

# Delays in Road Construction Projects in the State of Perak

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**Abstract.** Malaysia is a developing country. There are many projects being constructed to meet the demand of the rising economy. Apart from building projects, infrastructural projects are also equally important. The construction of roads, main water supply and sewerage system are vital for nation building. However, some of the infrastructural projects experienced delays. This is so for road projects. The delay in the completion of the road projects will cause undue inconvenience for the users. The main aim of this study is to identify the problem of delays in road construction projects in the state of Perak. The objectives of the study are to study the delay duration for road construction projects and the causes of delay forwarded by the contractor in the application of Extension of Time (EOT), to identify the problems faced by contractors in road construction projects and to investigate the reasons for the delay in road construction project from the contractor's view point. The study is conducted in the State of Perak involving road projects under the supervision of the Public Works Department (PWD). The study is conducted through questionnaires and collection of road project's data from Public Works Department (PWD) of Perak. A total of 15 respondents comprising of contractors who are registered with CIDB under Grade G6 and G7 are identified for the study. A total of 10 road projects are also studied. The data obtained from the questionnaire is analysed using Average Index Analysis and the statistics is analysed. From the 10 road projects that is studied, the longest duration of delay is 100 days and the shortest duration of delay is 30 days. Some of the cause of delays forwarded by contractors in the application of EOT are lack of materials, lack of workers, change of design, financial problems and lack of machinery. To identify the problems faced by contractors in road construction projects and reasons for the delay in road construction projects from the contractor's viewpoint, questionnaires is distributed to 15 respondents and the data is analyzed in the form of tables and charts. The problems faced by contractors in road construction projects are in terms of project management, financial management and difficulty in obtaining tenders. From this three problems, it is found from the study that the main problem faced by contractors are due to the problems in terms of financial management. The reasons for the delay in road construction projects from the contractor's viewpoint are general problems, workers, construction materials, machinery, financial sources, requirements of local authorities, requirements of client, contractor's management and consultant. From the study of this nine reasons, it is found out that the main reason for the delays in road construction projects is because of financial sources.

## Introduction

**Background** Every country in the world constantly needs to use roads because it plays an important role in the relationship between an areas to another in addition to being a catalyst for the local economy. The road is usually used for motor vehicles, civilians and their use is subject to the laws of transport. In Malaysia, there are about 65,000 km of roads that connects to every state and 75 percent of them are paved.

During the life time in a road construction project, there are many problems and conflicts that inevitably occur frequently. Among the critical issues that is being faced is the delay in completion of the project. Various speculations arose about why this problem occurs. According to [1], among the causes of the failure of the implementation of the project by the contractor on schedule is firstly,

many contractors do not fully understand the projects that they undertook. Second, there is no proper planning in the early stages of the project which should cover the needs of construction materials, labour, equipment requirements and the project cash flows. Third, there is no commitment to the project that can lead to expecting extended periods. Fourth, they reckon offer prices that are too low or inaccurate in order to win the tender for the project. Fifth, an inaccurate calculation of the prices can difficulty hardship to provide detailed planning of the project cost and potential for significant wastage. Sixth, they failed to determine the reasonable time of completion of the project and fails to identify the problems that may arise. Seventh, they rely too much on sub-contractors and does not provide perfect monitoring technique. Thus, a detailed study should be conducted to study the causes of delays in road construction project. Therefore, in order to look more into this issue, a case study to discuss and focus on the problem of delays in the construction project of roads in the state of Perak is done.

***Problem Statement*** Road is an infrastructure which is important to mobilize and connect the local community. The pace of road construction is growing positively in Malaysia. However with the rapid and modernization that occurred on this day we find that most of the existing roads are not able to accommodate the increasing number of users that is growing. Therefore, efforts to upgrade, expand and build new alternative roads are being implemented throughout the country. However, it often happens multiple delays in the completion of the road project and this will indirectly have a major impact to road users.

Typically, construction projects such as road construction projects is carried out without taking into account some factors that are considered trivial and it is causing a variety of problems during a road project under construction that led to the delay in completion of the project. Normally, people will blame the contractor. When a road project is delayed, the client is greatly affected as they have to postpone all plans in addition to incur the costs that will normally be increased. Therefore, to ensure that road construction projects can run smoothly without any delays, knowledge and understanding of the problems encountered during the construction process should be conducted more thoroughly. The factors that cause delays in road construction projects should be aware so the road project can be completed within the stipulated time.

***Aim and Objectives*** The main aim of this study is to identify the problem of delays in road construction projects in the state of Perak. Therefore, in general, the following key objectives will be implemented to achieve this aim:

1. To study the delay duration for road construction projects and the causes of delay forwarded by the contractors in the application of Extension of Time (EOT).
2. To identify the problems faced by contractors in road construction projects.
3. To investigate the reasons for the delays in road construction projects from the contractor's viewpoint.

***Scope of Study*** To ensure that all the objectives are achieved as planned, the scope of the study should be determined in advance so that the aim of the study is not deviated. The scope of the study has been determined at an early stage to ease the literature review and information gathering, so that the objectives being outlined can be achieved at the end of the study. With this, the scope of the study that will be emphasized are:

1. The scope of the literature review for this study is covering the background issues faced by contractors in road construction projects and the reasons for the delays.
2. This study is focused on the road construction projects in the state of Perak and involve a number of parties who are directly involved in road construction projects, namely the Perak Public Works Department and the contractor of the construction companies that are registered with the CIDB ( Construction Industry Development Board ).

## Previous Studies

The literature review will discuss in more detail about the objectives of the study. The literature review is conducted by referring to journals, books and information from the internet.

**Contractor** The development of national economy is always promoting the growth of contractors through construction industry. To undertake a construction project, the client must obtain a contractor for the construction project.

*Definition of Contractor.* Contractors are defined as those tied directly to a contract of construction projects that are responsible for controlling and implementing the project during the construction site until the project is fully completed. Contractor is someone who undertakes to carry out and complete any construction work. Contractor is carrying out the task of carrying out a construction project. Contractors have a great responsibility for running a direct relationship with the customer where the implementation of construction shall be in accordance with drawings and specifications comply with all the requirements set out in the contract documents [2].

*Problems Faced By Contractors.* In a construction project such as road projects, contractors cannot run away from challenges and problems. Problems arising from various aspects such as financial aspects, administrative, management and other aspects. The longer the contractors involved in the construction, the more mature they are in overcoming any problems. These problems cause many negative effects in order to ensure the project runs smoothly. A complete inventory should have yourself a contractor for the realization of the will of the client and project requirements. For this study, the problems faced by contractors have been divided into three parts, namely the issue of project management, financial management issues and problems in the tender offer.

*Project Management.* A project is defined as an operational activity that existed only sporadically in certain time period. Project management is the management which involves the development, change and innovation in an operations. It includes activities such as planning and controlling a project depends on budgetary constraints so that the project can be completed within a set time period. Project management is the discipline of planning, organizing, coordinating seta manage resources to achieve objectives and achieving the goals and objectives set for the implementation of a project. A contributor to the construction process should improve the ability to manage from time to time along with physical development [3]. There exist various conflicts in project management, but there are some common problems that have been identified for review, which is as follows:

- i. Delay in site ownership;
- ii. Equipment capacity and machinery is not sufficient;
- iii. Lack of construction materials;
- iv. Difficulty in communicating with the parties involved;
- v. Sub-contractors being appointed is inexperienced;
- vi. Not following the work program (CPM);
- vii. Do not understand the drawings and specifications;
- viii. Problems with suppliers;
- ix. Lack of labour and professional workers;
- x. Changes in the contract documents;
- xi. Compliance orders to sub-contractors.

*Financial Management.* Effective financial management, particularly in managing capital is an important factor in determining smooth running of the project. Adequate financial resources and financial assistance from various parties are always discussed by the contracting parties. Through a number of studies that have been conducted, the majority of construction projects that are stalled is due to a lack of effective financial management. Among the issues that arise in financial management is as follows:

- i. Delays in the payment of claims;
- ii. Cash flow problems of contractors;
- iii. Unstable financial sources;
- iv. Cost calculation system is inefficient and unrealistic.

*Difficulty in Obtaining Tender.* Tender offering is a process in which one copy of the offer will be given by the client when it intends to implement a project. The contractor that are interested in participating in the project need to fill in and return the tender documents within a set time period [4]. However, there are some problems that can be faced by the contractors during the process.

Among of them are:

- i. Honesty of the assessors;
- ii. Lack of expertise in the selection of contractors;
- iii. Relationships with contractors;
- iv. Too many tenderers;
- v. Inefficient management;
- vi. Time taken to choose a qualified contractor.

***Delays in Road Construction Projects*** In any construction project such as road, this issue is often dealt with. This happens when the time period set forth in the contract documents have been bypassed whether intentionally or not. Implementation of road construction projects are late and cannot be completed on schedule is a phenomenon that often occurs in Malaysia. The projects undertaken by contractors particularly government projects mostly cannot be delivered on time as stipulated in the contract. The delay occurred when the contractor failed to complete the project within the specified period by the date of the contract as agreed by both parties in the contract. Various factors that cause delays in the completion of the project, whether due to the client, contractor, human resources, equipment, financial, material resources and many other factors will be discussed later.

Delays in completion of the project may cause interference to the performance of work at the site where the productivity is declining, the project is slow and not completed on schedule, increasing the time for which will be closely linked to increased costs and involves the emergence of a third party claim and lastly it can cause project to grow slowly or even contract termination [5].

*Types of Delay.* According to [6], the issue of project delay could be referred to three stages of delay, namely:

- i. Compensable Delays;
- ii. Excusable Delays;
- iii. Non - Excusable Delays.

*Compensable Delays.* This delays occurs usually caused by the negligence of the client or the client representatives involved during the project where the client usually will give a new direction, for example the exchange of materials or design. If this happens, the construction work on these activities cannot be carried out until a change is ready to run. In such cases, the contractor is authorized and entitled to claim compensation of damages. Usually the form of compensation that can be claimed is the increase in costs and the extension of the contract period. A delay that can be claimed is when the project owner or consultant had causes contractors to could not complete the project on schedule. In this case the contractor is entitled to claim compensation and contractors may also get approval for extension of time (EOT).

*Excusable Delays.* Normally this delays is caused by third parties. Should delays occur due to the following items, then the contractor is entitled to claim an extension of time without justifiable claim compensation. The contractor is allowed to apply for an extension of time in case of delays

caused by such things such as force majeure, unusual weather, loss or damage caused by unexpected things such as fires, explosions, natural disasters (lightning, storm, flood ) etc.

*Non-Excusable Delays.* Delays in this category is due to the contractor itself in the management of construction projects. Weaknesses in the management of the contractor resulted in delays in the execution of a job. Contractor experience is a key factor to achieve the perfection of the project so that there is no delay. If there is no delay is not approve, then the contractor will be fined delay. Damages or delay penalties will be charged based on the number of days that passed until the project is completed.

*The Effects of Delays in Project Completion.* Some of the impact of the delays in project completion is that it can caused changes to the work schedule, the changes to the work activities, extension of all types of insurance related, the extension of the use of the site equipment, the use of human resources should be extended and more problems of complexity to all parties involved with the construction of the project.

Owners need to make changes to the original design of the original proposal to meet the new completion period. Should delays occur quite significant, then the owner will face a major problem for planning. The owner will also face the problem to cover the cost of contracts that has increased. Additional provisions needed to be resolved quickly to make payments towards the cost of which has been increased to ensure that the construction work will run smoothly.

The contractor will also experience financial problems as it involves additional administrative costs which involves administrative management, extending the period of use or rental equipment on site, extends the source of labour services and many others. Contractors also need to add some more cash flow to ensure that the new work schedule can be implemented over the finished period has been set [7].

The consultants involved equally responsible for the problems faced by owners and contractors. Consultants should continue to play a role until the project is completed and is also responsible for ensuring that projects run smoothly. Consultant had to devote more time and should play a role in more serious and should be responsible for making preparations for the delays. Image of contractors and consultants will also be involved in performance measurement. Therefore, when a project is delayed, it will cause all kinds of problems and losses to all parties involved in the project in question, whether they are involved directly or indirectly.

**Summary** In the life time of a road construction project, various issues will arise that must be faced by all involved parties such as contractors that will lead to delay in completion of the project.

When there is a delay, then the effect not only to the completion period of the project but also to the actual planning of the project owner. This will affect the construction work next, whether can be completed or will be delay more or probably be abandoned. The cause of the delays in a project is not only by the contractors but also to all those who were involved in the planning and construction. Clients, architects, engineers, consultants and contractors are directly which are contributing to the delays.

Through the three categories of delays discussed, there is actually a flexible space to all parties to make corrections or changes to the implementation of the project. The contractor, if the delay that occurred in the category of compensation, it is an initiative to accelerate the completion of the project.

## **Methodology**

Information and data will be collected and analysed by using multiple methods to achieve the aim and objectives. The methodology of the study is shown in Figure 1.

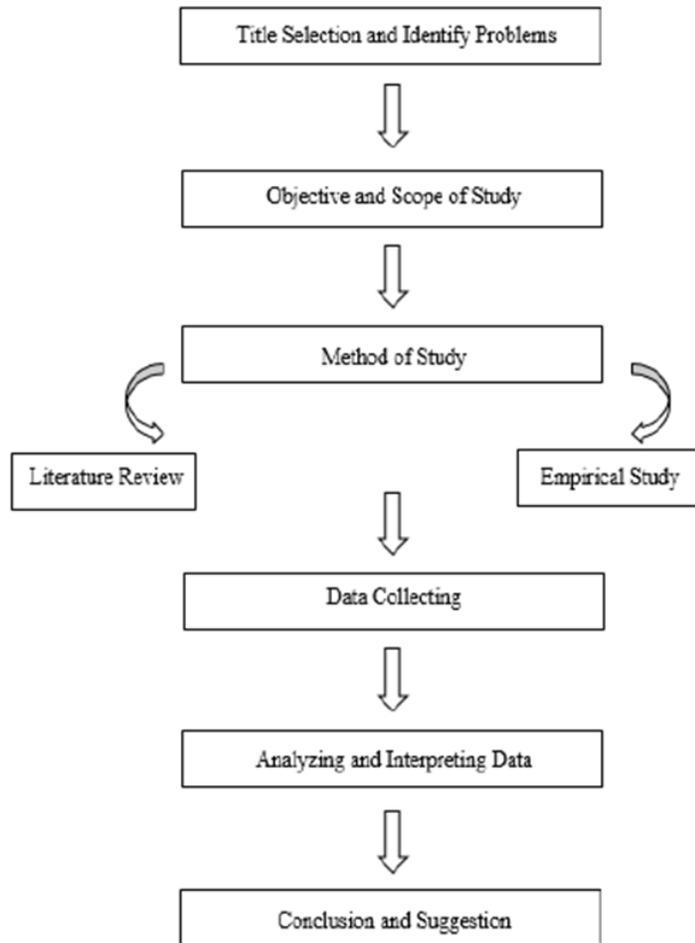


Figure 1: Flow Chart of Research Methodology

### Data Analysis

Collected data for this study is collected through questionnaire and road project data obtained from JKR Perak. The questionnaire is divided into Part A and Part B. Part A compromise of the respondents' background and Part B compromise of the questions regarding objective 2 and 3. The data is analysed using Microsoft Excel 2013 and average index analysis.

**Average Index Analysis** Average index analysis is used to evaluate the perception. Average index is calculated using the formula below:

$$\text{Average Index} = \frac{\text{Number of Respondents} \times \text{Number of Evaluation}}{\text{Total Respondents}}$$

The number evaluation for each question is based on a scale of 1 - 5. The scale of 1 -5 is described as:

- |                       |                    |                      |
|-----------------------|--------------------|----------------------|
| 1 = Strongly Disagree | 2 = Disagree       | 3 = Moderately agree |
| 4 = Agree             | 5 = Strongly agree |                      |

The rating for each elements is done based on each average index value. The classification of the average index values would been classified into five levels of agreements which are:

- 1.00 ≤ Average Index < 1.50 = “Strongly Disagree”
- 1.50 ≤ Average Index < 2.50 = “Disagree”
- 2.50 ≤ Average Index < 3.50 = “Moderately Agree”
- 3.50 ≤ Average Index < 4.50 = “Agree”
- 4.50 ≤ Average Index ≤ 5.00 = “Strongly Agree”

**Analysis for Objective 1:** To study the delay duration for road construction projects and the causes of delay forwarded by the contractors in the application of Extension of Time (EOT)

To achieve the requirements of objective 1, several data regarding 10 road projects around the year 2010 to 2015 in the state of Perak is obtained from JKR Perak and is analysed. All of the data is tabulated in Table 1 below.

Table 1: Data of road projects in the state of Perak around the year 2010-2015

Project	Delay Duration (EOT)	Percentage (%)	Causes of Delay Forwarded by Contractors in the Application of EOT
A	30	5.24	Shortage of construction materials and raw materials (diesel)
B	100	17.45	Shortage of workers and insufficient capital
C	94	16.40	Shortage of workers and insufficient capital
D	44	7.68	Lack of machinery and financial problems by the contractor
E	40	6.98	Lack of machinery and financial problems by the contractor
F	90	15.71	Difficulty to obtain foreign workers
G	50	8.73	Delays in the supply of construction materials
H	45	7.85	Financial problems by the contractor
I	40	6.98	Change of design
J	40	6.98	Cash flow problems by the contractor
Total EOT	573	100	

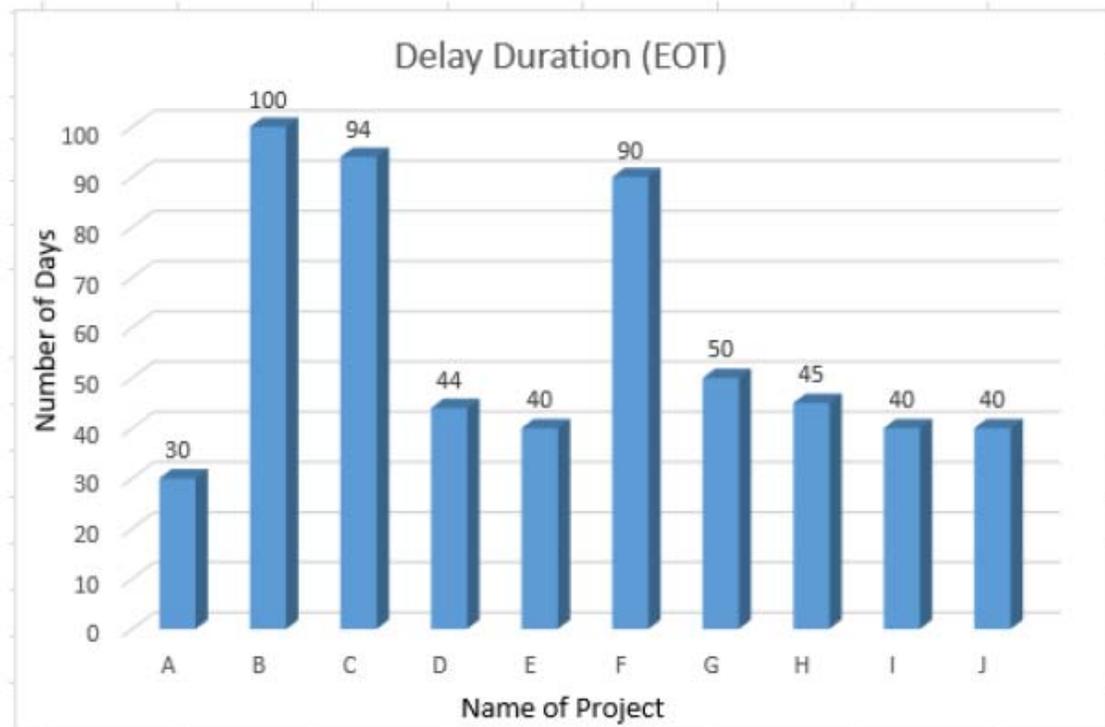


Figure 2: Delay duration of EOT for each project

Figure 2 shows the bar chart regarding the delay duration of EOT for each project. From the figure, it can be observed that project B has the most number of EOT of 100 days followed by project C and F with EOT of 94 and 90 days. Next, project G has EOT of 50 days followed by project D and H with EOT of 45 days and 44 day. Project E, I and J have the same number EOT of 40 days. Finally, project A has the least number of EOT which is 30 days. The total EOT calculated is 573 days. Next, the causes of delay forwarded by the contractor in the application of EOT is studied from Table 1. In project A, the contractor state the issues of shortage of construction materials and raw materials (diesel) in applying EOT. For project B and C, the issues of shortage of workers and insufficient capital is being forwarded by the contractor followed by the issue of lack of machinery and financial problems for project D and E in applying for EOT. The issues of difficulty to obtain foreign workers delays in the supply of construction materials is given to apply for EOT for project F and G. Finally, the contractors forwarded the issue of financial problems, change of design and cash flow problems for project H, I and J in the application of EOT.

**Analysis for Objective 2: To identify the problems faced by contractors in road construction projects.** The second objective of the study is described in question 1 of Part B of the questionnaire and it is divided into three criteria of problems in terms of project management, financial management and difficulty in obtaining tender which is then classified and ranked based on average index value. The analysis is tabulated for all the criteria in the tables below.

Table 2: Analysis for the criteria of project management

Project management	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
Delay in site ownership	0	0	4	5	6	4.13	Strongly Agree	2
Equipment capacity and machinery is not sufficient	1	0	4	5	5	3.87	Strongly Agree	4
Lack of construction materials	1	0	4	5	5	3.87	Strongly Agree	4
Difficulty communicating with the parties involved	1	0	5	5	4	3.73	Strongly Agree	6
Sub - contractors being appointed is inexperienced	1	0	4	6	4	3.80	Strongly Agree	5
Not following the work program (CPM)	1	0	5	3	6	3.87	Strongly Agree	4
Do not understand the drawings and specifications	1	0	5	4	5	3.80	Strongly Agree	5
Problems with suppliers	1	0	5	3	6	3.87	Strongly Agree	4
Lack of labour and professional workers	1	0	5	1	8	4.00	Strongly Agree	3
Changes in the contract documents	0	0	3	5	7	4.27	Strongly Agree	1
Compliance orders to sub	0	6	4	5	0	2.93	Moderately Agree	7
Overall Average Index						3.83	Strongly Agree	

*Project Management.* Table 2 summarizes the results of the study to identify the problem in terms of project management. From Table 2, it is found that the problem that gets the highest order of preference, with an average index by 4.27 is the changes in the contract documents. This is followed by delay in site ownership with an average index of 4.13, while the lack of labour and professional workers gets an average index of 4.00, followed by the problems with suppliers, lack of construction materials, not following the work program (CPM) and the equipment capacity and machinery is not sufficient with an average index of 3.87.

Sub-contractors being appointed is inexperienced and do not understand the drawings and specifications scored an average index of 3.80, followed by difficulty communicating with the parties involved with an average index of 3.73. Whereas compliance orders to the sub-contractor gets the lowest order of preference, with the average index of 2.93. The overall average index obtained is 3.83.

Table 3: Analysis for the criteria of financial management

ii. Financial Management	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
Delays in the payment if claims	0	0	5	5	5	4.00	Strongly Agree	3
Cash flow problems of contractors	0	0	0	9	6	4.40	Strongly Agree	1
Unstable financial sources	0	0	4	5	6	4.13	Strongly Agree	2
Cost calculation system in inefficient and unrealistic	0	0	5	7	3	3.87	Strongly Agree	4
Overall average index						4.10	Strongly Agree	

*Financial Management.* Table 3 summarizes the results of the study to identify the problem in terms of financial management. From Table 3, it is found out that the problem that gets the highest order of preference, with the average index of 4.40 is the cash flow problems of contractors. This is followed by unstable financial sources with an average index of 4.13, while delays in the payment of claims gained an average index of 4.00, followed by the cost calculation system is inefficient and unrealistic with an average index of 3.87. The overall average index obtained is 4.10.

Table 4: Analysis for the criteria of difficulty in obtaining tender

iii. Difficulty in obtaining tender	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
Honesty of the assessors	0	0	0	9	6	4.40	Strongly Agree	1
Lack of expertise in the selection of contractors	0	0	4	4	7	4.20	Strongly Agree	2
Relationship with contractors	0	2	5	4	4	3.67	Strongly Agree	4
Too many tenderers	0	5	4	4	2	3.20	Moderately Agree	6
Inefficient management	0	0	5	6	4	3.93	Strongly Agree	3
Time taken to choose a qualified contractor	0	5	4	3	3	3.27	Moderately Agree	5
Overall Average Index						3.78	Strongly Agree	

*Difficulty in Obtaining Tender.* Table 4 summarizes the results of the study to identify the problem in terms of difficulty in obtaining tender. From Table 4, it is found that the problem that gets the highest order of preference, with the average index of 4.40 is a matter of honesty of the assessors. This is followed by lack of expertise selection of contractors with an average index of 4.20 and inefficient management with an average index of 3.93, followed by the relationships with contractors with an average index of 3.67. Time taken to choose a qualified contractor gained an average index of 3.27 followed by the problem of too many tenderers have the lowest order of preference, with average index of 3.20. The overall average index obtained is 3.78.

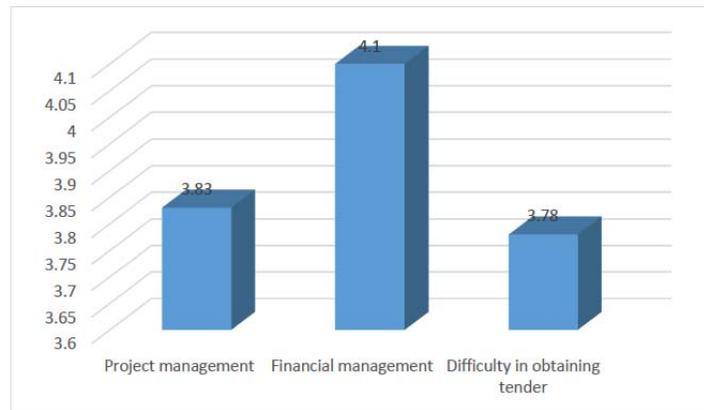


Figure 3: Overall average index for the problems faced by contractors

Figure 3 illustrates the bar chart for overall average index acquired for each three criteria of problems in terms of project management, financial management and difficulty in obtaining tender.

From Figure 3, it can be observed that financial management had the highest overall average index value of 4.10 followed by project management and difficulty in obtaining tender with overall average index value of 3.83 and 3.78. All of this problems is classified as “strongly agree” based on the average index value.

**Analysis for Objective 3:** To investigate the reasons for the delays in road construction project from the contractor’s viewpoint. The third objective of the study is described in question 2 of Part B of the questionnaire which is divided into nine criteria of reasons in terms of general problems, workers, construction materials, machinery, financial sources, requirements of local authorities, requirements of client, contractor’s management and consultant which is then classified and ranked based on average index value. The analysis is tabulated for all the criteria in the tables below.

Table 5: Analysis for the criteria of general problems

i. General problems	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
Unusual weather	7	5	3	0	0	1.73	Strongly Disagree	4
Natural disaster	8	3	4	0	0	1.73	Strongly Disagree	4
Force Majeure	9	5	1	0	0	1.47	Disagree	5
Delay enter the site	0	0	4	6	5	4.07	Strongly Agree	1
Existing facilities problems on site	0	0	6	7	2	3.73	Strongly Agree	2
Unplanned work schedule	0	4	4	3	4	3.47	Moderately Agree	3
Overall Average Index						2.70	Moderately Agree	

Table 6: Analysis for the criteria of workers

ii. Workers	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
Lack of professional management	0	0	0	9	6	4.40	Strongly Agree	1
Shortage of skilled labour	0	0	4	4	7	4.20	Strongly Agree	2
Strike action by the workers union	8	5	2	0	0	1.60	Strongly Disagree	4
Not good at communicating	0	0	6	4	5	3.93	Strongly Agree	3
Overall Average Index						3.53	Strongly Agree	

Table 7: Analysis for the criteria of construction materials

iii. Construction materials	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
The lack of construction materials	0	0	3	5	7	4.27	Strongly Agree	1
Prices of construction materials rose	0	0	2	8	5	4.20	Strongly Agree	2
Problems regarding cash payments with suppliers	0	0	4	3	8	4.27	Strongly Agree	1
Delays in the supply of construction materials by suppliers	0	0	3	5	6	3.93	Strongly Agree	3
Inefficient management of resources	0	0	8	6	1	3.53	Strongly Agree	4
Overall Average Index						4.04	Strongly Agree	

Table 8: Analysis for the criteria of machinery

iv. Machinery	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
Difficulty in operating machinery	0	0	7	5	3	3.73	Strongly Agree	3
Machinery of poor quality and frequently damaged	0	0	1	6	8	4.47	Strongly Agree	1
Lack of machinery	0	0	3	5	7	4.27	Agree	2
Overall Average Index						4.16	Strongly Agree	

Table 9: Analysis for the criteria of financial sources

V. Financial sources	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
Insufficient capital	0	0	2	4	9	4.47	Strongly Agree	1
Contractor is late in receiving progress payment	0	0	3	6	6	4.20	Strongly Agree	3
Problems with bank loans	0	0	1	7	7	4.40	Strongly Agree	2
Contractor is late in paying to subcontractors	0	0	2	5	8	4.40	Strongly Agree	2
Overall Average Index						3.78	Strongly Agree	

Table 10: Analysis for the criteria of requirement of local authorities

vi. Requirement of local authorities	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
Slow planning approvals	0	0	3	6	6	4.20	Strongly Agree	2
Slow building plan approvals	0	3	5	5	2	3.40	Moderately Agree	4
Instruction of design changes during construction	0	0	3	4	8	4.33	Strongly Agree	1
Instruction for use of materials during construction	0	0	3	7	5	4.13	Strongly Agree	3
Overall Average Index						4.02	Strongly Agree	

Table 11: Analysis for the criteria of requirements of client

vii. Requirement of client	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
Changing the scope of the original design	0	0	2	4	9	4.47	Strongly Agree	1
Changing the design/ structure that is being built	0	0	4	5	6	4.13	Strongly Agree	3
Poor managing the approval of work modification	0	0	4	4	7	4.20	Strongly Agree	2
Late in site ownership	0	2	3	7	3	3.73	Strongly Agree	4
Overall Average Index						3.78	Strongly Agree	

Table 12: Analysis for the criteria of contractor's management

viii. Contractor's management	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
Late in appointing the subcontractors	0	0	7	5	3	3.73	Strongly Agree	4
Often changing the subcontractors	0	0	6	5	4	3.87	Strongly Agree	3
Inexperience contractors	0	0	4	5	6	4.13	Strongly Agree	1
Contractors preference on other projects	0	0	4	5	6	4.13	Strongly Agree	1
Problems with management of subcontractors	0	0	6	3	6	4.00	Strongly Agree	2
Not according to the work schedule	2	3	3	4	3	3.20	Moderately Agree	5
Overall Average Index						3.84	Strongly Agree	

Table 13: Analysis for the criteria of consultants

ix. Consultant	Respondent Frequency					Average Index	Category	Ranking
	1	2	3	4	5			
Error in designing	0	0	2	3	8	4.13	Strongly Agree	3
Incomplete construction drawings	0	0	2	6	7	4.33	Moderately Agree	2
Late in visit for confirmation	0	2	1	5	7	4.13	Strongly Agree	3
Design problem cannot be resolved quickly	0	0	0	8	7	4.47	Moderately Agree	1
Overall Average Index						4.27	Strongly Agree	

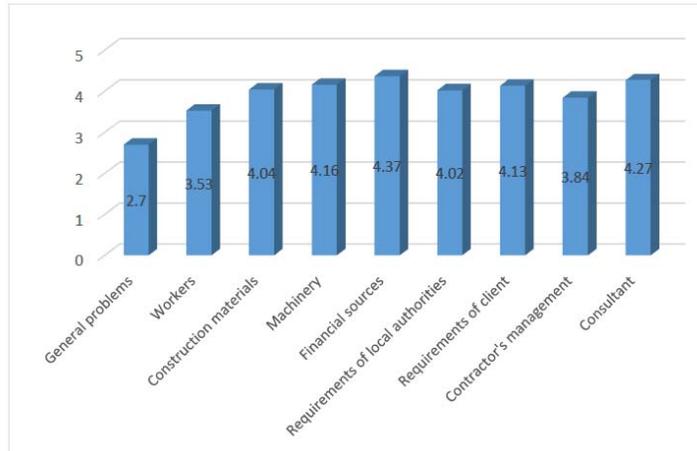


Figure 4: Overall average index for the reasons for the delay in road construction project from the contractor's viewpoint

Figure 4 illustrates the bar chart for overall average index acquired for each nine criteria of reasons for the delay in terms of general problems, workers, construction materials, machinery, financial sources, requirements of local authorities, requirements of client, contractor management and consultant. From Figure 4, it can be observed that financial sources had the highest overall average index value of 4.37 followed by consultant and machinery with average index value of 4.27 and 4.16. Requirement of client, construction materials and requirements of local authorities followed next with overall average index value of 4.13, 4.04 and 4.02. Finally, criteria of contractor's management, workers and general gained the least overall average index value of 3.84, 3.53 and 2.7. Financial sources, consultant, machinery, requirement of client, construction materials and requirements of local authorities, contractor management, workers is classified as "strongly agree" and general problems is classified as "moderately agree" based on the average index value.

## Conclusion

The conclusion is made based on the three objectives that had been set in the early stages of this study. This assessment is intended to identify and ensure that the aim, objectives and scope had been fulfilled. The objective will be analysed thoroughly through the elaboration and analysis of the data.

**Objective 1:** The delay duration for road construction projects and the causes of delay forwarded by the contractors in the application of Extension of Time (EOT).

For this objective, several data regarding 10 road projects around the year 2010 to 2015 in the state of Perak is obtained and the data is analysed. From the study, the longest duration of delay is 100 days and the shortest duration for delay is 30 days. The total delay of EOT obtained is 573 days. The cause of delays forwarded by contractors in the application of EOT are lack of materials, lack of workers, change of design, financial problems and lack of machinery.

**Objective 2:** The problems faced by contractors in road construction projects. The second objective of the study is to identify the problems faced by contractors in road construction projects for which this part is divided into three criteria, namely the problem in terms of project management, financial management and difficulty in obtaining tender. From the study it is found that the composition according to the ranking of the criteria of problems faced by contractors in road construction projects based on overall average index is as follows:

1. Financial management;
2. Project management;
3. Difficulty in obtaining tender.

Financial management criteria obtain the highest overall average index value of 4.10, which states that the problem is in the highest ranking. Next, project management criteria earned an overall average index value of 3.83 and criteria of difficulty in obtaining tender offer acquired the overall average index value of 3.78. From the above results, it can be concluded that the main problem faced by the contractor are due to the problems in terms of financial management. Problems in terms of financial management can be contributed by the delay in the payment of claims, cash flow problems of contractors, unstable financial sources and cost calculation system is inefficient and unrealistic. Out of these four sources, it was found that the problem that gets the highest order of preference, with the average index value of 4.40 is the cash flow problems of contractors. This is followed by unstable financial source with an average index value of 4.13, while delays in the payment of claims gained an average index of 4.00, followed by the cost calculation system is inefficient and unrealistic with average index of 3.87.

**Objective 3:** The reasons for the delays in road construction project from the contractor's viewpoint.

The third objective is to investigate the reasons for the delays in road construction project for which this part is divided into nine criteria of reason in terms of general problems, workers, construction materials, machinery, financial sources, and requirements of local authorities, requirements of client, contractor management and consultant. From the study it was found out that the composition according to the priority level of the reasons for the delay in the road construction project based on overall average index is as follows:

1. Financial sources;
2. Consultant;
3. Machinery;
4. Requirements of client;
5. Construction materials;
6. Requirements of local authorities;
7. Contractor's management;
8. Workers;
9. General problems.

Criteria for financial sources acquired the highest overall average index value of 4.37 which indicated that this reason is in the highest ranking. Next, the criteria of consultant earned an overall average index value of 4.27 and machinery criteria earned an overall average index value of 4.16. Requirements of client, construction materials, requirements of local authorities, contractor's management and workers acquires the overall average index value of 4.13, 4.04, 4.02, 3.85 and 3.53. Lastly, general problems criteria earned an overall average index value of 2.70.

From the above results, it can be concluded that the main reason for the delays in road construction projects is because of financial sources. The reason in terms of financial sources can be divided to insufficient capital, contractor is late in receiving progress payments late in paying the sub-contractor, and problem with bank loans and contractor is late in receiving progress payments. Out of these four fractions, the reason that gets the highest order of preference, with average index value of 4.47 is insufficient capital. This is followed by the contractors is late in paying to sub-contractors and problem with bank loans with average index value of 4.40. Contractors is late in receiving progress payments had the lowest order of preference, with average index value of 4.20.

**Suggestions** This limited study is not able to include or present the whole issue of delays in road construction projects. Therefore, further studies should be carried out next from time to time so that improvements and enhancements can be made for future research. Among the recommendations for

further study seems appropriate and should be implemented to help those involved in this area are as follows:

1. The study population should be broaden more where future researchers can conduct a larger study that covers road construction projects in the whole country and not just in the state of Perak only.
2. Diversify the methodology of the study. Scope of respondents should be extended to all parties involved in road construction projects. Interviews should be conducted with all the parties involved to get the data more accurate by orally.
3. In addition, individuals involved in the management and supervision of road construction projects should work together to address the problems that exist, particularly in terms of finance because it is found out to be the most critical factor in this study. Talks and site meeting shall always be held to discuss issues that occurred during the project.

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