ARCHITECT'S PERCEPTION OF FACTORS CONTRIBUTING TO CONSTRUCTION PROJECT DELAY IN PLANNING & DESIGN PHASE: CASE STUDIES OF PRIVATE HOUSING PROJECTS IN KLANG VALLEY, MALAYSIA

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RESEARCH PROJECT SUBMITTED TO THE FACULTY OF BUILT ENVIRONMENT UNIVERSITY OF MALAYA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PROJECT MANAGEMENT

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ORIGINAL LITERARY WORK DECLARATION

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Field of Study: Project Management

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ABSTRACT

For construction projects, a delay occurs when the project is unable to be finished on time. In Malaysia, delay is an unavoidable issue that occurs in all phases of construction project. Presently, the majority of past research has concentrated on determining the reasons of or resolving delays in the building phase; however, only a few studies have looked into delays in the planning and design phases. Thus, this study aims to to identify the factors that contributing to construction project delays in the planning and design phase, specially for the private housing projects. Quantitative research method is adopted as to meet the research objective. This research was conducted depend on the literature review and questionnaire survey. A questionnaire survey was conducted and delivered to respondents from architectural consultancy practice (ACP) registered with the Board of Architects Malaysia (LAM). Relative importance index (RII) analysis methods applied to justify the most critical delay factors for data analysis. Changes of client's requirements was among the most critical causes of delay in the planning and design phases. The outcome of this research is good justification to propose some recommendations to mitigate delays for better performance of Malaysia's private housing construction project.

Keywords: construction project, planning and design phase, delay, delay factors, private housing project, architect

PERSEPSI ARKITEK TERHADAP FAKTOR-FAKTOR YANG MENYUMBANG KEPADA KELEWATAN PROJEK PEMBINAAN DALAM FASA PERANCANGAN & REKABENTUK: KAJIAN KES PROJEK PERUMAHAN SWASTA DI LEMBAH KLANG, MALAYSIA

ABSTRAK

Kelewatan dalam projek pembinaan adalah keadaan di mana projek tidak dapat disiapkan mengikut masa yang dirancang. Di Malaysia, kelewatan merupakan isu yang tidak dapat dielakkan yang berlaku dalam semua fasa projek pembinaan. Pada masa ini, kebanyakan kajian terdahulu memfokuskan kepada mencari punca atau mengatasi kelewatan dalam fasa pembinaan, beberapa kajian telah menganalisis isu kelewatan dalam fasa perancangan dan reka bentuk. Justeru, kajian ini bertujuan untuk mengenal pasti faktor-faktor yang menyumbang kepada kelewatan projek pembinaan dalam fasa perancangan dan reka bentuk, khususnya bagi projek perumahan swasta. Kaedah kajian kuantitatif digunakan untuk memenuhi objektif kajian. Kajian ini dijalankan bergantung kepada kajian literatur dan tinjauan soal selidik. Tinjauan soal selidik telah dijalankan dan diedarkan kepada ahli pasukan daripada amalan perundingan seni bina yang telah berdaftar dengan Lembaga Arkitek Malaysia (LAM). Kaedah analisis indeks kepentingan relatif (RII) digunakan untuk mewajarkan faktor kelewatan yang paling kritikal untuk analisis data. Perubahan keperluan pelanggan adalah antara punca paling kritikal kelewatan dalam fasa perancangan dan reka bentuk. Hasil penyelidikan ini adalah justifikasi yang baik untuk mencadangkan beberapa cadangan untuk mengurangkan kelewatan untuk prestasi yang lebih baik bagi projek perumahan swasta di Malaysia.

Kata kunci: projek pembinaan, fasa perancangan dan reka bentuk, kelewatan, faktor kelewatan, projek perumahan swasta, arkitek

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DEDICATION

To my beloved supervisor, parents, friends and lecturers.

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CHAPTER ONE: INTRODUCTION

1.1 Introduction to Chapter One

Chapter 1 described the formulation of the research thoroughly. To give a quick overall view of the study, it stresses on the background of study, problem statement, objectives and aim, questions to be solved for research, research methodology, significance of study, research scope, and thesis structure.

1.2 Research Background

An rise in a country's economic growth would boost the construction industry's growth (Rum and Akasah, 2011). The building industry in Malaysia is frequently discussed as one of the key sectors contributing to the economy growth. This business will always expand in tandem with the rise of associated businesses such as finance, manufacturing, education, services, as well as others, as an activator for the economy (Alaloul et. al., 2020).

However, delays are widely recognised as the most prevalent problem in construction projects, as they are complicated, risky, and occur frequently (Alaghbari et. al., 2007). Delay is one of the most significant issues in construction projects, and there is still more to be done to achieve near-zero delays in all projects (Sepasgozar et al., 2019). Therefore, a delay in construction industry is undoubtedly a global issue (Sambasivan and Soon, 2007).

During construction project implementation, numerous issues may arise especially delay. Construction delays can determine whether a project succeeds or fails. Delays in

building projects are caused by a variety of circumstances (Zidane and Andersen, 2018). According to Assaf and Al-Hejji (2006), delay for delivery of a project is the overrun of time either beyond the date that agreed by the parties or beyond completion date designated in a contract. Many factors influence delay, according to Long et al. (2008), and it varies depending on the types of projects, scopes locations and sizes. According to Alaghbari, 2007, the study reveals that finance problems are the primary cause of building project delays in Malaysia, with coordination issues coming in second.

Poor site management, contractor financial issues, material shortages, labour shortages, tool and equipment shortages, construction mistakes and defective work and coordination problems are all factors that lead to delays, according to Ali et al. (2007). However, most research focused primarily on finding construction-related delays, with planning and design phases receiving little attention (Yang and Wei, 2010).

For keeping track of delay, there is a need for improvement in current practices. As a result, the purpose of this research is to identify the factors that contributing to construction project delays in the planning and design phase, especially from the perceptions of architect. The outcomes of this study will provide a number of helpful solutions for enhancing the performance of the planning and design phases in a project cycle. Consequently, there might be abundant financial savings on projects if the delays can be minimized.

1.3 Problem statement

Many studies have been conducted in Malaysia to discover the reasons of building project delays throughout the construction period. The eight key classes of reasons for building delays in Malaysia were identified based on surveys conducted by Sambasivan and Yau (2007): contract related factors, labour and equipment related factors, material related factors, client related factors,contract relationship related factors, contractor related factors, external factor and consultant related factors.

According to the latest RIBA Future Trends survey (2021), architects are facing project delays due to slow planning processes. Yang and Wei (2010) stated that a construction project's planning and design have a substantial impact on its overall timeline and cost. Once the project completion date is decided, delays in the planning phase often decrease the duration in the design or following construction phases. Because appropriately characterising delay liability helps delay dispute resolution, this problem of continuous effect demands additional examination. Basu (2005) highlighted elements that nearly always contribute to project delays at the outset of a project and gave insight into the reasons for the delays as well as their influence on the schedule.

According to McManus et al. (1996), who examined delay factors in architectural construction projects, many delays appear throughout all project phases and occur mostly during the building phase. However, many delays begin in the design phase. In building projects, design is extremely important. The total project performance is influenced by design quality. It also has a significant impact on project outcomes (Couto, 2012). According to Pandit (2015), Delays are exacerbated by issues that arise during the design process.

While most studies look at factors that cause delays during the construction phase and how to overcome them, few studies have looked at factors that cause delays during the planning and design phases (Yang and Wei, 2010). However, there exist a limited number of studies in the literature as pointed in recent years that focus on the planning and design phase in Malaysia, especially architect's perception on the factors that contributing to project delay as previous studies are mostly concentrate on the perception on contractor.

1.4 Research Aim

The main aim of this research is to improve project delays in the planning and design phase, especially from the perceptions of architect.

1.5 Research Objectives

This paper aims to achieve the following objectives:

Research objective 1: To identify the most critical delay factors that contributing to construction project delays in the planning and design phase

Research objective 2: To identify the ranking of delays factor that contributing to construction project delays in the planning and design phase

Research objective 3: To propose the strategies to minimize the construction projects delay in the planning and design phase

1.6 Research Questions

It is very important to establish an understandable and focused research question as a guide for conducting this research. The research's general question might be stated as follows:

Research Question 1: What are the most critical delay factors that contributing to construction project delays in the planning and design phase?

Research Question 2: What is the ranking of delays factor that contributing to construction project delays in the planning and design phase?

Research Question 3: What are the strategies to minimize the construction projects delay in the planning and design phase?

In order to meet the research goals and objectives, a questionnaire survey based on the answers to the above questions is needed.

1.7 Research Methodology

In this research, 2 strategies will be implemented in phase by phase in order to meet the research objectives, which are:

i. Qualitative research methodologies at the start of each objective, when more data can be gathered from prior linked publications' literature reviews. For example, books, library searches, academic journals, electronic journal databases, articles, conference proceedings, theses, and organisational reports were all employed to acquire material for the study's basis that focused on collecting data on the delay factors that contributing to construction project delays in the planning and design

phase. It is crucial to developing a firm theoretical knowledge of the problem for this study.

ii. Quantitative research methodologies in the 2nd stage of each objective, whereby, after the data has been acquired from the first stage, questionnaire design was developed to identify the most critical delay factors that contributing to construction project delays in the planning and design phase. The questionnaires were sent out to related respondents in order to obtain their feedback on the ranking of delays factor that contributing to construction project delays in the planning and design phase, as well as giving opinions on the strategies to minimize the construction projects delay in the planning and design phase. By using the relative importance index (RII) analysis methods, the results were analyzed.

Chapter 4 delves into the specifics of each study technique, research design, and justification.

1.8 Research Scope

The study is limited to Malaysia's construction industry. It focuses on private housing development projects, such as landed and high-rise housing in the perception of architect which focusing on factors that contributing to construction project delays in the planning and design phase.

This research will be conducted with a focus on team members (registered architect, graduate architect and assistant architects) from sole-proprietor, body corporate or

multi-disciplinary architectural practice that have registered with the Board of Architects Malaysia (LAM).

1.9 Significance of Study

Halim and Zin (2016) stated that delays manifest during all project phases, where they might initiate even in the design phase. Delay considerations have a substantial impact on the timely, cost-effective, and high-quality completion of a construction project. A project that is completed within the time range stipulated is exceedingly unusual (Endut et al. , 2009). The most important goal of delay analysis is to figure out what factors affect the key route and, as a result, the project's completion (Al Saggaf, 1998). As a result, understanding the underlying reasons of construction delays is crucial in order to assess their importance and limit the risk of a construction project being delayed (Shebob et al. 2012).

Therefore, hoping that by applying the findings from this research as a guide for construction participants, the delivery of private house construction project performance can be improved. Those key persons from construction industry will be aware of delay factors which might exists in current or future private housing projects, especially in the planning and design phase. The identified causes of delay in the planning and design phases would inevitably help with easing or alleviating the delay all through the construction project phases (Halim and Zin, 2016).

This study is also to provide superior methods and strategies for private housing construction projects by avoiding the critical factors that causing delays. Finally, the

research will confirm what other previous researchers have stated regarding variables that cause delays in building projects, particularly during the construction period. It will also give some information for future scholars who want to look into this or a similar issue further.

1.10 Structure of Thesis

CHAPTER ONE: INTRODUCTION

There were six chapters in this research. This chapter of the research will cover the research background, problem statement, research aim and objectives, research question, research methodology and also the scope and significance of the research.

CHAPTER TWO: LITERATURE REVIEW

The main aim of this chapter is to conduct a literature review. Articles, the internet, books, & journals connected to this topic shall be utilized as a guideline and reference to give a theoretical framework for this study in order to gain a thorough grasp of it.

CHAPTER THREE: RESEARCH METHODOLOGY

The appropriate research methodology will be identified and used for this study by considering the benefits and limitations of the research method. In the meantime, this chapter will look into several forms of analytical applications.

CHAPTER FOUR: RESEARCH FINDINGS

In Chapter 4, all findings related to research questions or hypotheses will be introduced and summarized with tables and graphs. It usually consists of the study facts and does not consist of much analysis, which will be covered further in the next chapter.

CHAPTER FIVE: DISCUSSION

All of the data or findings gathered in Chapter 5 will be analyzed and understood, and the phenomena will be further elaborated qualitatively. All of the data that has been analyzed will be addressed further. The research's limitations will be highlighted, along with suitable explanations.

CHAPTER SIX: SUMMARY AND RECOMMENDATIONS

A conclusion will be formed according to the findings. Only a number of recommendations will be made for future research.

1.11 Summary

This chapter has focused on the study's core concern, which is project delays throughout the planning and design phases. The scope and objectives of the investigation are discussed in this chapter. There are three research objectives that are examined during the study. This chapter also discussed the importance of conducting this research since it will support what other previous researchers have stated on factors that cause building project delays. The second chapter, Chapter Two, will cover the basic overview of a

building project, the planning and design process, delays, delay reasons, and private housing projects.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction to Chapter 2

This chapter describes a written survey aiming to provide the inquiry on a basic overview of the implemented system. Boote and Beile (2004) claimed that a written survey contains an evaluative test summary which presents for the analysis an implied basis of contention. The writing analysis will have the potential to demonstrate the researcher's propensity to interpret relevant content data and therefore to integrate the data to comply with the work extension.

There are few areas of knowledge that must be addressed in this project. For this research, it is fundamentally reviewed in six perspectives which are construction industry, construction project, planning and design phase, delay, delay in construction project, type of delay, delay factors in construction phase, delay factors in the planning and design phase, private housing project in Malaysia, architect and strategies to minimizing delay in planning and design phases.

2.2 Construction Industry

CIDB (2007) stated that construction industry performs a crucial role in Malaysia's economic growth. Nevertheless, the more complex an industry is, the more challenges it faces. Beyond-reliance on foreign employees, building faults, extra costs over budget, and a delay in completing the project on time are just a few of the difficulties that come to mind. The construction sector contributes significantly to the economy, providing both employment and wealth to the sector. However, in the actual fact, there are lots of

projects encounter extensive delays, which surpass the initial planned time and estimated cost (Sweis et. a.l., 2008).

Other than being part of the process that creates and sustains the built environment, the construction industry actually has another more significant role to play within the overall economy in any nation. This is one of the salient points stated by Foulkes and Ruddock (2007). The construction industry is often time, being placed solely in the secondary sector, mostly due to the fact that economist and the general public view the construction industry as the transformation from manufactured materials into a final product. When we look at the bigger picture from a more holistic point of view, the construction industry in fact spans across primary, secondary and tertiary sectors, not to mention how extensive the involvement of professional services and sale of products to the end users. Such examples imply that the construction industry isn't merely about raw materials being transformed into manufactured materials and then on into a final product; it's beyond that.

According to Daba and Pitroda (2018), construction industry comprises but not limited to the following fields: project duration scheduling, project work planning, organizing, evaluating, implementing project progress and monitoring of all project works. The Structural organizations that is to be executed in construction industry includes water supply, energy, infrastructures, disposal construction work, communication & energy-related construction works and so on. As 'time factor' always being the most critical factor other than fund itself, the management function scheduling is always being put under tight monitoring as it will determine the completion time of the project, as well as anything remotely close to work delay. Due to interrelation with other industries

(Durdyev& Ismail, 2012), construction industry is acting significant role when it comes to providing the needed infrastructure and improving the life quality.

2.3 Construction Project

Based on the report from Daba and Pitroda (2018), construction projects are the projects that construction field related, which have limited time dimension within specific allocation of resources, but with a particular purpose. A successful project is to be done on time, within cost and achieve the quality or standard as agreed in the contract by satisfying their clients and all stakeholders involved (Chan and Kumaraswamy, 1993). That's just another concrete reason to regard the construction industry as a fragmented, scheduled, complex and resource driven industry.

Reported by Rauzana (2016), the success of a construction project relies on cooperation between the involving parties, which are project planners, contractors and building owners. There are various of factors could delay the implementation of construction projects. Among the most vital goals is to carry out construction projects on time without delays before and during the implementation. Experiencing limitations during project implementation is extremely undesirable as it will be deleterious to all involving parties. Every construction project has their unique implementation plan, especially on when shall the project implementation project begin, when to solve the issues, how shall the solving being carried out, and the distribution of resources provision resources. If there is no suitable plans being made to the actual reality, problems will undoubtedly arise. Those arising issues would be an obstruction to for a smooth construction project implementation.

2.4 Planning and Design Phase

A plan is a series of steps for reaching a goal in the future, particularly a set of actions that has been deliberately and thoroughly examined (Longman, 2003). It emphasises the value of working toward a goal and determining how that goal will be achieved. There are more extensive viewpoints or definitions be considered in what constitutes planning, for example:

a) The process of deciding and conveying a planned course of action, which involves detailed methods that illustrate the resources, time and place required, is known as planning (CIOB, 2011).

b) Planning is the creative and challenging mental process of figuring out what has to be done, how and when it needs to be done, by whom, and with what, i.e. performing the task in your head (Neale and Neale, 1989).

c) Planning is a decision-making process that occurs before to action and aims to design a desired future and effective means of achieving it (Ackoff, 1970).

Planning and design phases offer the greatest potential for influencing the performance of a project. An all-around managed project will give esteem and basically meet client prerequisites all through its lifetime and will likewise advantage the earth, society and the economy. Appropriate execution in planning and design can convey these advantages and avoid pointless expenses and delays (Halim and Zin, 2016).

2.5 Delay

According to Daba and Pitroda (2018), delay is a period of project's late delivery that acknowledge in a contract or the timeline that agreed by client and contractor. The time fall behind its schedule of a project which becomes a common challenge in the construction industry? A delay is known by a hardship of pay for the project holder's side, through a dependency on present services or shortcoming of manufacture services and rentable space. On the other hand, delay means additional cost to the project developer/ contractor side due to the project submitting late and delay timeline, may incur higher cost of material than at cost at before through cost increase, and due to labour cost rises than previously scheduled within the estimated timeline.

Delays happen in plenty of construction project and the level of these delays contrast extensively from case to case. A few projects may complete a couple days later as scheduled; others may delay over than a year. Hence, delay factors are significant to be identified in order to refrain from construction project delay (Ahmed et al., 2003). Lo et al (2006) defines that delay refers to exceeded or beyond the contract timeline that both parties have agreed in the signed contract upon for the delivery of a project.

Stumpf (2000) expressed delay as an event or act that over the period required delivering the tasks which has agreed and signed in the contract. Normally, it is requiring extra days of work or as a delayed to execute an activity. Later he explains that delay may not bring significant impact, and that varies way for studying schedule delay lead to varies results especially to the client and contractor. Construction delay happens when one project is completed behind its scheduled timeline, or completed later of the period that specified or stated in the contract (Haseeb et al., 2011).

The delay is over the date and time that all parties signed and agreed upon for a project delivery or the over the completion date or time overdue which concurred in a contract (Assaf and Al-Hejji, 2006). They further explained that delay also implied as postpone of the project completion date which agreed by the parties in the initial stage. Enshassi et al. (2009) highlights that delay in construction as one of the most important cause that impacting a project performance. Delay may also refers as act or event, which beyond planned timeline in delivering work as specified in contract, shows extra days of work required for the works (Zack, 2003). In short, delay in construction projects is a significant issue (Kazaz and Ulubeyli 2009).

2.6 Construction Project Delays

KPKT (2010) describes project delays as those projects that experience delays during the construction period, with time gaps between actual site work progress and planned or scheduled timelines ranging from 10% to 30%. According to Ahmed et al. (2003), delays are commonly seen in infrastructure projects, and their seriousness varies from one to another. Some projects are only a few days behind schedule; some are more than a year behind plan. Some project delays are caused by the contractor's behavior, while others are caused by the owner. Also, there will be delays that are not caused by the two parties stated above. Construction project delays imply that additional implementation time is required for projects that were previously planned and outlined in contract agreements. (Rauzana, 2016).

According to Assaf and Al-Hejji (2006), delays occur in the majority of construction projects, whether complicated or trivial. A construction delay is described as a time overrun that surpasses the contractual deadline or the agreed-upon completion date for

all affected parties. Construction delays have become an integral part of life of construction project. Even with the most up-to-date technology and a thorough understanding of project management practises, there are still construction projects that are experiencing delays and project completion deadlines that are being delayed. (Stump, 2000).

Delay in planning and design phases is not a separate subject from a delay in construction phases. Each phase has its own deadline in an effort to achieve the set goals and objectives. Nevertheless where contractors are the ones to deliver products in the construction phase, designers or consultants are the ones who are supposed to deliver products (design reports) in the design phase. Yau and Yang (2012) referred to this fact, that most projects have delays in the design stage, which subsequently prompts project delays. It would appear that types of delay in the planning and design phases are identical to delay in the construction phases, but with lesser potential causes and concurrent delay is unlikely to be established.

2.7 Types of Delays

As defined by Ahmed et al. (2003), there are four main categories of delay deriving from how they work on contractually as shown in figure 2.1:

(1) Non-excusable delays;

(2) Excusable non-compensable delays;

(3) Excusable compensable delays; and

(4) Concurrent delays

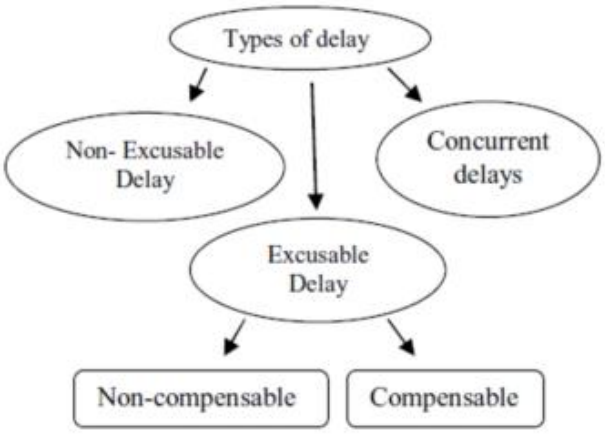

Figure 2.1 Types of Delay. (Source: Ahmed et, al., 2003)

2.7.1 Compensable delays

Compensable delays are those that are resulted by either its agents or the owner or both in general. It's not something unheard of as some of the most common delay of such can come in the form of insufficient drawings and specifications. Apart from that, failure of owner to requests for shop drawings or data and to respond in a timely fashion could well slow down the construction execution; although at most of the times, owners are often unaware of how the protracted changes in materials or design could also result in the disruption of the work sequence. As a result of compensable delays, the contractor is qualified to get extra time and extra money, as long as enough evidence and supporting documents can be presented to prove such delay is caused by owner (Alaghbari, 2005).

2.7.2 Non-excusable delays

In contract to compensable delays, non-excusable delays are generally caused by subcontractors or contractors, which essentially include supplier's materials, through no

fault of the owner. The owner will not bear additional cost incurred from the delay, although there might be a chance the contractor will be qualified for compensation because of the delay from supplier or subcontractor or. Normally, extra cost and no extra time will be to the contractor due to the non-compensable delays (Alaghbari, 2005).

2.7.3 Excusable delays

Excusable delays, some also refer it as "force majeure" delays, are the third general classification of delay. These delays are often signifies as "acts of God" because they are not the fault or responsibility of any specific group. Although no additional money will be granted, extension of time will be given to contractor for the reason due to the excusable delays (Alaghbari, 2005).

2.7.4 Concurrent delays

It is generally genuinely simple to figure both the cost and time that come from that single issue. If there is only one delay factor to the construction, a more convoluted; yet in addition more common. Circumstance is one where there are more than one factor delays the simultaneously or in covering time frames specified in the contract (Alaghbari, 2005).

2.8 Delay Factors in Construction Phase

According to Alkass et. al. (1996), delays can occur with many factors such as material shortage, change orders, failure of equipment, strikes, rework, poor organization, act of God and others. Furthermore, scenario becomes more complex with delays. In Malaysia,

the main factor causing delay in construction projects is financial issues whereas the next most important factor is coordination problems (Alaghbari et. al., 2007). From the findings, 28 common construction delay factors have been developed and classified into eight main groups which are consultant, external factors, material, client, contractor, labour and equipment, financial and contract (Sambasivan and Soon, 2007). Ramli et al (2019) highlighted that climate condition, progress payment delay by client, award project to lowest bid price, lack of skilled laborers due to site location distance, and political interference are the most significant delay factors.

Arditi et al. (1985) look into the delays reasons in public projects in Turkey. According to the findings, the most significant reasons for the delay are financial difficulties of public agencies and contractor, resources shortage, continuous change orders, considerable additional work, organizational deficiencies and delays in design work. Ogunlana and Promkuntong (1996) investigated a study in Thailand on construction delays. In developing economies like Thailand, incompetence or inadequacies of contractor, clients and consultants and shortages or inadequacies of resources in industry infrastructure are the delay factors faced by the construction industry. As suggests by them, construction industry organizations and economy managers should be concerted effort to give the appropriate framework for effective project management in order to overcome this issue.

In Nigeria, 16 key reasons that caused delays and cost overruns have been recognised (Mansfield, 1994). In Nigeria, a questionnaire survey was done with consumers, contractors, and consultants. The main reasons of delays and cost overruns in Nigerian construction projects include material inadequacy, improper estimation, finance and

payment arrangements, pricing variations, and inefficient contract management. Another research further into reasons for the delays in public-sector construction projects in Nigeria has been conducted (Dlakwa and Culpin, 1990). Plant and labour expenses are rising, material costs are fluctuating, and agencies are not paying contractors on time. These are the major reasons for delays in public sector building projects.

Apart from that, Odeyinka and Yusif (1997) investigated the causes of delays in Nigerian construction projects. The delay factors have been categorized as project participants and external factors. Contractor delays are caused by financial challenges, material management issues, a lack of staff, planning issues, scheduling issues, equipment management issues, and a lack of site inspection. Cash flow issues, poor decision-making, and variation orders are all examples of client delays. Labor conflicts, strikes, natural disasters, and harsh weather are examples of extraneous causes of delay. Frimponget et al. (2003) conducted a survey in Ghana to recognise and quantify the relative effects of significant delays and cost overruns in groundwater development projects.

Based on preliminary research completed between 1970 and 1999, a questionnaire with 26 components was developed. The questionnaire was sent to three groups of consultants, contractors, and owners of groundwater projects, both public and private. A random sample of 30 consultants, 55 owners, and 40 contractors were issued this questionnaire. According to the study, the primary causes of groundwater construction project delays and cost overruns in Ghana include growing material costs, inadequate technical performance, monthly payment concerns, material procurement, and

inefficient contractor management. Amoatey et al. (2015) had identified the six most significant delays in Ghanaian housing infrastructure projects. Poor financial or capital market conditions, sponsor funding delays, variation orders, payment delays, material price increases, and price inflation or fluctuation are the leading causes of delay.

According to Assaf et al. (1995), a study of 56 significant causes of delay in Saudi large building construction projects revealed their relative importance. Design revisions, owner payment delays, contractor progress delays, and shop drawings preparation and validation were the most significant delay reasons from the survey to the contractors. However, owner's slow decision making, financial issue during construction and the relationship between subcontractors were the main causes of delay from the perspective of the consultants (architects and engineers). In view of owners showed that inadequate labor skills, labor shortages and the design mistakes were important delay factors. In addition, Assaf and Al-Hejji (2006) conducted another research in Saudi Arabia to investigate on time performance of large construction projects. There are 73 various varieties of delays that have been recognised. Change orders were the most major form of delay, according to owners, consultants, and contractors, when compared to other key causes. They also discovered that 70 percent of the projects had time overruns from their findings.

A survey has been conducted in Hong Kong construction projects, to recognise and evaluate the relative significance of the important factors causing delays. Type of projects and the role of the parties (client, consultants or contractor) are the two categories of main reasons causing delays based on the analysis. According to the findings, five principal delays were caused by client-initiated changes, unanticipated

ground situations, inadequate site administration and supervision, poor decision-making involving all project teams, and essential work variations. (Chan and Kumaraswamy, 1997). Client-initiated changes, unanticipated ground conditions, inefficient site management and supervision, low speed of decision-making including all project teams, and essential work variations were five key delays causes, according to the findings. (Chan and Kumaraswamy, 1997).

Al-Momani (2000) did a quantitative survey in Jordan's construction delays. From his findings, increase in quantity, climate, site conditions, economic conditions, project delivery late, user changes, and designers were the major factors of delay in public projects construction. Subsequently, Odeh and Battaineh (2002) carried out a study on construction projects with traditional type of contracts, as to investigate the most significant causes of delays based on the perspective from consultants and contractors. From the results, as agreed by contractors and consultants, the top ten most significant factors were planning improper, slow decision making, lack of experience of the contractor and subcontractors, labor productivity, financing and payments and owner interference.

2.9 Delay Factors in the Planning and Design Phase

Many delays emerge across all project phases and largely occur during the building phase, according to McManus et al. (1996), who researched delay reasons in architectural construction projects. However, many delays begin in the design phase. Basu (2005) also identified indicators at the outset of a project that would virtually surely result in project delays, as well as insight into the causes of the delays and their influence on timelines. The key delay factors, according to Abdullah and Koskela

(2008), tend to cluster around management concerns and the project environment. Gonzalez et al. (2014) came to the conclusion that more study is needed to address existing management techniques and detrimental delay effects. Inspired to carry out a related research, they proposed that noncompliance in the planning phase was the most important cause of delay.

In particular, Yang and Wei (2010) at the early stage of their research managed to determine 15 and 20 causes of delays in the planning and design phases respectively. Halim and Zin (2016) found out 19 and 24 delay factors in the planning and design stage. These delay factors by Yang and Wei (2010) were listed together with the findings by Halim and Zin (2016) in Table 1 for broader perspective of delay causes in the planning and design phases.

Table 2.1 Delay factors in the planing and design phases

Yang & Wei (2010)		**Halim and Zin (2016)**	
Planning	Design	Planning	Design
1. Changes in client's requirement 2. Poor scope definition 3. Unreasonable or unpractical initial plan 4. Change orders by client 5. Project complexity 6. Unreasonable contract	1. Changes in client's requirement 2. Unclear authority among designers 3. Incomplete design drawings and specifications 4. Poor communication between	1. Improper basic planning. 2. Changes in client's requirement. 3. Complicated administration process of client. 4. Insufficient or ill-integrated basic project data. 5. Unfinished	1. Changes in client's requirement. 2. Inadequate integration on project interfaces. 3. Change orders by deficiency design. 4. Unrealistic design duration imposed.

duration 7. Insufficient or ill-integrated basic project data 8. Inadequate planning and schedule 9. Slow land expropriation due to resistance from occupants 10. Complicated administration process of client 11. Improper selection of subsequent consultants 12. Unfinished client-furnished item 13. Weather 14. Infectious disease 15. Indication of suspension or delay by client	designers 5. Slow decision making by designers 6. Inadequate experience of designers 7. Slow information delivery between designers 8. Unrealistic design duration imposed 9. Improper or wrong cost estimation 10. Wrong or improper design 11. Change orders by code change 12. Inadequate integration on project interfaces 13. Disagreement on design specifications 14. Lack of database for estimation 15. Insufficient training of designers 16. Change orders	client furnished item. 6. Slow land expropriation due to resistance from occupants. 7. Unreasonable planning duration. 8. Poor scope definition 9. Project complexity 10. Unreasonable or unpractical initial plan. 11. Inadequate planning and schedule. 12. Improper selection of project team and subsequent consultants. 13. Change orders by client. 14. Incomplete or delayed document delivery by client. 15. Indication of suspension or delay by client. 16. Tedious review processes. 17. Regulation	5. Liability ambiguity due to improper contract clauses. 6. Conflicts between contract clauses. 7. Incomplete design drawings and specifications. 8. Change orders by code change. 9. Disagreement on design specifications. 10. Improper or wrong cost estimation. 11. Slow decision making by designers. 12. Insufficient training of designers. 13. Poor communication and coordination between designers/ project user groups. 14. Inadequate experience of designers. 15. Lack of

	by deficiency design 17. Client's financial problems 18. Weather 19. Infectious disease 20. Client's indication of suspension or delay	changes. 18. Over-subjective explanation of regulations. 19. Public resistance or political intervention.	database for estimation. 16. Wrong or improper design. 17. Client's financial problems. 18. Unclear authority among designers. 19. Slow information delivery between designers. 20. Inadequate schedule control. 21. Inability of owners to review design in a timely manner. 22. Late incorporation of emerging technologies into a design. 23. Unforeseeable site conditions (e.g., existing underground conduits). 24. Delay due to other construction projects in hand.

2.10 Private Housing Project in Malaysia

Housing, along with food, clothing, education, and medical, is a basic requirement for each individual, according to the National Housing Department (n.d.). For a healthy, happy, and productive living, a comfortable home is essential. Housing accommodation is defined as any messuage, building or tenement that is completely or primarily constructed, modified, or planned for human residence, or partially for human habitation and partially for business premises, according to the Housing Development Act of 1966 (Act 118). Housing development is defined as the process of developing, constructing, or causing to be constructed more than 4 units of housing accommodation in any way, including the collection of funds or the execution of any construction operations for the purpose of erecting housing accommodation in, on, over, or under any land, or the sale of more than 4 lots of land or building lots with the intention of constructing more than 4 units of housing accommodation. According to Jaafar et al.(2014), housing development is the provision of funding for the construction of residential estates in compliance with existing rules and regulations.

Home builders shall purchase property, adjust land use to suit the desired development purpose, integrate resources required for the projects, analyse market demand and supply, offer housing units, and lastly sell the constructed houses to complete a housing development project. Moreover, realistic housing projects must include a variety of required facilities and amenities, as well as environmental protection (Sudin, 1997). According to Venkatesh and Venkatesan (2017), construction projects will fulfill housing needs such as water supply on basic infrastructure, energy supply, and road connection. Infrastructure must be constantly developed and upgraded in order to accommodate the ever-increasing population and demand.

Finance, building materials, land, and advisory services, according to Jaafar et al. (2010), are the most important supporting elements in home construction. Assigned consultants, which most often include engineers and architects, must adhere to all government requirements, which include acquiring regulatory approval, fulfilling construction practice regulations, and following the conditions imposed upon completion of a project, such as procedures for procuring a Certificate of Completion and Compliance (CCC). Meanwhile, housing development in Malaysia is also greatly manipulated by a number of laws, policies, and guidelines, which comprises the Government Act 1976 (Act 171), National Land Code (NLC) 1965, Environmental Quality Act 1984, Local Government Act 1976, Street, Drainage and Building Act 1974 (Act 133), Town and Country Planning Act 1976 (Act 172), Fire Services Act 1988, Town Planning Act 1995, Housing Developers (Control and Licensing) Act 1966, Strata Titles Act 1985, Uniform Building By-Law 1984 (UBBL) and Sewerage Services Act 1993, as outlined by Abdullah et al. (2011). In addition to these laws, new housing developments should consider the local authority's requirements as well as the project's demand factor to ensure company sustainability (Khalid, 2010).

According to PropertyGuru (2021), To date, Malaysia has a diverse range of residential property types which including condos, bungalows, terraces, apartments, semi-Ds and so on. The Housing Development Act protects certain residential properties, which have been around for over a decade (HDA), which aims to establish regulations and rules for when a developer can start charging the buyer, protect the buyer's interests when a project is abandoned and protect the interests of property buyers by providing assistance during developer-buyer disputes.

2.11 Delay Factors in Private Housing Projects in Malaysia

The top 10 causes of delays in private housing developments, according to Mydin et al. (2014), were site weather conditions (external factors), poor site conditions the contractor's inadequate site management, the consultant's incomplete papers, the consultant's site staff (managerial and supervisory people) lack of expertise, and the contractor's financial problems, client contract adjustments, as well as changes in specifications, consultant delay in authorising major changes within the scope of work, contractor coordination issues with other parties, replacement and addition of new work and construction errors and defective work.

2.12 Architect

"Architect" is defined as a person who is registered under subsection 10(2) of the architect act of 1967. A person who is registered under subsection 10(1) is referred to as a graduate architect. A body corporate, partnership or sole proprietorship constituted under the Companies Act 1965 [Act 125] that provides architectural consultation services and is registered by the Board under section 7A or 7B is referred to as a "architectural consultancy practise."; "architectural consultancy services" means the provision of architectural consultancy services and advice pertaining to all or any of the following: (a) any other actions involving the development, maintenance, or enhancement of the built environment; (b) all services are provided in accordance with legal regulations; (c) creation of blueprints and other presenting materials; (d) feasibility studies and cost estimates are being prepared; (e) interior design, financial advice services, project management, contract administration, and landscaping are all part of the planning and development process; (f) construction and industrial programming, as well as product design, are all examples of project programming; (g) any study, report,

or inquiry relative to the built environment, including environmental impact assessment studies; (h) any design for the built environment requires conceptualization, study, and development; (i) submittal of plans or drawings to any Malaysian individual or local authority.

Malaysian Institute of Architects (2021) defined an architect as a qualified professional that can aid people in transforming architectural needs into reality. Before a construction project can be performed, a qualified architect is hired to get planning and building permissions from the appropriate authorities. Architects might work in groups or on their own. The architect, as superintending officer, performs his professional obligations as both the employer's agent and contract administrator under the terms and circumstances of the PAM Standard Form (2006) of building contract. The latter function places a duty on the architect to act equally amongst the contracting parties in addition to exercising competent professional judgement.

2.13 Strategies to Minimize Delay in Planning and Design Phases

It is regarded a success when a construction project is completed on time, on budget, and according to specifications, as well as to the satisfaction of all stakeholders (Nguyen et al., 2004). According to Adnan et al. (2014), important success factors are a select few aspects or variables that a manager should focus on in order to achieve the specified objectives. Ibironke et al. (2013) and Mahamid et al. (2012) gave succinct insights on tactics and possibilities for reducing or eliminating delays during the planning and design phases.

1. Give yourself enough time to plan, develop, gather information, document, and submit a tender.
2. Investing enough effort and money in the design process.
3. Before granting the contract to the lowest bidder, check for resources and competencies.
4. During the design process, a thorough and detailed site assessment should be carried out. The project team is multidisciplinary and skilled.
5. Communication and collaboration with other parties should be improved.

Prior research by Yau and Yang (2012), also suggested some tactics for preventing delays, designed primarily for turnkey projects but relevant to all construction projects. The suggested strategies were based on the owner's and designer's perspectives as exploratory proposals for dealing with comparable situations. Their suggestions were as follows:

For the Client:

1.An open public hearing should be arranged to serve as a link between the project team and stakeholders.

2.A site visit of finished projects is a viable option for settling public and political concerns.

3.Selection of a qualified contractor or consultant for the seamless implementation of the project, which is accomplished through a transparent prequalification procedure throughout the procurement process.

For the Designer:

1. The designer should finish the preliminary drawings, site layout and regulatory checks as soon as feasible before filing for essential permissions or licences, ideally completing the design work fully to minimise probable planning and design difficulties.

2. If the conclusion of the government agencies' evaluation conflicts with the client's initial planning and design concepts, the designer may need to seek client approval.

3. A designer can help with the investigation of popular opposition or political involvement.

4. A designer should absolutely assume the role of a professional while creating a project, especially by giving an error-free design and, if necessary, a detailed project description.

Design issues in most construction projects could be the results of inadequate on-site investigation, design and specifications inaccuracy, incomplete drawings, lack of details, design changes, and so on. To achieve error-free design, strong communication with the whole design team is required, as is including a well-planned design process that allows for ample time for adjustments, detailed inquiry, and reviews (Ambituuni, 2011).

2.14 Summary of Literature Review

In our country, construction industry contributes significantly to the country's economic growth and development. Because meeting the housing needs of all people has always been our national policy goal, the housing sector is an irrefutable factor of economic empowerment in Malaysia (Hong, 2011). Construction project delays, on the other hand, are an inevitable global phenomenon. Hence, the construction industry in Malaysia is no

exception. Whether it is a simple or complex construction project, delays have occurred in most of the construction projects in Malaysia, and as a result, many problems have arisen.

Based on the literature review, there are limited researches concerning delay causes in the planning and design phases conducted in recent years as pointed out earlier. The majority of research focused primarily on finding construction-related delays, with planning and design phases receiving little attention (Yang and Wei, 2010). As a result, this research is being conducted in order to determine the variables that contribute to construction project delays throughout the planning and design phase, particularly from the perspective of architects.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Introduction to Chapter 3

Chapter 3 gives an overview of the study process, including data collection and analysis methodologies, as well as predicted outcomes for the subject discussed in the previous chapter. The researcher is able to examine the data collection, data analysis, and data description methods for applications by using research methodology. This study started with a discussion of a wide range of analytic strategies and techniques that were used in this study, as well as a description of the methodology and strategy methods that were adopted. Research methods have constantly been about ways and techniques for examining both decisions and choices by applying specialized data collection approaches and tools from a wide range of perspectives and remarks.

3.2 Research

The term "research" indicates "re" and "search". 'Re' means the process of repetition, meanwhile 'search' refers to discover something (Igwenagu, 2016). Commonly, research refers to an exploration for knowledge. Research can also define as a systematic and scientific finding for relevant data on a particular title. As matter of fact, research implies as the art of scientific investigation. Redman and Mory (1923) stated research as an “orderly attempt to acquire new knowledge.” Research is a branch of knowledge helping in the maturity and development of its citizens and society and solving all business problems and government policies, whilst avoiding superstitious beliefs (Pavan and Kulkarni, 2014).

3.3 Methodology

According to Irny and Rose (2005), methodology is the methods of theoretical and systematic analysis that applied to an area of research. It consists of the principles linked with a vast knowledge and theoretical analysis of the body of methods. Normally, it includes ideas such as quantitative or qualitative techniques, paradigm, theoretical model and stages.

3.4 Research Methodology

Research methodology is an organized way to deal with research questions (Rajesekar et. Al., 2006). In the analysis of the research issue and the judiciousness, it is deciphered as the number of steps that are usually taken by the researcher, and the study of concentrating how research is acquired for this research. (Daniel & Sam, 2011). Essentially, research methodology is defined as the set of methods and practices by which researchers portray their study, evaluate and understand phenomena. According to research objectives, questions and the interpretation that is outlined in the research scope, the choice of the methodology to be utilized will be determined. The research methodology might be as quantitative as well as qualitative data (Ahuja, 2003).

3.5 Research Process

In executing a thorough research or study, it is a vital step to understand the research process. Therefore, this study is adopting the model proposed by Rummel and Ballaine (1963). Six steps are included in this research process. These comprise identification of the general study area, selecting the topic of research, formulating plan and methodology, data collection, interpreting and analysing the data as well as study write

up. Such steps able to simplify in three phases, which are the phase of planning, research and presentation. It will be shown in the figure below.

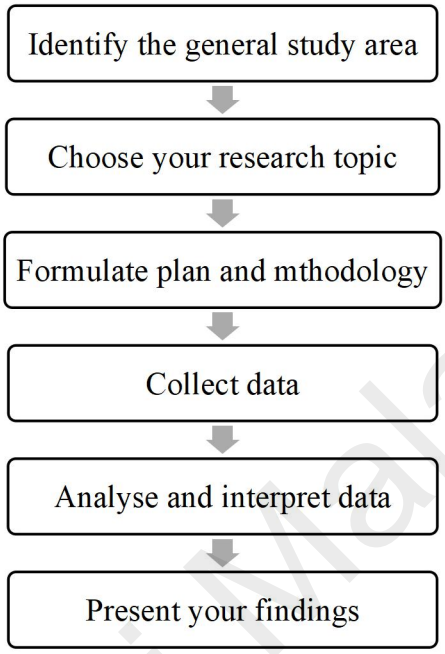

Figure 3.1 Research Model Process (Source: Rummel, 1963)

By venturing through all the highlighted steps, progression through a research is basically made from careful compliance with model, enhancing the possibilities to complete the study effectively. Continuous amendment of prior steps can be an indication that these initial steps have been unsuccessfully conducted. Research viewed this way can be seen as a progression of related events. Thereby, it is referred as a linear process.

3.6 Research Purpose

According to Kothari (2004), through the application of scientific procedures, discovering answers to questions is the research purpose. The primary aim of research is to to discover reality which has not been found or which is covered up at this point. We may consider research objectives despite the fact that each research study has its own particular purpose, as falling into various after general groupings:

1. Increasing familiarity with a circumstance or to accomplish new insights into it (exploratory or formulative research studies has been known as for studies with this object);

2. Depicting precisely on the attributes of a specific individual, circumstance or a group (descriptive research studies has been known as for studies with this object);

3. Deciding on the frequency with which something occurs or with which it is connected with something different (diagnostic research studies has been known as for studies with this object);

4. Testing on a hypothesis of a causal connection between factors (hypothesis-testing research studies has been known as for such studies).

The research purpose is the justification or rationale or the principal interest for the conduct of research (Hill et. al., 1974). Hill et al. (1974) further expounds on the research objective that can be clarified or categorized as a framework or structure for defining or anticipating a condition / solution.

The goal of this study is to to identify the factors that contributing to construction project delays in the planning and design phase, especially from the perceptions of architect. In addition, this study will propose the strategies to minimize the construction projects delay in the planning and design phase.

3.7 Research Approach

According to Creswell (2009), a research approach is a plan of action that directs research in a logical and proficient manner. Quantitative approach, qualitative approach, and mixed-mode methodologies are the three main research approaches.

To find out the most appropriate outcomes, all researches must include a systematic, explicit and disciplined approach. Researchers often use a quantitative strategy to respond to research questions that require numerical data, a qualitative approach to research questions that require textual data, and a mixed approaches approach to study problems that require both textural and numerical data (Williams, 2007).

In this study, the quantitative approach is the major source of data. Quantitative research is "objective" by definition. It is described as the testing of a hypothesis or theory made up of variables, measured using numbers, and analysed using statistical processes to discover if the hypothesis or theory holds true (Creswell,1994). As a result, quantitative data is abstract; it is reliable and hard; it is a measure of the world's physical, countable, and sensate properties (Bouma and Atkinson, 1995).

In order to obtain accurate and accurate results, the number of sample sizes has to be big and usually upwards of 40 (Boudon, 1967). In addition, Guba and Lincoln (1994) explain also that quantitative method could be described as calculating and the connection between variables can be calculated through statistical analysis. They further clarify that the researcher must also be experienced and well understood in the field to show that if the variables are remarkable. This research is based on the quantitative method used to discover research problems and to accomplish desired goals and objectives via an in-depth analysis (Guba & Lincoln, 1994)

3.8 Research Design

According to Krippendorf (1980), a research design is a procedural network of analytical procedures through which information is processed. The purpose of study design is to determine what data to seek and how to analyse it. It provides as a reference for what should be done when collecting data, since it will be used as evidence to support the research goals established at the start of the project. The research design is referred to the strategy plan by the researcher for implementing and incorporating numerous research methods in an understandable and sensible manner (Vaus, 2006). With the implementation of the strategy, which includes a template for data collection, measurement, and analysis, the issue statement and hypothesis will be properly addressed.

Quantitative research, according to Sarantakos (1988), is research that is based on quantitative measurement and statistical analysis. The goal of using a quantitative approach is to ensure that the research can convey social reality and reduce personal

bias and . Consistency, true value, conformability and application are all requirements for quantitative methods (Guba and Lincoln, 1989).

Primary and secondary data are the two types of information that may be gathered. A questionnaire survey provided the majority of the source materials. Secondary data was gathered from textbooks, peer-reviewed journals, websites, seminar and conference papers, and official census reports, on the other hand.

The purpose of this study was to determine the most important delay reasons that contribute to building project delays throughout the planning and design phases, according to architect opinions. Three stages of data collection as shown in figure 3.2 were used to implement this research and achieve its objectives as shown in figure 3.3:

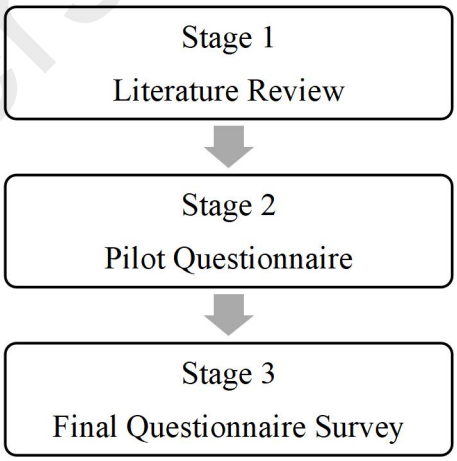

Figure 3.2 Flow of Stages of Data Collection

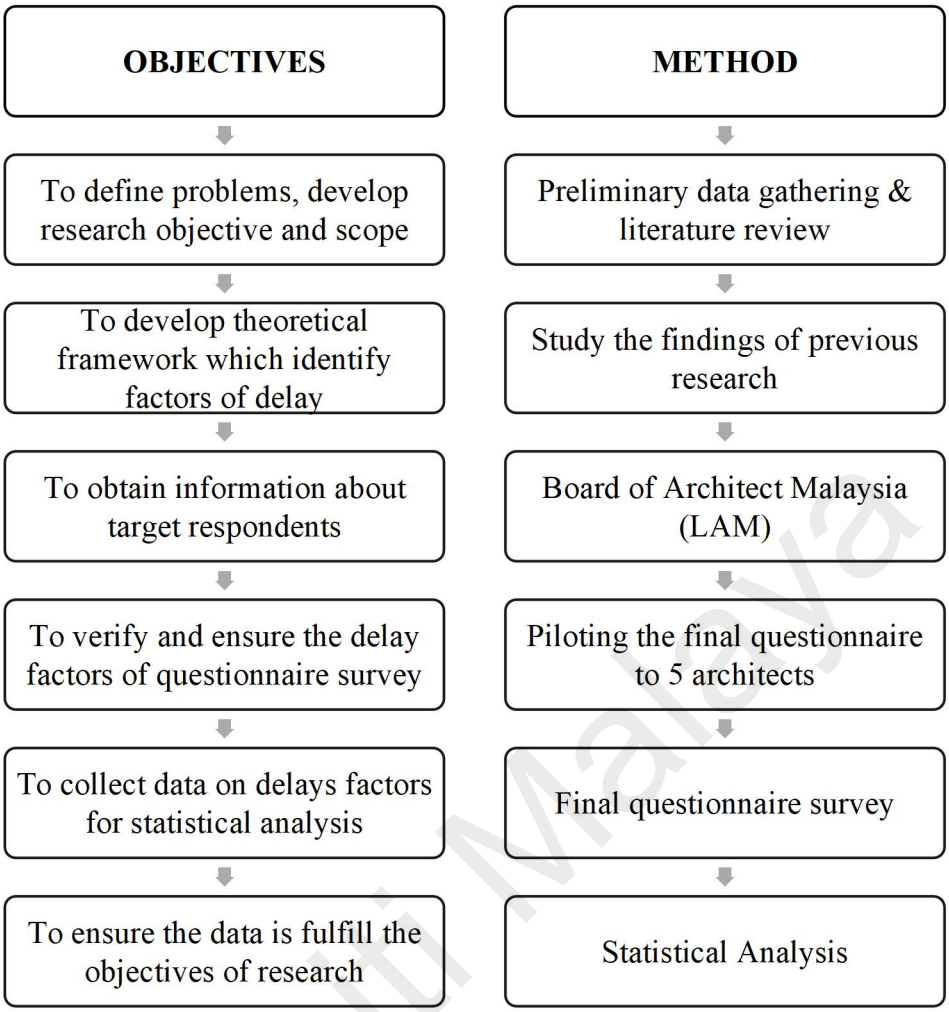

Figure 3.3 Flow of Research Methodology

3.8.1 Stage One: Literature Review

Conducting a literature review is an important activity for establishing a theoretical foundation for data collecting and determining the scope of this study. In order to understand a concept from previous study, it is necessary to review the literature related to delay factors that contributing to construction project delays in the planning and design phase. Hence, the research problem and variables were identified through literature search. The importance of a literature review is that it informs the researcher about the strengths and shortcomings of prior studies and allows them to gain a better knowledge of the concepts that have been established.

While working on semi-structured and questionnaire surveys, a review of the literature aids in identifying the important features. In the social science research process, Sekaran (2004) highlighted the advantages of studying the literature as follows:

1.To verify that all of the study variables are not counted out.

2.To find the important variable that aids in the construction of the theoretical framework.

3. To prevent conducting redundant study in the same field.

3.8.2 Stage Two: Pilot Questionnaire

The pilot questionnaire is the study's second step. Because the research on the delay factor in the planning and design phases is limited, a pilot questionnaire is needed to confirm the variables affecting private home building projects in the planning and design phases as indicated in the literature. It is important to obtain opinions from competent respondents to ensure suitability and comprehensibility and a better understanding before the final questionnaire could be designed. Due to time constraints, only five experts returned the pilot questionnaire and agreed that the questionnaire was sufficient to capture the causes of delay. Responses from these few selected respondents aided into finalizing a comprehensive questionnaire.

3.8.3 Stage Three: Final Survey Questionnaire

The questionnaire survey was the last stage of data collecting. To collect all of the necessary data for the study, an online questionnaire survey approach was used. The

Quantitative Statistical Analysis package software was utilised as a tool to gather all of the necessary information at the last step of data collecting. The following are the reasons why an online survey is the ideal way for collecting final data:

1.To prevent any difficulty, the questionnaire can be completed at any time.

2.Questionnaires are uniform and consistent, making data analysis simple.

3.A questionnaire can prevent bias or human mistakes caused by respondents' prejudice.

4. An online questionnaire is inexpensive and simple to complete.

3.9 The Structure of the Questionnaire

The respondent's gender, age, employment position in the architectural consultation practise, year of experience, and kind of architectural consultant practise are all asked in the first portion of the questionnaire.

The second component of the questionnaire separated into 2 parts which are:

Part 1: Fifteen (15) variables of delay factors derived from prior research in order to identify the most critical delay factors that contributing to construction project delays in the planning phase.

Part 2: Twenty three (23) variables of delay factors derived from prior research in order to identify the most critical delay factors that contributing to construction project delays in the design phase.

The third section of the questionnaire contains eleven (11) strategies derived from prior research in order to minimize the construction projects delay in the planning and design phase. In an open-ended question at the end of the third portion of the questionnaire, respondents were asked to provide suggestions on techniques to minimise construction project delays in the planning and design phase, according to the literature study.

A five-point Likert Scale will be adopted ranging from 1 (strongly disagree) to 5 (strongly agree) to most critical delay factors that contributing to construction project delays and strategies to minimize the construction projects delay in the planning and design phase. All the variables are tested with five-point Likert scale to reflect the level of criticalness in the Malaysian construction industry: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree and 5 = Strongly Agree.

3.10 Research Population and Sampling Size

This study concentrates specifically on the private housing constructions projects such as landed and high-rise housing in the perceptions of architect which focusing on factors that contributing to construction project delays in the planning and design phase. The target research population of this research will be focus on the registered architect, graduate architect and assistant architect working in sole-proprietor, body corporate or multi-disciplinary architectural practice that have registered with the Board of Architects Malaysia (LAM).

According to to the website of LAM (2021), there are 2418 graduate architect and 2357 registered architect that have registered with LAM. Based on the statistics of LAM

annual report in 2019, 82 architectural partnership, 1311 architectural sole proprietorship, 53 multi-disciplinary practice and 297 architectural body corporate which sum up to a total number of 1743 architectural consultancy practice that have registered with LAM. The individuals that took part in this study are professional who have worked in architectural consulting firms and have expertise with private house development projects.

Based on Naoum (2007), a questionnaire is a quick way to collect data from a large number of people and hence get a generalised conclusion. Based on the literature review, a set of questionnaires was created. As a result, the questionnaire survey was conducted with respondents from this category, with a total distribution of 313 questionnaires projected, according to the National Education Association's (NEA) Study Division (Kerjcie & Morgan, 1970). To reach a best possible outcome for the data, Krejcie and Morgan (1970) calculated a predetermined number required for sample size.

For assistance in collecting data, chosen participants will obtain a digital questionnaire form, which will ask to reply based on the delay factors that contributing to construction project delays in the planning and design phase. Because the number was too great, a list of participants participating in private housing development projects was compiled by searching the firm website for all essential information.

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Figure 3.4 Krejcie and Morgan Sampling Method. (Source: Krejcie et. al., 1970)

3.11 Data Collection

Any raw facts without analysis, processing or organizing are referred as data. Hence, to the managers and decision-makers, they have few advantages and less meaning. They are uninterpreted materials that must be used to make a decision, and they rely on facts that may include anything that is known to be true or exist. They are meaningless in and of themselves. They are pieces of material in sequences of numbers, characters, or images, in either text or numerical format. A collection of 'discrete intention insights regarding occurrences' demonstrates them. They're usually well-organized, but they lack the information needed to put them to use in a certain situation (Mohajan 2016).

Referring to Osorio (2014), at the data "life cycle" phases, researchers can recognize and utilize significant information as follows:

i) study idea, demonstrating key components, definitions and ideas

ii) Collection of data, consists of coding instruments and questionnaires

iii) data processing, comprising of the information and specifying the data content

iv) data archiving, showing methodology to ensure the protection of information and secrecy

v) data distributing, showing the terms of utilization and reference

vi) data analysing, giving replication codes and publications, and

vii) data re-purposing, showing data transformation and the procedures for post hoc harmonization

According to Sekaran (2003), data should be collected using a variety of methods and sources. According to him, the data would be reliable if the replies from interviews, questionnaires, and observations were all connected. Each type of study, according to Babbie (2003), has advantages and disadvantages. As a result, data is more trustworthy when many research methods are used.

In order to complete the assignment properly, we used both primary and secondary data in our research. This study focuses on the analysis and acquisition of primary and secondary data resulting from quantitative data collection procedures.

3.12 Data Analysis and Strategies

The relative importance index (RII) technique will be used to rank the delay factors that contributing to construction project delays. The relative importance index (RII) has been used in a variety of fields to assess the relative value of one thing to others. Several studies have been conducted. Several studies: Odeh and Battaineh (2002); Olomolaiye et al. (1987); Kometa et al. (1994); Chan and Kumaraswamy (1997) employed RII to rank delay causes in construction projects. The following is the RII formula:

$$\textbf{Relative Importance Index} = \frac{\sum w}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N}$$

Figure 3.5 Relative Importance Index (RII) Formula

Where w is the weightage/weighting given to the respective factor by the respondent, from 1 to 5 (1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree and 5 = Strongly Agree). Whereas n1 = number of respondents for Strongly Disagree, n2 = number of respondents for Disagree, n3 = number of respondents for Neither Agree nor Disagree, n4 = number of respondents for Agree, n5 = number of respondents for Strongly Agree. And N is the total respondents to the questionnaire. The standard deviation may then be used to see if the predicted components were equally responsible for the Likert-scale score (Yin et. al., 2016).

3.13 Data Transformation

The frequency distribution approach might show the profile of the final survey replies. To convey the overall perspective of the profile, the data are presented in tables and

visual formats in percentage form. The descriptive analysis, according to Hong (2005), Liaw and Goh (2002), and Naoum (1998), may offer a broad summary of study findings.

3.14 SUMMARY

Finally, in social science research, the development of the study plan is critical. It is necessary to have a thorough knowledge of basic social science in order to generate high-quality research. Quantitative methodologies were employed in the research process for this study. The quantitative approach employed was sufficient in obtaining the necessary data, which could then be utilised to construct a theoretical framework through statistical analysis. Literature research, pilot questionnaire, and final questionnaires were employed in the data gathering process. A total of 78 people responded to the final surveys. The statistical approaches for data analysis were chosen according to the limits of each stage of the process, as well as associated components of the survey.

In the following chapter, Chapter Four, the outcomes of the quantitative data analysis will be provided. The results of descriptive statistics based on the final questionnaire are discussed in this chapter.

CHAPTER 4 RESEARCH FINDINGS: DESCRIPTIVE ANALYSES

4.1 Introduction to Chapter 4

The outcomes of the quantitative data analysis in the current investigation are presented in this chapter. This chapter systematically uses statistical methods to explain the data gathered from previous chapter in table format and descriptions. The results are based on the final questionnaire survey. It will highlight or indicate what the data demonstrated or indicated will contribute to the written work of the next chapter – Discussion.

4.2 Demographic Data

The target participants, as stated in the previous chapter, are the registered architect, graduate architect and assistant architect working in sole-proprietor, body corporate or multi-disciplinary architectural practice that have registered with the Board of Architects Malaysia (LAM). A total number of 1743 architectural consultancy practice (ACP) that have registered with LAM, , thus this research requires 313 sampling sizes (Kerjcie & Morgan, 1970).

The quantitative method is based on Google Forms-an online survey form as it is user-friendly and detailed for most participants. Survey forms have been disseminated via emails and social networking channels such as: Facebook Messenger and WhatsApp. There are 78 data sets obtained over 1 month of the dissemination of the questionnaire, which is only 25%. This is mainly due to the tight schedule, poor survey timing due to festive season and COVID-19 pandemic.

Nonetheless, the summary of demographic information of the questionnaire was drawn up as follows:

Table 4.1 Summary of Demographic Data

		Frequent Count	**Percentage (%)**
Respondent age category	21-25	4	5.1
	26-30	10	12.8
	31-35	46	59.0
	36-40	6	7.7
	41-45	10	12.8
	46-50	-	-
	>50	2	2.6
	Total	**78**	**100.0**
Gender	Male	44	56.4
	Female	34	43.6
	Total	**78**	**100.0**
Work position in ACP	Registered Architect	42	53.8
	Graduate Architect	26	33.3
	Assistant Architect	10	12.8
	Total	**78**	**100.0**
Years of Experiences	0-5	20	25.6
	6-10	44	56.4
	11-15	6	7.7
	16-20	6	7.7
	20 years & above	2	2.6
	Total	**78**	**100.0**
Type of ACP	Sole-proprietorship	34	43.6

	Partnership	6	7.7
	Body corporate	30	38.5
	Multi-disciplinary	8	10.3
	Total	**78**	**100.0**

More than half of the participants (59.0 %) are 31-35-years old. 12.8 % of the participants are aged between 41 and 45, 7.7 % of the participants are aged between 36 and 40 years and 2.6 % of the participants are more than 50 years old. More than half of the respondents had more than five years of job experience, according to the findings, implying that they have significant expertise and knowledge in the field of private house building projects. Because of the respondents' history and experience, it is possible to assume that the results acquired from the questionnaire survey are quite credible. The remaining 12.8 % of participants are aged between 26 and 30, as well as 5.1 % of participants are aged between 21 and 25. Figure 4.1 shows age of participants, however figure 4.2 shows the number of years respondents have worked on construction projects.

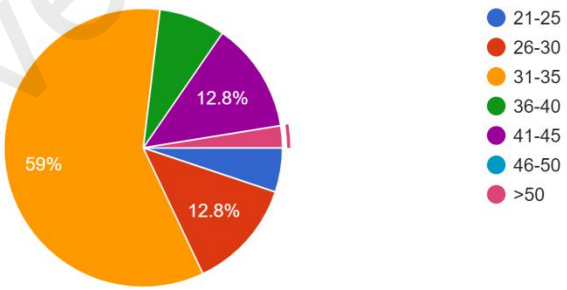

Figure 4.1 Age of participants

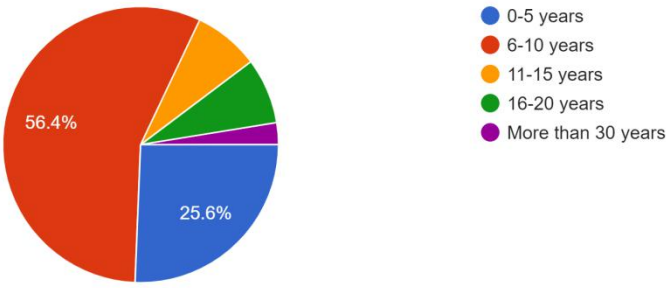

Figure 4.2 Years of experiences

From the Figure 4.3, the result of gender shows more male architect (56.4 %) than female architect (43.6 %). According to Datuk Tan Pei Ing (2021), architecture is very male-dominated in Malaysia. The longer the female architects stay in the practice, the percentage will drop.

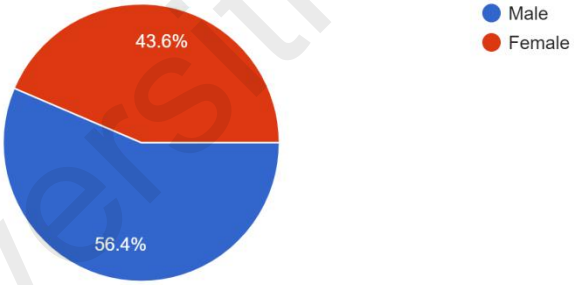

Figure 4.3 Gender of participant

On the other side, majority respondents are registered architect (53.8 %), 33.3% of graduate architect and 12.8 % of assistant architect. Getting more response from registered architect is important as they are the key person in architectural consultancy practice. Figure 4.4 shows the respondent's work position in the architectural consultancy practice.

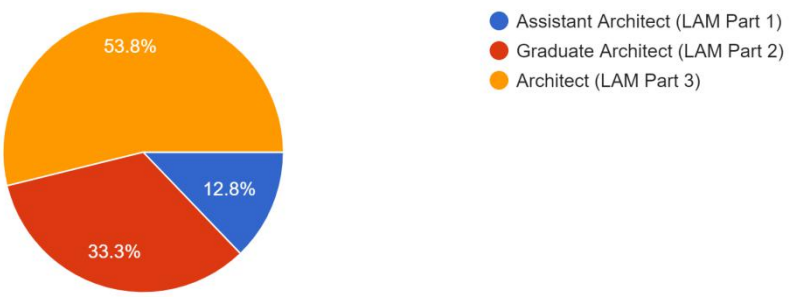

Figure 4.4 Work position in the architectural consultancy practice

Moreover, the findings of type of ACP for this study show 43.6 % of sole-proprietorship, 7.7 % of partnership, 38.5% of body corporate and % of multi-disciplinary. Those selected ACPs involved in this survey are ACPs with experiences in handling of private housing constructions projects. Figure 4.5 shows the type of architectural consultancy practice involved in this survey.

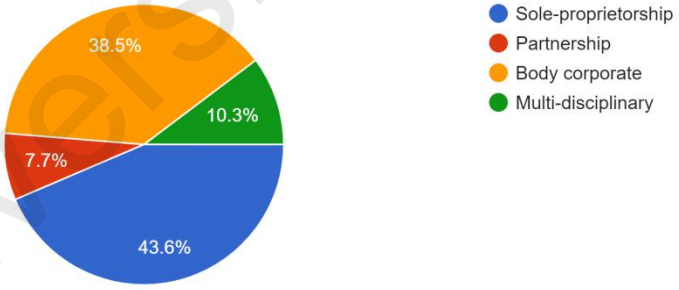

Figure 4.5 Type of architectural consultancy practice

4.3 Data Analysis

The following section provides a list of the factors that contributing to private housing construction project delays in the planning and design phase. Participants are required to select agreement or disagreement on each of the factors outline in the survey

questionnaire. The research pursued architects' view on the agreement of the below factors that contributing to private housing construction project delays in the planning and design phase. Participants are required to select their agreement to the above factors that contribute to private housing construction project delays in the planning and design phase using Likert-Scale from 1 to 5 (1: Strongly Disagree and 5: Strongly Agree). The results were then analysed and calculated by relative importance index (RII). The ranking for critical factors that contributing to private housing construction project delays in the planning and design phase is tabled in the table below:

4.3.1 Factors that contributing to construction project delays in the planning phase

Section2 of questionnaire comprise of 2 parts which are planning phase (part 1) and design phase (part 2). The objective of part 1 questionnaire intends to identify the most critical factors that contributing to private housing construction project delays in the planning phase.

The critical factors that contributing to private housing construction project delays in the planning phase identified from this study are arranged following by ranking: (1) changes in client's requirement and change orders by client, (3) authority regulation changes, (4) unreasonable or unpractical initial plan, (5) indication of suspension or delay by client, (6) inadequate planning and schedule , (7) project complexity, (8) poor scope definition, (9) insufficient or poorly integrated basic project data, complicated administration process of client and improper selection of subsequent consultants, (12) unfinished client furnished items, (13) unreasonable contract duration, (14) public

resistance or political intervention and slow land expropriation due to resistance from occupants.

Table 4.2 Factors that contributing to private housing construction project delays in the planning phase

Factors contributing to construction project delays	**Relative Importance Index** **Σ W / (A X N)**	**Ranking**
Changes in client's requirement	0.872	1
Change orders by client	0.872	1
Authority regulation changes	0.862	3
Unreasonable or unpractical initial plan	0.795	4
Indication of suspension or delay by client	0.785	5
Inadequate planning and schedule	0.754	6
Project complexity	0.723	7
Poor scope definition	0.718	8
Insufficient or poorly integrated basic project data	0.703	9
Complicated administration process of client	0.703	9
Improper selection of subsequent consultants	0.703	9
Unfinished client furnished items	0.697	12
Unreasonable contract duration	0.677	13
Public resistance or political intervention	0.631	14
Slow land expropriation due to resistance from occupants	0.631	14

4.3.2 Factors that contributing to construction project delays in the design phase

Section 2 of questionnaire comprise of 2 parts which are planning phase (part 1) and design phase (part 2). The objective of part 2 questionnaire intends to identify the most critical factors that contributing to private housing construction project delays in the design phase. The term of 'Designers' in the questionnaire refer to architects, C&S engineers, M&E engineers, landscape architects...etc.

The factors that contributing to private housing construction project delays in the design phase have been identified and are ranked as following order: (1) changes in client's requirement, (2) change orders by code change, (3) client's financial problems and inability of owners to review design in a timely manner, (5) client's indication of suspension or delay, (6) unrealistic design duration imposed, (7) inadequate integration on project interfaces, (8) improper or wrong cost estimation, (9) slow information delivery between designers, (10) poor communication between designers, (11) lack of database for estimation, incomplete design drawings and specifications and inadequate schedule control, (14) unclear authority among designers and inadequate experience of designers, (16) disagreement on design specifications, (17) wrong or improper design, (18) slow decision making by designers and change orders by deficiency design, (20) delay due to other construction projects in hand, (21) insufficient training of designers, (22) late incorporation of emerging technologies into a design and (23) conflicts between contract clauses.

Table 4.3 Factors that contributing to private housing construction project delays in the design phase

Factors contributing to construction project delays	**Relative Importance Index** **Σ W / (A X N)**	**Ranking**
Changes in client's requirement	0.908	1
Change orders by code change (Eg. : New scope of works added…)	0.846	2
Client's financial problems	0.836	3
Inability of owners to review design in a timely manner	0.836	3
Client's indication of suspension or delay	0.821	5
Unrealistic design duration imposed	0.815	6
Inadequate integration on project interfaces (Eg.: Project teams…)	0.779	7
Improper or wrong cost estimation	0.759	8
Slow information delivery between designers	0.754	9
Poor communication between designers	0.728	10
Lack of database for estimation	0.723	11
Incomplete design drawings and specifications	0.723	11
Inadequate schedule control	0.723	11
Unclear authority among designers	0.718	14
Inadequate experience of designers	0.718	14
Disagreement on design specifications	0.713	16
Wrong or improper design	0.697	17
Slow decision making by designers	0.692	18
Change orders by deficiency design	0.692	18
Delay due to other construction projects in hand	0.687	20
Insufficient training of designers	0.672	21
Late incorporation of emerging technologies into a design (Eg: BIM…)	0.651	22

Conflicts between contract clauses (Eg. : liability of consultants…)	0.636	23

4.3.3 Strategies that are applicable to minimize the construction projects delay in the planning and design phase

The following section will be the last section on the questionnaire to let participants to identify which strategies that needed to minimize the private housing construction projects delay in the planning and design phase.

Each point of suggestions was calculated for the RII value and ranked to seek best strategies or opportunities to be implemented. The strategies are ranked as following order: (1) designer need to complete the site layout, preliminary drawings, and regulation checks as early as possible before applying for necessary permits or licenses, thus preferably complete the design work thoroughly to avoid foreseeable pitfalls in planning and design, (2) better communication and coordination with other parties, (3) allow sufficient time for proper planning, design, information, documentation, and tender submission, (4) a client is obliged to provide complete project data to planners or designers and scope investigation with clients in order to fully understand their requirement and finalize the outcome of the projects, (6) competent and capable client representatives, (7) multidisciplinary/competent project team, (8) detailed and comprehensive site investigation should be done at the design phase, (9) comprehensive project communication plan needs to be in place, implemented and monitore, (10) government to modify and improve the related regulations and laws and (11) awarding bids to the right/ experienced consultant.

Table 4.4 Strategies that are applicable to minimize the construction projects delay in the planning and design phase

Strategies	Relative Importance Index Σ W / (A X N)	Ranking
Designer need to complete the site layout, preliminary drawings, and regulation checks as early as possible before applying for necessary permits or licenses, thus preferably complete the design work thoroughly to avoid foreseeable pitfalls in planning and design.	0.882	1
Better communication and coordination with other parties.	0.877	2
Allow sufficient time for proper planning, design, information, documentation, and tender submission.	0.872	3
A client is obliged to provide complete project data to planners or designers.	0.862	4
Scope Investigation with clients in order to fully understand their requirement and finalize the outcome of the projects.	0.862	4
Competent and capable client representatives.	0.851	6
Multidisciplinary/ competent project team.	0.841	7
Detailed and comprehensive site investigation should be done at the design phase.	0.831	8
Comprehensive project communication plan needs to be in place, implemented and monitored	0.821	9
Government to modify and improve the related regulations and laws.	0.785	10
Awarding bids to the right/ experienced consultant.	0.774	11

In addition, in an open-ended question at the end of this portion of the questionnaire, respondents were asked to provide suggestions on how to reduce construction project delays throughout the planning and design phase. The following are some proposals for

techniques to reduce construction project delays throughout the planning and design phases:

1. Client shall determine and firm on design brief versus project cost

2. Client shall not cutting cost during design phase

3. Authorities shall allow for pre-sell concept which may require more deposits into Housing and Development Board (HDB) from developer.

From the survey, few participants agreed that those strategies indicated in table 6.4 have covered more than sufficient for improvising the efficiency in the construction period.

4.4 Summary

As a summary, the research findings managed to collect all the critical data and tabulated in table form. It includes questionnaire survey involving architects as respondents. The survey of questionnaire contains factors that contributing to private housing construction project delays in the planning and design phase. The questionnaire was prepared based on literature review. All the answers from questionnaire survey are calculated by using RII method and able to arrange in the sequence of ranking. In the following chapter, chapter five will discuss the research findings in this chapter.

CHAPTER 5: DISCUSSION

5.1 Introduction to Chapter 5

The primary findings are discussed in this chapter, which summarises the findings from the whole study processes. The framework and model developed by the research methodology will be introduced to benefit the construction industry, contractors, and academicians. This embodies a contribution to both practice and theory within the construction industry and project management area in general. The chapter will elaborate on how the research objectives are achieved in the findings.

5.2 Discussion

Client and designers play an important role in planning and design phase for the implementation of construction project. The architect, as superintending officer, performs his professional obligations as both the employer's agent and contract administrator under the terms and circumstances of the PAM Standard Form (2006) of building contract. Architect is the head of of the consultant which also means the one with the highest amount in total paychecks that comes with the biggest responsibility.

However, literature studies to far have revealed that no such study has been conducted in the perception of architect to examine the critical factors that contributing to private housing construction project delays in the planning and design phase. It is therefore critical to have a better understanding on the most critical factors that contributing to private housing construction project delays in the planning and design phase from the perception of architect so that superior methods and strategies can be proposed for

private housing construction projects by avoiding the critical factors that causing delays in planning and design phase.

In this chapter, the discussion outcome intends to cover the three main research questions of this study. The three questions of this chapter are:

Research Question 1: What are the most critical delay factors that contributing to construction project delays in the planning and design phase?

Research Question 2: What is the ranking of delays factor that contributing to construction project delays in the planning and design phase?

Research Question 3: What are the strategies to minimize the construction projects delay in the planning and design phase?

5.2.1 Factors that contributing to construction project delays in the planning phase

The results show that the participants agree that the most critical delay factors that contributing to private housing construction project delays in the planning phase are changes in client's requirement and change orders by client. Halim and Zin also highlighted changes in the client's requirements as the most significant factors (2016). Obviously, the majority of the delays in the planning phases are caused by the customer. This study shows that, in order to avoid delays, a client must offer comprehensive project data to planners or designers; otherwise, project delays will be blamed on the customer (Yang and Wei, 2010).

The rank 3 most important delay factors that contributing to private housing construction project delays in the planning phase is authority regulation changes. Government policy and regulatory reforms must be welcomed since the government's participation in the competitive home development business is critical (Nuruddin et. Al., 2015). Because most land concerns entail working directly with local and state authorities, the role of government in developing the housing sector is extremely important. The government's restrictions are seen as unbalanced, adding to the obstacles that home developers face in order to stay afloat.

The forth (4th) most agreed factor is unreasonable or unpractical initial plan. Meanwhile, indication of suspension or delay by client is the fifth (5th) rank factor that contributing to private housing construction project delays in the planning phase. These two factors are interrelated as client may suspend or delay the project if there is any unreasonable or unpractical initial plan. No one wants to start with a strategy that is either unworkable or out of their budget. As a result, as stated by Saeed, customer intervention and delays in the decision-making process are also key causes of delays (2009).

Furthermore, inadequate early planning are the prime delays by the client (Saeed, 2009). The unrealistic time schedule imposed in the contract has emerged as a critical reason for delays (Idrees and Shafiq, 2020). The remaining least important factors are: (6) inadequate planning and schedule , (7) project complexity, (8) poor scope definition, (9) insufficient or poorly integrated basic project data, complicated administration process of client and improper selection of subsequent consultants, (12) unfinished client

furnished items, (13) unreasonable contract duration, (14) public resistance or political intervention and slow land expropriation due to resistance from occupants.

Planning would take too long if every possible delay was considered into a planned schedule, and projects would be deemed excessively long and costly.

5.2.2 Factors that contributing to construction project delays in the design phase

From the result, most of the participants agreed that changes in client's requirement and change order by code change rank the first and second most critical factors that contributing to construction project delays in the design phase which is similar as the planning phase. Halim and Zin (2016), as well as Yang and Wei (2016), cited changes in the client's requirements as the most significant factors (2010). Because the customer kept modifying the design and failed to have the architect submit the essential drawings on time, the project was delayed. Change orders are frequently issued, indicating that the same action requires additional time and effort (Mahamid, 2021).

The rank 3 most important delay factors that contributing to private housing construction project delays in the design phase is client's financial problems. Financial market volatility, late payment, insufficient financial resources and inadequate cash flow management were determined to be the most significant causes by Rahman et al. (2009) in their research of financial related variables leading to project delays in Malaysia. Every design decision has a financial and time impact. To maintain a finger

on the pulse of cost and schedule, it's critical to seamlessly integrate design and cost management throughout the process.

Owners' incapacity to assess design in a timely manner is the fourth (4th) most commonly mentioned factor. When the client's brief hasn't been thoroughly created or the design process has been inadequately handled, this might happen. However, it's more difficult when the design and specification aren't given enough thought throughout the design process. Correcting weak or ineffective designs and specifications may need extensive revision of the original design. These changes may cause the project's start date to be postponed (Cunningham, 2017).

Client's indication of suspension or delay is the fifth (5th) rank factor that contributing to private housing construction project delays in the design phase. In certain circumstances, the customer delays or alters the design, resulting in a slew of further adjustments, such as design-related revisions to drawings and their approval by authorities (Saeed, 2009). In building projects, design is extremely important. The total project performance is influenced by design quality. It also has a significant impact on project outcomes (Couto, 2012). During the design phase, project failure may due to poor planning and design management (Williams and Johnson, 2014). "Problems during design development contribute greatly to delays," according to Pandit (2015).

The remaining least important factors are: (6) unrealistic design duration imposed, (7) inadequate integration on project interfaces, (8) improper or wrong cost estimation, (9) slow information delivery between designers, (10) poor communication between

designers, (11) lack of database for estimation, incomplete design drawings and specifications and inadequate schedule control, (14) unclear authority among designers and inadequate experience of designers, (16) disagreement on design specifications, (17) wrong or improper design, (18) slow decision making by designers and change orders by deficiency design, (20) delay due to other construction projects in hand, (21) insufficient training of designers, (22) late incorporation of emerging technologies into a design and (23) conflicts between contract clauses.

In short, delay in the design phase should really need much more attention if there was a concern to seriously mitigate delays in planning and design phases efficiently. This phase might involve a contractual job (with consultants) that is always time sensitive (Azrul and Rosli, 2016).

5.2.3 Strategies that are applicable to minimize the construction projects delay in the planning and design phase

From the analysis to mitigate delays in the planning and design phases, the top 3 strategies or opportunities were depicted as follows:

1. Designer need to complete the site layout, preliminary drawings, and regulation checks as early as possible before applying for necessary permits or licenses, thus preferably complete the design work thoroughly to avoid foreseeable pitfalls in planning and design.

2. Better communication and coordination with other parties.

3. Allow sufficient time for proper planning, design, information, documentation, and tender submission.

Kaming et al. (1997) and Elinwa and Joshua (2001) both cited changes in the client's requirements as the most important factor (2001). These studies, on the other hand, investigated at this element during the construction phase, whereas ours looks at it at the planning and design stages. As a result, this cause of delay might occur at any time during the project's life cycle. To avoid the incidence of delays and even resolve potential delay conflicts, well-structured configuration management utilising a project management strategy and clear scope definition are essential (Yang and Wei, 2010).

As a result, clients must prepare project data ahead of time. If the customer uses risk management systems, delays due to insufficient early preparation can be prevented (Saeed, 2009). Designers, on the other hand, play a crucial role since their duties and responsibilities span the whole project life cycle, from start to finish, and may help save money by making construction projects more efficient, less resource-intensive, and more valuable.

In the endeavour to prevent delays in the planning and design phases, as well as the building phase, the communication component might have been the primary essential method to overcome certain major or critical delay issues. Transparency and better dissemination of data and information could provide great aid to resolve issues especially communication issues with clients, which mainly and frequently occurred in a project’s life cycle. Ability to precisely estimate time needed for activities or tasks is a

significant skill in project management. Establishing a realistic timeframe during the planning phase of a project can assist an agency achieve public expectations for project length, avoiding the public relations issues that come with time overruns (Irfan et al., 2011).

5.3 Summary

In conclusion, the study findings were successful in answering the research questions and achieving the research objectives. Experts justify the most crucial variables that contribute to building project delays throughout the planning and design phases. The seventh chapter, Chapter Seven, will look at the conclusion of each chapter, as well as the findings for each of the study's objectives, as well as future research suggestions.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction to Chapter 6

It is utmost essential for clients and designers to know the critical delay factors that contributing to construction project delays. Thus, the aim of this research is to improve project delays in the planning and design phase, especially from the perceptions of architect. This study's last chapter concludes this area of scholarly research. An overview of all the discussions conducted in the study's critical components is provided in this chapter, with conclusions drawn accordingly. This thesis's last chapter also evaluates the study's contribution, portrays the study's limits, and suggests the direction of future research .

6.2 Conclusions of Main Findings

To meet the study objectives outlined in Chapter 1, the key findings from the research are examined and summarised.

6.2.1 Objective 1

The primary goal of this study is to "identify the most relevant delay causes leading to construction project delays in the planning and design phase," which is accomplished through a thorough assessment of the literature. The criteria and project characteristics were verified using a pilot questionnaire. During the final questionnaire, the discovered variables were verified.

Fifteen delay factors that contributing to construction project delays were identified as dominant in planning phase. They are changes in change orders by client, client's requirement, authority regulation changes, unreasonable or unpractical initial plan, inadequate planning and schedule, complicated administration process of client, project complexity, indication of suspension or delay by client, poor scope definition, insufficient or poorly integrated basic project data, unfinished client furnished items, unreasonable contract duration, public resistance or political intervention, improper selection of subsequent consultants and slow land expropriation due to resistance from occupants.

Twenty three that contributing to construction project delays were identified as dominant in design phase. They are change orders by code change, changes in client's requirement, client's financial problems, client's indication of suspension or delay, inability of owners to review design in a timely manner, unrealistic design duration imposed, inadequate integration on project interfaces, improper or wrong cost estimation, slow information delivery between designers, poor communication between designers, lack of database for estimation, incomplete design drawings, specifications and inadequate schedule control, unclear authority among designers, inadequate experience of designers, wrong or improper design, disagreement on design specifications, slow decision making by designers and change orders by deficiency design, delay due to other construction projects in hand, insufficient training of designers, late incorporation of emerging technologies into a design and conflicts between contract clauses.

6.2.2 Objective 2

The second objective of this research is "to identify the ranking of delays factor that contributing to construction project delays in the planning and design phase" is achieved by questionnaire survey. The top five most important criteria identified by the final questionnaire and ranked by respondents are described in the preceding chapter.

The critical factors that contributing to private housing construction project delays in the planning phase identified from this study are arranged following by ranking: (1) changes in client's requirement and change orders by client, (3) authority regulation changes, (4) unreasonable or unpractical initial plan and (5) indication of suspension or delay by client.

The factors that contributing to private housing construction project delays in the design phase have been identified and are ranked as following order: (1) changes in client's requirement, (2) change orders by code change, (3) client's financial problems and inability of owners to review design in a timely manner and (5) client's indication of suspension or delay.

6.2.3 Objective 3

The third objective of this research is "to propose the strategies to minimize the construction projects delay in the planning and design phase" is achieved by questionnaire survey.

Once the critical delay factors that contributing to construction project delays in the planning and design phase has been identified, next step is to recommend which strategies to minimize the construction projects delay in the planning and design phase. The majority of respondents believe that these three (3) approaches must be applied to reduce project delays during the planning and design phase, and the top three strategies are as follows:

1. Designer need to complete the site layout, preliminary drawings, and regulation checks as early as possible before applying for necessary permits or licenses, thus preferably complete the design work thoroughly to avoid foreseeable pitfalls in planning and design

2. Better communication and coordination with other parties

3. Allow sufficient time for proper planning, design, information, documentation, and tender submission

6.3 Contribution of the Study

Clients and designers that want to reduce project delays throughout the planning and design phase can benefit from the findings of this study. This study contributed in the following manner:

i. Unlike past studies which only discussed about the factors that contributing to delay on construction projects in construction phase, this study focuses on delay factors that contributing to construction project delays in the planning and design phase.

ii. Besides that, there are no studies which have been done in this area from perceptions of architect on delay factors that contributing to construction project delays in the planning and design phase in Malaysia. This research will back up what previous researchers have said regarding variables that cause delays in construction projects during the construction phase.

iii. Having this identification of delay factors that contributing to construction project delays in the planning and design phase would assist clients and designers to have more control over them and to aid in the reduction of delays. This study could contribute as a guide for construction participants so that the delivery of private house construction project performance can be improved.

6.4 Limitations of Study

Several limitations were encountered while performing this study, which may have influenced the findings:

i. Researcher faced difficulty in collecting responds from the targeted population as this research survey conducted during the Covid-19 pandemic. Most of the targeted populations are still work from home scheme whereas the MCO (Movement Control Order) has been lifted. Hence, the responds of questionnaire survey are not as expected.

ii. The research study is limited in sole-proprietor, body corporate or multi-disciplinary architectural practice that have registered with the Board of Architects Malaysia (LAM). Therefore, those respondents were registered architect, graduate architect and assistant architects.

iii. The study has been limited to private housing projects in Klang Valley that cover landed housing (terrace, townhouse, semi-D, bungalow…etc) and high-rise (apartment, flat, condominium…etc).

6.5 Recommendations for Future Research

The research findings generally listed out the most critical delay factors that contributing to construction project delays and the relevant strategies to minimize the construction projects delay in the planning and design phase, there are plenty of practical and theoretical applications for the result of this research. This research has led to some advantageous results and conclusions particularly on the perceptions of architect, however there are number of gaps in the research which could be further developed:

i. In-depth study was undertaken in this report, concentrating mainly on on team members (registered architect, graduate architect and architects) from sole-proprietor, body corporate or multi-disciplinary architectural practice that have registered with the Board of Architects Malaysia (LAM) who made them a key participant in a construction project. A similar study should be conducted with diverse responders, such as clients and other designers, such as civil and structural engineers. The findings might be compared to those of the current investigation.

ii. The focus of this study is on delay reasons, the same methodology may be used to investigate the effects and consequences that contribute to construction project delays throughout the planning and design phases.

iii. As this study solely looks at private housing developments in the Klang Valley; a comparable study with diverse types of construction projects should be conducted. To corroborate the research findings, a comparison investigation is necessary.

iv. Finally, the research is mainly conducted based on quantitative basis. It would also be helpful to capture qualitatively the experiences and perspectives of the respondents who could contributed to the research questions and findings.

REFERENCES

1. Abdullah, A., and Koskela, L. (2008). What Can Be Learned From Studies of Delay on Construction? Proc., 16th Annual Conf. of Int. Group for Lean Construction, Manchester, UK.
2. Abdul-Rahman, H., Takim, R. & Min, W. (2009). Financial-related causes contributing to project delays. J Retail Leisure Property 8, 225–238.
3. Ackoff, R. (1970). A Concept of Corporate Planning. Long Range Planning. 3(1), 2–8.
4. Adnan, H., Yusuwan, N. M., Yusuf, F. and Bachik, F. (2014). Critical Success Factors for Contractors. International Journal of Engineering and Technical Research. Vol.2, Issue 2, 107–113.
5. Ahmed, S.M., Azhar, S., Kappagntula, P. and Gollapudil, D. (2003), "Delays in construction: a brief study of the Florida construction industry", Proceedings of the 39th Annual ASC Conference, Clemson University, Clemson, SC, pp. 257-66.
6. Ahuja, R. (2003). Research Methods. New DElhi: Rawat Publication.
7. Ambituuni, A. (2011). Causes of Project Delay and Cost Overrun, and Mitigation Approach. MSc Project Management. The Robert Gordon University, Scotland.
8. Amoatey, C., Ameyaw, Y., Adaku, E., &Famiyeh, S. (2015). Analysing delay causes and efects in Ghanaian state housing construction projects. International Journal of Managing Projects in Business, 8(1), 198–214.
9. Alaghbari, W.A.M. (2005). "Factors affecting construction speed of industrialized building systems in Malaysia", Master's thesis, University Putra Malaysia, Serdang.

10. Alaghbari, W. e., Kadir, M. R. A., & Salim, A. (2007). The significant factors causing delay of building construction projects in Malaysia. Engineering, Construction and Architectural Management, 14(2), 192-206.
11. Alaloul, W. S., Liew, M. S., Zawawi, N. A. W. A., & Kennedy, I. B. (2020). Industrial Revolution 4.0 in the construction industry: Challenges and opportunities for stakeholders. Ain shams engineering journal, 11(1), 225-230.
12. Ali, S. A., Smith A., Pitt, M. and Choon, C. H. (2010). Contractors' Perception of Factors Contributing to Project Delay: Case Studies of Commercial Projects in Klang Valley, Malaysia. Journal of Design and Built Environment 7(1).
13. Alkass S, Mazerolle M, Harris F. (1996). Construction delay analysis techniques. Constr Manage Econ 1996; 14(5):375–94.
14. Al-Momani A. (2000). Construction delay: a quantitative analysis. Int J Project Manage 2000; 20:51–9.
15. Al-Saggaf, H. A. (1998). "The five commandments of construction project delay analysis." Cost Eng., 40 4 , 37–41.
16. Architect Act 1967.
17. Arditi, D., Akan, G., &Gurdamar, S. (1985). Reasons for delays in public projects in Turkey. Construction Management and Economics, 3(2), 171–181.
18. Assaf SA, Alkhalil M, Al-Hazmi M. (1995). Causes of delay in large building construction projects. J Manage Eng, ASCE 1995;11(2):45–50.
19. Assaf SA, Al-Hejji S. (2006). Causes of delay in large construction projects. Int J Project Manage 2006; 24(4):349–57.
20. Basu, A. (2005). Is your schedule late at the starting gate? AACE International Transaction. Morgantown, Washington, D.C., Paper No. PS.07, 1–8.
21. Babbie, E. R. (2003). The practice of social research. California: Wadsworth Publishing Company, Inc.

22. Blundell, S. (2021). Architects face project delays due to slow planning process. Planning, BIM & Construction Today.
23. Boote, D.N., & Beile, P. (2004, April). The quality of dissertation liter-ature reviews: A missing link in research preparation. Paper presentedat the annual meeting of the American Educational Research Associ-ation, San Diego, CA.
24. Boudon, R. (1967). Book Reviews : Theory and Methods of Social Research. By Johan Galtung. Acta Sociologica, 12(3), 161-163.
25. Bouma, G., & Atkinson, G. (1995). A Handbook of Social Science Research: A Comprehensive and Practical Guide for Students. Oxford University Press.
26. Chan, D.W.M. and Kumaraswamy, M.M. (1997) A Comparative Study of Causes of Time Overruns in Hong Kong Construction Projects. International Journal of Project Management, 15, 55-63.
27. CIDB news, issue 3, 2007.
28. CIOB (2011). Guide to Good Practice in the Management of Time in Complex Projects. Oxford, UK: Wiley-Blackwell.
29. Couto, J. P. (2012). Identifying of the reasons for the project design errors in the Portuguese construction industry. Natural and Applied Sciences, 3(2), 163-170.
30. Creswell, J.W. (2009), Research Design: Qualitative, Quantitative and Mixed Method Approaches (3rd Ed.), Los Angeles: SAGE Publications.
31. Cunningham, T. (2017) What Causes Cost Overruns on Building Projects? - An Overview.
32. Daba, D.D. and Pitroda, J. (2018) A Critical Literature Review on Main Cause of Delay in Construction Projects, International Research Journal of Engineering and Technology (IRJET), 5(1), 612-615.
33. Daniel, P., & Sam, A. (2011). Research Methodology. Delhi: Kalpaz Publications.

34. Dlakwa, M. M., &Culpin, M. F. (1990). Reasons for overrun in public sector construction projects in Nigeria. International Journal of Project Management, 8(4), 237–240.
35. Durdyev, S., & Ismail, S. (2012). Role of the construction sector in the economic development of Turkmenistan'. EEST Part A: Energy, Science and Research, 29, 883–890.
36. Elinwa, A. U., and Joshua, M. 2001 . "Time-overrun factors in Nigerian construction industry." J. Constr. Eng. Manage., 127 5 , 419–425.
37. Endut I.R., Akintoye A and Kelly J. (2009) "Cost and Time Overrun Projects in Malaysia".
38. Enshassi, A., Mohamed, S., &Abushaban, S. (2009). Factors afecting the performance of construction projects in the Gaza strip. Journal of Civil Engineering and Management, 15(3), 269–280.
39. Foulkes, A. and L. Ruddock. (2007). Defining the scope of the construction sector. in Proceedings of the 8th IPGR Conference, Salford.
40. Frimpong Y, Oluwoye J, Crawford L. (2003). Causes of delay and cost overruns in construction of groundwater projects in a developing countries; Ghana as a case study. Int J Project Manage 2003; 21:321–6.
41. González, P., González, V., Molenaar, K., & Orozco, F. (2014). Analysis of Causes of Delay and Time Performance in Construction Projects. Journal of Construction Engineering and Management, 140(1), 04013027.
42. Guba, E. G., & Lincoln, Y. S. (1994). Competing Pradigms in Qualitative Research. In N. K. Denzin, & Y. S. (Eds), Handbook of Qualitative Research (pp. 105-117). SAGE publication.

43. Haseeb, M., Bibi, A. and Rabbani, W. (2011). Problems of projects and effects of delays in the construction industry of Pakistan. Australian journal of business and management research, 1(5), pp.41-50.
44. Hill, R. A., Campiglia, H., Beckingham, P., & Brandes, B. (1974). ACT, Achievement Competence Training. Philadephia: Humanizing Learning Program, Research for Better Schools.
45. Home - Pertubuhan Akitek Malaysia (PAM). (n.d.). Retrieved January 6, 2022, from http://www.pam.org.my/.
46. Hong, T.J. (2005). Statistical techniques in business research a practical approach. Pearson Prentice Hall, Malaysia.
47. HOUSING DEVELOPMENT (CONTROL & LICENSING) ACT 1966 (2007). (n.d.). https://www.hba.org.my/laws/hda/2007/ACT118(2007).htm.
48. Ibironke, O. T., Oladinrin, T. O., Adeniyi, O. and Eboreime, I. V. (2013). Analysis of NonExcusable Delay Factors Influencing Contractors' Performance in Lagos State, Nigeria. Journal of Construction in Developing Countries. 18 (1), 53–72.
49. Idrees, S. and Shafiq, M. T.(2020). Factors for Time and Cost Overrun in Public Projects.Journal of Engineering, Project, and Production Management 2021, 11(3), 243-254.
50. Igwenagu, C. (2016). Fundamental of Research Methodology and Data Collection. Nsukka : LAP Lambert Academic Publishing.
51. Irfan, M., Khurshid, M. B., Anastasopoulos, P., Labi, S. and Moavenzadeh, F. (2011). Planningstage estimation of highway project duration on the basis of anticipated project cost, project type, and contract type. International Journal of Project Management. 29, 78–92.

52. Irny, S.I. and Rose, A.A. (2005) "Designing a Strategic Information Systems Planning Methodology for Malaysian Institutes of Higher Learning (isp- ipta), Issues in Information System, Volume VI, No. 1, 2005.
53. Jaafar M, Abdul-Aziz AR, Ali R. (2010). Entrepreneurship: A Critical Outlook on Housing Developers in Malaysia. The International Journal of Construction Management 2010;10(4) 77-101.
54. Jaafar M, Nuruddin AR, Syed-Abu-Bakar SP. (2014). Business Success and Psychological Traits of Housing Developers. Australasian Journal of Construction Economics and Building 2014;14(2) 57-72.
55. Kaming P., Olomolaiye P., Holt G., and Harris F. C. (1997). Factors influencing construction time and cost overruns on high-rise projects in Indonesia, Journal of Construction Management and Economic. Vol. 15, No.1, 83-94.
56. Kazaz, A., & Ulubeyli, S. (2009). Cost and time focused risk analysis in Turkish construction industry. In Collaboration and integration in engineering, management and technology, (pp. 340–347). Istanbul.
57. Kometa, S.T., Olomolaiye, P.O., Harris, F.C. (1994). "Attributes of UK construction clients influencing project consultants' performance." Construction Management & Economics, (12), 433–43.
58. Kothari, C.R. (2004). Research Methodology: methods and techniques, The New Age International Publication.
59. KPKT (2010). Kementerian Perumahan dan Kerajaan Tempatan. Putrajaya.
60. Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30(3), 607–610.
61. Krippendorff, K. (1980). Content Analysis: An Introduction to its Methodology. NewburyPark: Sage.

62. Liaw, S.H. & Goh, K.L. (2002). Statistik asas: konsep & amalan. McGraw-Hill (Malaysia) Sdn. Bhd, Kuala Lumpur.
63. Longman, Pearson Education Limited. Dictionary of Contemporary English. Edinburgh Gate, Harlow. 2003.
64. Lo, T. Y., Fung, I. W. H., and Tung, K. C. F. (2006). Construction delays in Hong Kong civil engineering projects, Journal of Construction Engineering and Management, 132, pp. 636–649.
65. L. V. Redman and A.V.H. Mory,: 1923, The Romance of Research, p.10.
66. Mahamid, I., Bruland, A. and Dmaidi, N. (2012). Causes of Delay in Road Construction Projects. Journal of Management in Engineering. 28 (3), 300–310.
67. Mahamid, I. (2021). Effects of Design Quality on Delay in Residential Construction Projects. Journal of Sustainable Architecture and Civil Engineering Vol. 1 / No. 28 / 2021 pp. 118-129.
68. Malaysia PAM standard form of contract 2006.
69. Mansfield NR. (1994). Causes of delay and cost overruns in Nigerian construction projects. Int J Project Manage 1994; 12(4):254–60.
70. McManus, T. C., Tishman, D. R. and Turnbaugh, L. R. (1996). Remedies for delays in architectural construction. Cost Engineering. 38 (9), 33–40.
71. Module. (n.d.). Retrieved January 6, 2022, from https://portal.lam.gov.my/lam/website_member_list.php?gtype=pa.
72. Mohajan, H.K. (2016). Sharing of tacit knowledge in organizations: A review. American Journal of Computer Science and Engineering, 3(2): 6–19.
73. Naoum, S.G. (2007) Dissertation Research and Writing for Construction Students. 2nd Edition, Butterworth-Heinemann, Cambridge.

74. A. Rum, Z.A. Akasah, Implementing life cycle costing in malaysia construction industry: areview, in Proceedings of International Building and Infrastructure Technology Conference(Penang, 7–8 June 2011)

75. Neale, R., and Neale, D. E. (1989). Construction Planning. London: Thomas Telford.

76. Nguyen, L. D., Ogunlana, S. O. and Lan, D. T. X. (2004). A study on project success factors in large construction projects in Vietnam. Engineering, Construction and Architectural Management. 11 (6), 404–413.

77. Nuruddin et. Al (2015). Unveiling the Challenges Faced By Malaysian Housing Developers through Government Policy Changes. Journal of Construction in Developing Countries, 20(2), 37–52, 2015.

78. Odeh AM, Battaineh HT. Causes of construction delay: traditional contracts. Int J Project Manage 2002; 20:67–73.

79. Odeyinka HA, Yusif A. (1997). The causes and effffects of construction delays on completion cost of housing project in Nigeria. J Financial Manage Property Construction 1997; 2(3):31–44.

80. Ogunlana SO, Promkuntong K. (1996). Construction delays in a fast-growing economy: comparing Thailand with other economies. Int J Project Manage 1996;14(1):37–45.

81. Olomolaiye, P. O., Wahab, K. A., Price, A. D. F. (1987) "Problems influencing craftsmen's productivity in Nigeria", Building and Environment, 22(4), pp. 317–323.

82. Osorio, Javier (2014). The challenge to quantitative data gathering in highly violent settings, SSRC paper.

83. Othuman Mydin, M.A.; Sani, N. Md; Taib, M.; Mohd Alias, N.; Othuman Mydin, Md A. (2014). Imperative Causes of Delays in Construction Projects from Developers' Outlook. MATEC Web of Conferences, 10(), 06005–.
84. Pandit, D., Yadav, S. M. and Vallabhbhai, S. (2015). Factors affecting efficient construction project design development: A perspective from India. International Journal of Construction Supply Chain Management Vol. 5, No. 2 (pp. 34-50).
85. Pavan G. K. and Dr. Nagarekha Kulkarni, Review Article on Research Methodology, International journal of innovative research and development, Vol. 3 Issue 7, 2014.
86. PropertyGuru. (2022). 11 different types of properties and houses in Malaysia. Retrieved January 6, 2022, from https://www.propertyguru.com.my/property-guides/different-types-of-properties-and-houses-in-malaysia-9448.
87. Rajesekar, S., Pitchai, P. N., & Veerapadran, C. (2006). Research Methodlogy.
88. Ramli, M. Z., Nordin, A., Roslin, N. T., Hamid, N. B., Azman, N. S., & Zahari, N. M. (2019). Causes of construction delay for housing projects in Malaysia. APPLIED PHYSICS OF CONDENSED MATTER (APCOM 2019).
89. Rauzana, A. (2016). Causes of Conflicts and Disputes in Construction Projects. IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 13, Issue 5 Ver. VI (Sep. - Oct. 2016), PP 44-48.
90. Rummel, J. F., Ballaine, W. C. (1963). Research methodology in business. Harper & Row.
91. Saeed, S. A. A. (2009). Delay To Projects – Cause, Effect And Measures To Reduce / Eliminate Delay ByMitigation / Acceleration

92. Sambasivan, M., & Soon, Y. W. (2007). Causes and effects of delays in Malaysian construction industry. International Journal of Project Management, 25(5), 517-526.
93. Sarantakos, S. (1998). Social Research. Hampshire: PALGRAVE.
94. Sekaran, U. (2004), Research methods for business, a skill building approach, 4th Edition. John Wiley & Sons, Inc.
95. Sepasgozar et al., 2019 S.M.E. Sepasgozar, et al. Delay causes and emerging digital tools: a novel model of delay analysis, including integrated project delivery and PMBOK Buildings (2019).
96. Shebob, A., Dawood, N., Shah, R. K., & Xu, Q. (2012). Comparative study of delay factors in Libyan and the UK construction industry. Engineering, Construction and Architectural Management, 19(6), 688–712.
97. Sin Yin, T., Othman, A.R., Sulaiman, S., Mohamed-Ibrahim, M.I. and Razha-Rashid, M. 2016. APPLICATION OF MEAN AND STANDARD DEVIATION IN QUESTIONNAIRE SURVEYS: CONSTRUCT VALIDATION. Jurnal Teknologi. 78, 6-4 (Jun. 2016).
98. Stumpf G. Schedule delay analysis. Cost Eng J 2000; 42(7):32–43.
99. Sudin, PW. International Experiences III: Low-Cost Housing. In: Mohd-Don A. (ed.) Housing the Nation: A Definitive Study. Kuala Lumpur: Cagamas Berhad; 1997. p823-843.
100. Sweis, G., Sweis, R., Abu Hammad, A., & Shboul, A. (2008). Delays in construction projects: the case of Jordan. International Journal of Project Management, 26(6), 665–674.
101. Vaus, D. D. (2006). Research Design. London: Sage Publication.

102. Venkatesh, P. K. andVenkatesan V. (2017), Delays in construction projects: A review of causes, need & scope for further research, Malaysian Construction Research Journal, 23(3), 89-113.

103. Williams, C. (2007), Research Methods, Journal of Business & Economic Research, 5(3): 65-72.

104. Williams, C. Jr. & Johnson, P. (2013). Standards of professional practice for design management. Journal of Professional Issues in Engineering Education and Practice, 140(20).

105. Yahoo! (2021). Inspiring the next generation of female architects in Malaysia. Yahoo! News. Retrieved January 3, 2022, from https://malaysia.news.yahoo.com/inspiring-next-generation-female-architects-185924066.html?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAANTnpiZ63y3nswHcjBPUfrMfx9QnpZSUniZFjIeEKXjG4H0m0PFFjSF4n6Vvv8O3DtN5L_DPeii_GcExax8ILWz-w8VTF2QBlE2uxxaAxHbdB9BWxbuMmSTKCJIbP8Kpn_wXc8MjwGEywhkKtAM_iITYPjpI66os3r72SAmQuU1X.

106. Yang, J. B. and Wei, P. R. (2010). Causes of Delay in the Planning and Design Phases for Construction Projects. Journal of Architectural Engineering. 16 (2), 80–83.

107. Yau, N. J. and Yang, J. B. (2012). Factors Causing Design Schedule Delays in Turnkey Projects in Taiwan: An Empirical Study of Power Distribution Substation Projects. Project Management Journal. Vol. 43 No. 3, 50–61.

108. Zack, J. G. (2003). Schedule delay analysis; is there agreement? Proceedings of PMI-CPM College of Performance Spring Conference. May 7–9, 2003.

109. Zidane, Y. J.-T., & Andersen, B. (2018). The top 10 universal delay factors in construction projects. International Journal of Managing Projects in Business, 11(3), 650–672.