean in traditional method 	<ul style="list-style-type: none"> • Mostly using traditional method • Sometimes use agile and lean in traditional method

Based on Table 9, the summary of the results and analysis on introduction traditional, agile, lean as hybrid method of project management implementation in the construction industry. In this period of globalisation, Malaysia has been active in the use of technology in the sector of building which is still considered new for developing countries. The modern technologies employed will increase the quality of productivity of building projects, allowing Malaysia to compete with industrialised countries in management development. The introduction to the method of project management are traditional, agile and leas as hybrid project management implementation in the construction industry. The respondents explained that they are mostly using traditional method in the construction site but sometimes they use agile and lean in traditional method. As the respondents responded, the researcher can conclude that some critical players or stakeholders are missing the hybrid project management knowledge in their planning phases (Teodesk, 2020).

Table 10: Statement accepted by the respondents on the introduction to understanding traditional, agile and lean as hybrid project management implementation in the construction industry

Statement	R1	R2	R3	R4
<ul style="list-style-type: none"> • Mostly using agile, lean in traditional project management in construction site 	✓	✓	✓	✓

Based on Table 10, the introduction to understanding traditional, agile and lean as hybrid project management implementation in the construction industry, all respondents (R1, R2, R3 & R4) believe that they are using agile and lean in traditional as the method in their project management in the construction site.

4.3 Potentials of Hybrid Method of Project Management Implementation in The Construction Industry

The potentials of hybrid project management implementation in the construction industry section were answered well from the respondents where it has included the three factors that have been discussed such as workplace culture, functionality and versatility and high demand. The summary of the potentials of hybrid project management implementation in the construction industry for this study can be referred in Appendix B. A good workplace culture can be implemented by good teamwork, good communication where it can boost morale, production and efficiency in managing the construction project. Also, this can increase employee engagement in working and can get effective workplace culture even though by working remotely as they can be a potential in hybrid project management implementation in the construction industry. To get better functionality and versatility in potentials of hybrid project management implementation in the construction industry, solving problems that arise in the construction work need to be effectively solved from every parties that involved in the construction work. Even though it is before it can be known that it can be happened in the future or arise when implementing the construction work at the site. Based on the respondents' respond, the potentials of hybrid project management can be implemented in the construction industry by good teamwork, many parties' involvement, good communication, solving problems effectively and good project management. The potential of hybrid project management implementation in the construction industry stated from the respondents that the potentials in workplace culture, functionality and versatility and high demand. Workplace culture were one of the most discussed of potentials in the hybrid project management. The efficacy of this potentials is determined by the substance of the evaluation, the methodology of implementation and the organisational culture (Moradi *et al.*, 2020).

As shown in the Table 11, the workplace culture in potentials of hybrid project management implementation in the construction industry were the most agreed from all of the respondents. But, as the functionality and versatility, only R2, R3 and R4 agreed. For the high demand factor, only R3 is not agreed but R1, R2, and R4 were agreed for the hybrid project management can be remained in the future.

Table 11: Statement accepted by the respondents on the potentials of hybrid project management implementation in the construction industry

Statement	R1	R2	R3	R4
<ul style="list-style-type: none"> • Workplace Culture 	✓	✓	✓	✓
<ul style="list-style-type: none"> • Functionality and Versatility 		✓	✓	✓
<ul style="list-style-type: none"> • High Demand in Remote Work 	✓	✓		✓

4.4 Key Criteria of Hybrid Project Management Implementation in The Construction Industry

The key criteria of hybrid project management implementation in the construction industry section were answered well from the respondents where it has included the three factors that have been discussed such as software design, reduce maintenance and cost-effectiveness and mobility and user satisfaction. The summary of the key criteria of hybrid project management implementation in the construction industry for this study can be referred Appendix C. The use of BIM and IBS can be criteria on software design in the hybrid project management implementation in the construction industry. BIM will integrate all the software data in order to design a building and helps to recognise any problems that will be occurred. And IBS will be easily installed using new technology and machine in order to reduce the time and cost in hybrid project management. To develop cost-effectiveness and reducing the maintenance, the use of other than conventional type of work will help it too. The consumption balance in order to get the criteria will help through it. Also, with proper planning and scheduling, it also can help to reduce maintenance in the future and will be cost-effective within the budget. The mobility and user satisfaction are one of the key criteria of hybrid project management implementation in the construction industry. Good and proper preparation of cost, time and the types of material used will be the key criteria of hybrid project management as they can be implemented in the construction industry.

The key criteria of hybrid project management implementation in the construction industry stated from the respondents that the most key criteria that have been discussed is software design. According to Cho (2009), this tendency is mostly related to the limitations of traditional processes, such as delayed adaptability to quickly changing business requirements and a tendency to go over budget and time. This study compares and contrasts the qualities, strengths, and shortcomings of traditional and agile approaches.

Table 12: Statement accepted by the respondents on the key criteria of hybrid project management implementation in the construction industry

Statement	R1	R2	R3	R4
• Software Design	✓	✓	✓	✓
• Reduce Maintenance and Cost-Effectiveness		✓	✓	✓
• Mobility and User Satisfaction	✓	✓		✓

Based on the Table 12, the key criteria of hybrid project management implementation in the construction industry, all respondents agreed with the factor of software design. For the reduce maintenance and cost-effectiveness, there is one respondent not agreed (R1), but R2, R3 and R4 were agreed to the factor. And for the mobility and user satisfaction factor, only three of them were agreed (R1, R2 & R4) but only R3 was not agreed.

4.5 Strategies of Hybrid Method of Project Management Implementation in The Construction Industry

The strategies of hybrid project management implementation in the construction industry section also were answered well from the respondents where it has included the four factors that have been discussed such as knowledge, research and development, develop solutions and proposed and improved management. The summary of the strategies of hybrid project management implementation in the construction industry for this study can be referred in Appendix D. In order to get the knowledge, the types of knowledge, the strategies and structures are the main things in the hybrid project management implementation in the construction industry. It helps to contribute more in hybrid project management. The assessments are important in order to manage and get the best quality control of the projects in the construction industry. Also, the assessment helps to implement the hybrid project management in the construction industry too. Developing solutions are the most important things in construction industry in order to get the successful of the project as it can be the strategies to implement hybrid project management in the construction industry. The proposed and improved management are able to apply from the experienced and skilled person from the past projects they have done. Also, the agencies related such as CIDB can take actions to execute this hybrid project management in the construction industry.

The strategies of hybrid project management implementation in the construction industry stated from the respondents that the strategies that can be implemented were knowledge, develop solutions and proposed and improved management in the future. The inadequate knowledge exists regarding the magnitude of effects that environmental events may trigger (Barbosa & Saisse, 2019). Also, in the development stage, a hybrid framework is repetitious in and of itself, but it begins sequentially, it will be easier to monitor and track the project's workflow to develop solutions (Teodesk, 2012). And, according to Nexvoo (2021), the last strategy is start and propose and improve the hybrid project management implementation in the construction industry.

Table 13: Statement accepted by the respondents on the strategies of hybrid project management implementation in the construction industry

Statement	R1	R2	R3	R4
• Knowledge	✓	✓	✓	✓
• Research and Development (R&D)	✓		✓	✓
• Develop Solutions	✓	✓	✓	✓
• Proposed and Improved Management	✓	✓	✓	✓

As shown in the Table 13, the statement accepted by the respondents in the strategies of hybrid project management implementation in the construction industry were knowledge, research and development, develop solutions and proposed and improved management. All of the respondents (R1, R2, R3 & R4) were acknowledged of the strategies that can be implemented in the construction industry in the future. But, only one respondent (R2), was not agreed with the research and development as the strategies to implement in the construction industry.

5. Conclusion

The construction industry is one of the ever-emerging industries, with current technology always improving and demand in the construction industry getting on board. Almost every year, numerous structures and constructions encounter various issues caused by the unsatisfactory project management. As a result, this research was conducted to give contractors and project managers with a method and exposure to hybrid project management in the construction industry. Hybrid project management is a recent finding that can help contractors and project managers to implement about new combination

method in project management. Respondents in this research include those participating in G7 Contractors construction projects that registered and approved by Malaysia's Construction Industry Development Board (CIDB). The research approach used in this study is qualitative method with data collected through interview sessions. The interview sessions were being held and more than 30 responders from various companies were reached and approached. However, only four of the companies provided and contributed the feedbacks for the interview sessions. The researcher was used Microsoft Word's software to analyse the data given by the respondents. Other than that, the qualitative approach was used to reach the researcher's intended targets because based on the data required, the respondents answered all of the questions concerning hybrid project management implementation in the construction industry.

The term of research limitations refers to flaws or restrictions in the study that are beyond the researcher's control. Researchers must be mindful and aware of the research gaps that arise when performing research study. In addition, writing about the constraints of the research that occurred in this study would assist future research. This research study and like the other research studies, has their limitations. The first constraint is that the researcher may only conduct study on hybrid project management implementation in the construction industry and cannot incorporate other topics that are unrelated to the research topic. Furthermore, the limitation constraint is that the researcher encountered a number of issues while completing this investigation. This study has constraints in terms of obtaining data from respondents received as a result of the COVID-19 pandemic to endemic era. Most construction projects are carried and continue their journey towards better with the new norm. Many construction projects struggling and recovering and that also made it as a limitation to obtain data from the respondents. The restrictions of the study scope are one of the constraints that a researcher must encounter when doing research. Due to the pandemic to endemic condition and circumstances, the researcher barely able to locate more responders in Selangor because most of them did provide no cooperative due to no respond to the researcher to make interview appointment and also time constraints handling many projects. In addition to the limits of the reference sources, the researcher frequently has difficulties accessing and interviewing the respondent. But, in this COVID-19 pandemic to endemic, researcher can obtain information and data conducted by a hybrid method where using physically and virtual interview sessions. Both of the method can provide good data for researchers.

The construction industry will be exposed to the cloud computing lifecycle, including its varieties, benefits, and obstacles as a result of this research. Later, the industry will see and recognise the need of employing hybrid project management to be implemented in the construction industry as it can be give more beneficial to their project management. As a result, it can be assisted the industries in dealing hybrid project management and their associated issued. This study will also provide advice to the contractor team and project manager team on how to apply hybrid project management in any construction projects during pre-construction stage, as well as increase the management skills in construction project execution. Finally, this research will assist in the production of a construction generation equipped with management skills which will assist the expansion and development the economy of the construction industry in Malaysia. According to the findings of this research, construction management may develop and expand new knowledge and skills in terms of hybrid project management among employees and employers in the management section, where soft skills are highly valued in any business, and this type of thing can also open up to the bigger and wider area. There are several work options for construction management graduates. The knowledge and the use of hybrid project management may be developed further in the construction management. Project management may be conducted more efficient and effective. The conclusion should summarize the main findings of the study, and restate the key points inferred from trends observed and discussed regarding the data. Some suggestions should be included to encourage the continuation of the current research.

The construction industry is one of the ever-emerging industries in the world. Almost every year, numerous construction industries face poor project management issues. So, in order to ensure that the

construction industry becomes more efficient and effective, changes must be made on a regular basis. The technology and good management used to manage the construction industry in project management has very high running expenses. If there are persistent difficulties with project management flow at the construction site, the company will experience a loss since it demands large expenses and budgets to accomplish. This follow-up study and research is consistent with previous studies in terms of delivering innovations, enhancement and improvements from previous research. Among the additional studies that can be offered is first, to increase understanding about hybrid project management implementation in the construction industry, researchers must locate multiple sources or more thorough information on the topic in order to add to their expertise of the study. In addition, if researchers want to work more in order to do more research of the project management or construction management, the outcomes of this research may be used to develop numerous systematic ways for implementing hybrid project management such as using other than qualitative method. For example, using quantitative method or mix-method as it can be obtained more from the respondents of construction companies in Malaysia. Moreover, the research scope can also be expanded not only to G7 Contractors but can be execute from other grades of registered under CIDB organisation. And using the data received and obtained from the respondents, researchers may determine if the management commonly used is suitable to manage construction projects, as well as ways of improvement and implementation from time to time that is connected to the new method used.

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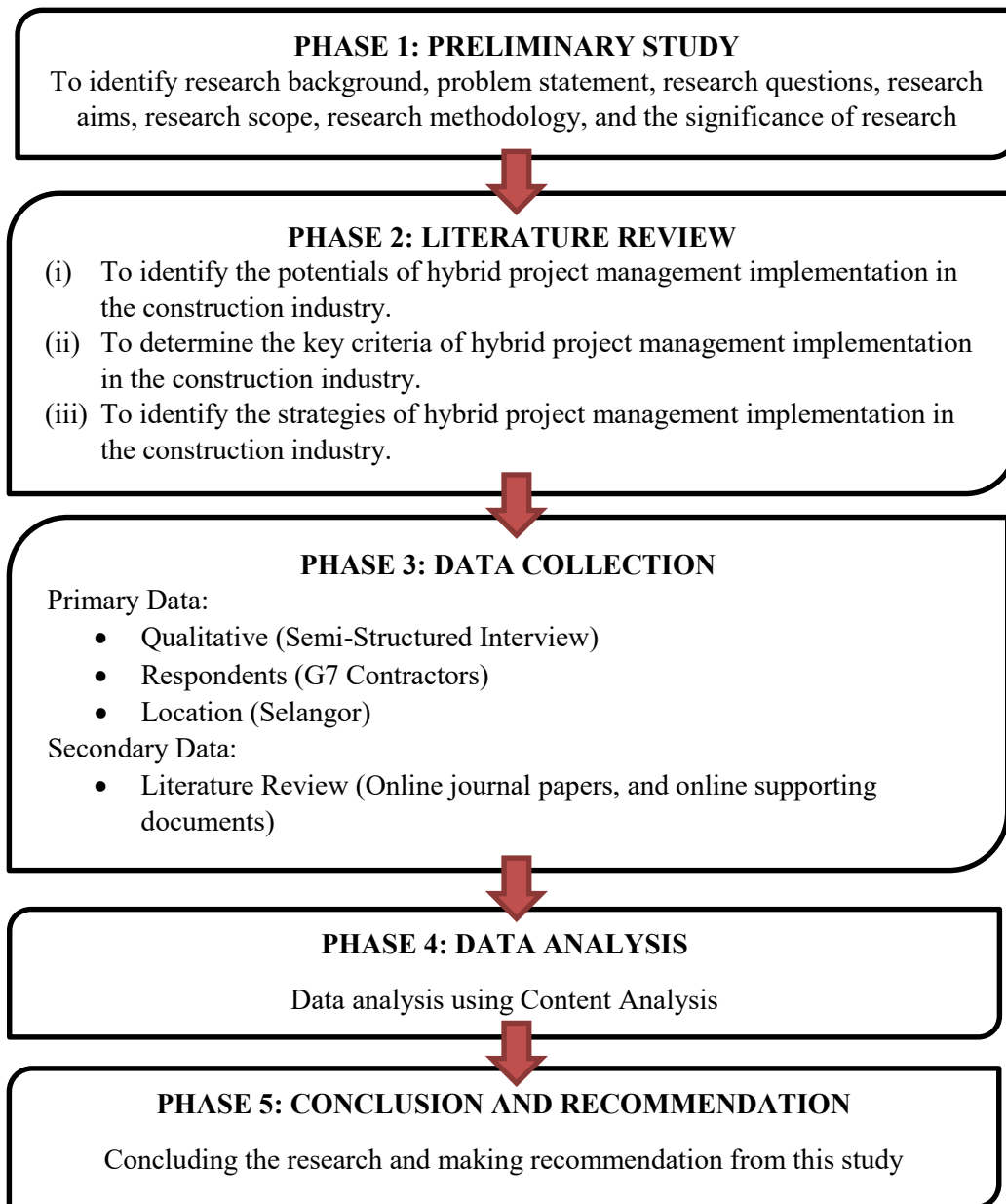
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Appendix A



Research Process

Appendix B

Summary of Potentials of Hybrid Project Management Implementation in the Construction Industry

Questions	R1	R2	R3	R4
a) Workplace Culture				
1. Encourage Teamwork	<ul style="list-style-type: none"> Parties involvement 	<ul style="list-style-type: none"> Parties involvement Committed in goals and mission 	<ul style="list-style-type: none"> Parties involvement 	<ul style="list-style-type: none"> Parties involvement Teamwork
2. Boost Morale	<ul style="list-style-type: none"> High patience Work spirit 	<ul style="list-style-type: none"> Teamwork Supporting each other 	<ul style="list-style-type: none"> Teamwork Supporting each other Effective communication 	<ul style="list-style-type: none"> Teamwork Learn new things by hybrid
3. Boost Production And Efficiency	<ul style="list-style-type: none"> Teamwork 	<ul style="list-style-type: none"> Teamwork Supporting each other 	<ul style="list-style-type: none"> Consistency Teamwork Solve problems 	<ul style="list-style-type: none"> Teamwork Combination work
4. Increase Employee Engagement	<ul style="list-style-type: none"> Parties involvement Training the new ones Learn more 	<ul style="list-style-type: none"> Provide exposure Take good action 	<ul style="list-style-type: none"> Responsibility from high parties Playing good roles 	<ul style="list-style-type: none"> Adapt new things
5. Effective Workplace Culture Remotely	<ul style="list-style-type: none"> Prefer to do physical monitoring 	<ul style="list-style-type: none"> Daily report Weekly cycle 	<ul style="list-style-type: none"> Effective communication 	<ul style="list-style-type: none"> Effective communication
b) Functionality and Versatility				
1. Offer Better Control	<ul style="list-style-type: none"> Do more paperwork and documentation Proper planning 	<ul style="list-style-type: none"> Parties involvement 	<ul style="list-style-type: none"> Parties involvement Learn more Expand knowledge Broaden scope of work 	<ul style="list-style-type: none"> Parties involvement
2. Achieve Competitive Advantage	<ul style="list-style-type: none"> Provide exposure Motivation Work with competency 	<ul style="list-style-type: none"> Good experience Daily report Effective communication 	<ul style="list-style-type: none"> Solve problem efficiently Teamwork Easily handle 	<ul style="list-style-type: none"> Earlier planning Solve problems efficiently
c) High Demand				
1. Remote Work	<ul style="list-style-type: none"> Meeting, yes Site, physically Depends on new situation 	<ul style="list-style-type: none"> Meeting, yes Site, physically Depends on new situation in construction industry 	<ul style="list-style-type: none"> More efficient and effective Can replace traditional project management 	<ul style="list-style-type: none"> Meeting, yes Site, physically Depends on new situation

2. Increase Potential	in construction industry			in construction industry
	<ul style="list-style-type: none"> • Experiences • Training and attend courses • Take examination • Committed 	<ul style="list-style-type: none"> • Good distribution of work or task • Monitoring work progress • Solve problems 	<ul style="list-style-type: none"> • Work planning • Time planning • Cost planning • Teamwork 	<ul style="list-style-type: none"> • Improve ourselves to learn more

Appendix C

Summary on Key Criteria of Hybrid Project Management Implementation in the Construction Industry

Questions	R1	R2	R3	R4
a) Software Design				
1. Better Design And Performance	<ul style="list-style-type: none"> • Using BIM as they completed each other's activities in design 	<ul style="list-style-type: none"> • Using BIM 	<ul style="list-style-type: none"> • Using BIM • Shop drawing 	<ul style="list-style-type: none"> • Using BIM • Move towards IR 4.0 • Using all software
2. Provide Easy Installation	<ul style="list-style-type: none"> • Using IBS as new technologies • Construction technology machine • New construction components 	<ul style="list-style-type: none"> • Using aluminium formwork • Shop drawing 	<ul style="list-style-type: none"> • Modelling • Using IBS 	<ul style="list-style-type: none"> • Using IBS
b) Reduce Maintenance and Cost-Effective				
1. Reduce Maintenance	<ul style="list-style-type: none"> • Parties involvement • Proper planning • Discuss with team and stakeholders 	<ul style="list-style-type: none"> • Materials used • Self-climbing platform 	<ul style="list-style-type: none"> • Planning and modelling • Problem-control 	<ul style="list-style-type: none"> • Using BIM • Installed services software
2. Cost-Effectiveness	<ul style="list-style-type: none"> • Cost monitoring • Spend within budget 	<ul style="list-style-type: none"> • Consumption balance between time and cost 	<ul style="list-style-type: none"> • Planning and modelling • Problem-control 	<ul style="list-style-type: none"> • Time monitoring
c) Mobility and User Satisfaction				

1. Availability Of Mobility	<ul style="list-style-type: none"> • Cost preparation and planning • Professional work • Being more flexible 	<ul style="list-style-type: none"> • Not really • As an additional criteria 	<ul style="list-style-type: none"> • Earlier planning 	<ul style="list-style-type: none"> • Time and cost monitoring • Good project management
2. Client's Satisfaction	<ul style="list-style-type: none"> • Clients as portable to input hybrid project management • Clients give new specifications of what they want 	<ul style="list-style-type: none"> • Completed report and documentation • Using drone and CCTV • Yearly survey • Feedback / rating 	<ul style="list-style-type: none"> • Earlier planning 	<ul style="list-style-type: none"> • Documentation • Software • Time and cost monitoring

Appendix D

Summary on Strategies of Hybrid Project Management Implementation in the Construction Industry

Questions	R1	R2	R3	R4
a) Knowledge				
1. Type of Knowledge	<ul style="list-style-type: none"> • Provide exposure • Learn and take initiatives in construction courses 	<ul style="list-style-type: none"> • Project management knowledge 	<ul style="list-style-type: none"> • Knowledge with each other 	<ul style="list-style-type: none"> • Basic traditional project management
2. Develop Strategies	<ul style="list-style-type: none"> • Learn and implement more • Do it practically 	<ul style="list-style-type: none"> • Briefing every day before or after work • Training and attend courses • Refreshing core management system 	<ul style="list-style-type: none"> • Have knowledge • Discuss with team as a teamwork 	<ul style="list-style-type: none"> • Seminar • Good communication and technical • Good project management • Software used
3. Create Structure of Working	<ul style="list-style-type: none"> • Professional training • Learn and teach employees 	<ul style="list-style-type: none"> • Good preparation and submission • Quality control awareness training 	<ul style="list-style-type: none"> • Meeting before start construction activity • Post-mortems 	<ul style="list-style-type: none"> • From top management • Professional training

b) Research and Development (R&D)

1. Need of R&D	<ul style="list-style-type: none"> • Based on suitability project 	<ul style="list-style-type: none"> • Not really • Site visit is construction R&D 	<ul style="list-style-type: none"> • Based on suitability project 	<ul style="list-style-type: none"> • Yes, to develop and implement hybrid project management
2. Assessment From Stakeholders, Clients And Consultants	<ul style="list-style-type: none"> • Assessment from clients after the project • Quality value and plan 	<ul style="list-style-type: none"> • Assessment from clients after the project • Quality control 	<ul style="list-style-type: none"> • Assessment from clients after the project • Assessment from every stakeholders 	<ul style="list-style-type: none"> • Assessment from clients, stakeholders and consultant

c) Develop Solutions

1. Techniques of Develop Solution	<ul style="list-style-type: none"> • Experienced and skilled person • Training and attend courses 	<ul style="list-style-type: none"> • Technical meeting • Site walk 	<ul style="list-style-type: none"> • Use modelling work • Imagination implemented to software 	<ul style="list-style-type: none"> • Monitoring work • Implement using new method to every new project • Experienced and skilled person
2. Ensure Rational System	<ul style="list-style-type: none"> • Planning project • Based on experienced past project 	<ul style="list-style-type: none"> • Analysis table 	<ul style="list-style-type: none"> • Based on individual or board of director • Initiatives from the top management 	<ul style="list-style-type: none"> • Initiatives from the top management

d) Proposed and Improved Management

1. Put Forward Hybrid	<ul style="list-style-type: none"> • Based on experienced past project • Good documentation 	<ul style="list-style-type: none"> • Based on experienced past projects • Training and attend courses • Always implement 	<ul style="list-style-type: none"> • Based on individual in the construction company • Initiatives from government and CIDB 	<ul style="list-style-type: none"> • An exposure to hybrid project management • Initiatives from government and CIDB
2. Improvising from Hybrid Project Management	<ul style="list-style-type: none"> • Completed and related to each other 	<ul style="list-style-type: none"> • Due to technology • Using hybrid materials 	<ul style="list-style-type: none"> • Implement hybrid project management in the future • Get more knowledge 	<ul style="list-style-type: none"> • Implement hybrid project management