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CAUSES OF RURAL ROAD PROJECTS DELAY IN SOUTHERN REGION OF PENINSULAR MALAYSIA

MD RAZIP BIN ISHHAK

A capstone project report submitted in fulfillment of the
requirements for the award of the degree of
Master of Project Management

Faculty of Civil Engineering
UniversitiTeknologi Malaysia

JANUARY 2014

I declare that this study entitled *"Causes of Rural Road Projects Delay in Southern Region of Peninsular Malaysia"* is the result of my research except as cited in the reference. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any degree.

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To my wife, Ahlia Mohd. Omar and my children Aishah Zakira, Fatimah Syam, Muhammad Mujahid, Muhammad Nur Izhar, Ainur Solehah, Ainul Nadhirah, and Iman Asraaf who have been able to tolerate the weekends I was away from them.

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ABSTRACT

Performance of rural road construction projects have been found to be affected by factors related to the excusable delay. Repeated delays have also caused dissatisfaction among all parties involved. The purpose of this study was to identify the causes, frequency of occurrence and ranking of delay causes according to the client, consultants and contractors. Data was collected using a questionnaire survey containing 30 common causes and analyzed using SPSS version 18.0. Nineteen delayed rural road projects in the southern region of peninsular Malaysia under the implementation of the Jabatan Kerja Raya were involved and referred to as the validity of the results. The results proved that the main cause of the delay is 'inadequate costing during tendering'. The perception comparison between the three key stakeholders has shown that 'insufficient experience of contract administration, project management and supervision of the project is a major cause. The report also includes a number of recommendations and suggestions for further research.

ABSTRAK

Prestasi masa pembinaan projek jalan luar bandar telah didapati terjejas oleh factor-faktor yang berkaitan dengan kelewatan yg dibenarkan. Kelewatan yang berulang juga telah menimbulkan rasa tidak puas hati dalam kalangan semua pihak yang terlibat. Tujuan kajian ini dijalankan untuk mengenal pasti punca, kekerapan kejadian dan kesan kelewatan mengikut klien , perunding dan kontraktor. Data dikumpul menggunakan borang soal selidik mengandungi 30 punca-punca lazim dan dianalisa menggunakan program SPSS versi 18.0. Sembilan belas projek jalan luar bandar yang lewat di bahagian selatan semenanjung Malaysia di bawah pelaksanaan JKR telah terlibat dan dirujuk sebagai kesahan keputusan. Hasil kajian membuktikan bahawa punca kelewatan paling utama adalah 'kelemahan dalam menghargakan tender'. Manakala perbandingan tanggapan diantara pihak yang terlibat menunjukkan bahawa pengalaman yang tidak mencukupi ke atas pentadbiran kontrak, pengurusan projek dan penyeliaan projek adalah merupakan punca utama. Laporan ini juga merangkumi beberapa saranan serta cadangan untuk kajian lanjutan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Introduction

Public Work Department (JKR) is a subsidiary of the Ministry of Public Works (KKR). JKR has been entrusted to implement urban and rural road construction including new, rectification and upgrading projects throughout Malaysia. JKR is responsible to plan, build and maintain all federal and state roads. There are 14,586.57 km gazette federal roads and 113,077.95 km state roads in Peninsular Malaysia until 31 December 2012 (JKR's road statistic report, 2013).

The federal roads in Peninsular Malaysia are solely owned by KKR, whereas the state roads belong to their respective state governments. Most of the federal and state roads in Malaysia were constructed under JKR's supervision. Malaysia Highway Authority (LLM) is another subsidiary of KKR, LLM has been entrusted to implement toll expressways in Peninsular Malaysia. The LLM has built 1,817.11 km toll expressways according to the highest standard of Road Engineering Association of Malaysia (REAM standard, 2002).

1.2 Background of the Study

The Rural Road (JALB) program was launched in 1977 through the Accelerated Rural Road Program (ARRP). Its initial aim was to speed up and increase the number of road construction projects which significantly needed in rural areas. The road project for states has been funded by Federal Government. The roads have been constructed according to REAM standards, namely R1, R2, and R3. Since the roads have been registered under the Malaysia Road Registration Information System (MARRIS) they were entitled for Federal Government's maintenance funding. Internationally, the rural road construction projects have been considered as the rural infrastructure which is classified as a major development priority by the World Bank (World Bank report, 1994).

One of the National Key Results Areas (NKRA) under the Government Transformation Program (GTP) introduced in the year 2010 is to improve the rural basic infrastructure. The NKRA has been controlled by Ministry of Rural and Regional Development (KKLW) with collaboration of JKR. The rural roads have been built and upgraded across the country in the NKRA program to targets all population in Peninsular Malaysia that lives within five (5) kilometers of a paved road. At the beginning of year 2010, achieved coverage is already ninety one (91%) percent of the target.

The rural road projects are been picked from a list of needed rural roads by JKR's district offices, recommended by the local authorities of rural communities. The lists for future projects will then be sent to KKLW for approval. KKLW will submit to the Economic Planning Unit (EPU) for allocation based on priorities of road location before handing back to JKR.

Internally, JKR have been setting its Strategic Framework 2012-2015 with the theme "Excellent Project Execution" that have the following attributes:

- On-time delivery
- Meet and exceeding client's requirement
- Cost effectiveness

Thus, the performance of JKR as strategic partner in implementing the rural road projects is very important and crucial to make sure that the projects are delivered timely.

1.3 Statement of the Problem

Delay or time overran continuously happened in most of the construction projects and become our national issues. Malaysian government had acknowledged the construction delays and cost overruns problems, especially on government related fund projects. There is a universal agreement that delay is a common phenomenon in the construction industry worldwide (Chan and Kumaraswamy, 1997).

JKR, as the main implementing agency, which comprises of varies technical disciplines, is also responsible for all project delays. The situations have tarnished JKR's reputation. JKR has been receiving a lot of criticism from the public and even bring out for debate in the parliament. The credibility of JKR is at stake while many clients go to the department to opt for in-house project implementation.

The construction time performance of the public projects in Malaysia were found to be affected largely by variables related to excusable delays than project characteristic variables (Othman et al., 2006). Figure 1.0 illustrated the approved reasons of Extension of Time (EOT) for overall road projects implemented by JKR in the year 2012. The top five excusable delays were land acquisition at 22 percent, relocation of utilities at 21 percent, design changes at 20 percent, inclement weather at 12 percent and followed by third parties approval at 9 percent (data generated from SKALA-JKR's project reporting and monitoring tools, 23 July 2013). This study discussed the findings of top five significant delay causes for the rural road projects in Chapter 4.

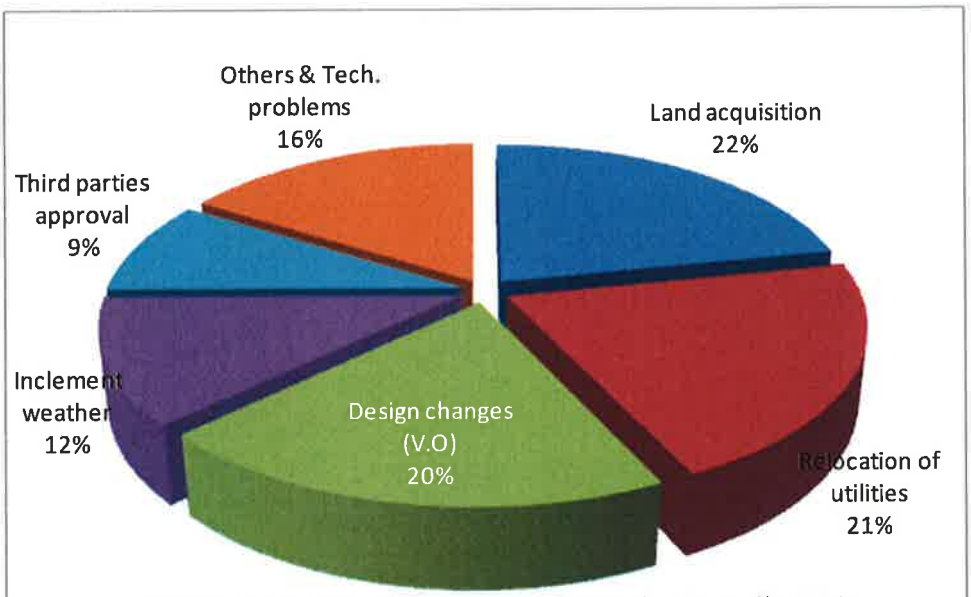

Figure 1.0 : Reasons for EOT approval - Overall JKR's road projects for the year 2012 pie chart

JKR implemented 128 rural road projects throughout Peninsular Malaysia for the year 2013. The study focused on the southern region namely the developed states: Johor, Melaka and Negeri Sembilan to justify the findings.

Johor had fifteen (15) rural road projects in varying stages of implementation with eight (8) reported delays, Melaka had three (3) rural road projects with two (2) reported delays and Negeri Sembilan had nineteen (19) rural road projects with nine (9) reported delays (Report on physical and finance of rural road projects, June 2013). This attributed to 48.6 percent of rural road projects which were not completed on-time in southern region of peninsular Malaysia.

Table 1.1 shows the nineteen projects delay constructed and completed within the last five years. Although most of the project had completed with EOT, the percentage of delay quite alarming.

Table 1.1 : Rural road projects delay in southern regions of peninsular Malaysia.

Project reference	Planned duration of contract (days)	EOT approved (days)	Percentage delay	Remark
J1	783	170	22	Completed
J2	699	90	13	Ongoing
J3	665	212	32	Completed
J4	546	967	177	Terminated
J5	490	483	99	Completed
J6	730	634	87	Completed
J7	419	630	150	Completed
J8	914	369	40	Completed
M1	365	257	70	Completed
M2	458	217	47	Completed
N1	504	90	18	Completed
N2	365	60	16	Completed
N3	728	406	56	Completed
N4	546	237	43	Completed
N5	365	150	41	Completed
N6	549	76	14	Completed
N7	336	150	45	Completed
N8	731	120	16	Completed
N9	454	178	39	Completed

Note: J – Johor, M – Melaka, N – Negeri Sembilan.

. Delays in construction projects gave rise to dissatisfaction to all the parties involved (Sambasivan and Soon, 2007). Although the contracted parties agreed upon the extra time and cost associated with the delays, in many cases there were various problems between the clients and contractors as to whether the contractors were entitled to claim the extra cost. Such situations usually involved the questioning for truths, causal factors and contract interpretation.

Chan and Kumaraswamy (1997) found there was a difference in perceptions as to the causes of delays by different groups of participants in the building and civil engineering works. They suggested that biases of different industry groups might direct blames on the delays to other groups. Without understanding of the causes of delays, finger-pointing between parties involved would occur. This study also will compare the differences in perceptions of the parties involved to agree on solving the problems.

1.4 Research Questions

The research questions of this study are as follows: -

i. What are the causes of delay in rural road projects implemented by JKR?

ii. How to rank the delay causes in term of frequency of occurrence and severity of effects?

iii. What is the perception of the key stakeholders toward the issue of project delay?

1.5 Objectives of the Study

The aim of this research is to study and evaluate the issues related to the major causes of rural road project delays in the southern region of Peninsular Malaysia by a survey. In order to achieve this aim, it is necessary and thoroughly required to review the existing literature and research findings. Therefore, the objectives of this study are as follows: -

i. To identify the causes of delays in rural road projects implementation under JKR.

ii. To establish the ranking of significant causes of delays for the rural road projects.

iii. To compare the differences in perceptions of the three key stakeholders, namely the clients, contractors and consultants.

1.6 Scope of the Study

This study focuses on public sector civil engineering projects limited to rural road projects implemented by JKR and allocation of the projects received from the client's department - Ministry of Rural and Regional Development (KKLW).

1.6.1 Three Key Stakeholders

Respondents for the study are limited to the three key stakeholders namely the clients, contractors and consultants, carefully chosen for sources of data. The clients of the rural road projects which are the client department (KKLW) and the JKR's managing team which deal with the contractors and end users.

The consultants include the appointed consultants and in-house JKR's design team that carry out all the design works from the beginning till the end of the construction project. The contractors are the producers of the road projects varying in capability and involving many classes under CIDB certification.

1.6.2 Rural Road Projects under JKR.

Nineteen (19) real projects implemented by JKR were located in the states of Johor, Melaka and Negeri Sembilan. Only roads categorized as rural roads were chosen for the study. The roads were constructed according to REAM standards i.e.: R1, R2 and R3.

1.7 Significance of the Study

There are several advantages for the parties involved or the stakeholders the clients, contractors and consultants. The importance to establish the issue relating to the rural road project delays is to provide a greater insight and understanding of the causes of delays. This can be achieved by applying theoretical concepts in literature into practice. Researcher hopes that it may encourage the practitioners to focus on delay mitigation of their present or future plan projects. It also presents a few suggestions on how to improve future project deliveries.

1.8 Limitation of the Study

This study was limited to a time frame of the taught course of the Master Degree program by UTM that spread over one and a half semesters. Due to the large number of rural road projects throughout Malaysia, it covered only three states and may not reflect the actual situation of the whole population in this organization. In addition, it adopted a self-appraisal questionnaire as the method of data collection, which might have inaccuracy on the actual thoughts of the key stakeholders, as some respondents may hide the truth.

1.9 Conceptual Definition

The conceptual definitions on the main topic of this study are given below:-

1.9.1 Causes

The first step in addressing a problem is to identify the causes or sources of the problem. Causes or factors resulting in delay or time overrun should become very clear to all parties involved in construction projects (Sambasivan and Soon, 2007). It is necessary to create awareness of delay causes, their frequency, and the extent to which they can adversely affect project delivery.

1.9.2 Delay

It is defined as any occurrences or events that extend the duration or delay the start or finish of any of the activities of a project. Its increases the time and cost allocated for executing the project activities, resulting in late completion and cost overrun. Late completion will only occur when the delay lies on the critical path of the program. Delayed completion of projects is generally caused by the actions or inactions of the one or more project parties (Braimah, 2008). In short, delay has prolonged construction period (Kikwasi, 2012).

1.9.3 Rural Road

The rural road construction projects have been considered as rural infrastructure which is classified as a major development priority by World Bank. High quality infrastructure in rural areas is important to economic development in developing countries (World Bank report, 1994). In Malaysia context, high quality rural roads are built according to R3 of REAM standard (2002). Most of the nineteen rural projects in this study were built by G7 highest class of contractor under CIDB, only few with class G6 and G5.

1.9.4 Perception

The focus of most studies of project delay is on dimensions of project delay and factors influencing project delay. In this study the perception of the three key stakeholders will be discussed on their differences and agreement in ranking of delay causes.

1.10 Conclusion

This chapter includes the objectives, problem statement, study scope, research questions, significance and limitation of the study. Delay in construction industry, especially road construction projects is a worldwide issue. Through applying theoretical concepts to be discussed in the next chapter, researcher hope that this study forms the baseline for future researches in Malaysia to monitor the changes in the delay causes in road construction projects.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presented the criteria for successful project before moving to the delay theory, delay classification, delay causes, delay effects, and delay mitigation from relevant literature studies. It also discussed the relationship between delay causes and their source groups. Finally, it described the perception of stakeholders in the issues and their agreement toward the severe delay causes. Most of the materials reviewed in this chapter are obtained from literature cited in the references.

2.2 Criteria for successful project execution

Traditionally way of measuring project success is so called golden triangle of time, cost and required quality. PMBOK Guide published by the Project Management Institute (2004) defined project success criteria shall include the golden triangle and key project stakeholders' satisfaction of the project (Wang et al., 2005). An indicator of an efficient construction industry is completing projects on time (Chan et al., 1997). Thus, completing projects within time is one of the biggest challenges facing the construction industry (Kaliba et al., 2009).

2.3 Delay Theory

There have been various definitions of delay until now, aside from the conceptual definition in item 1.9.2. Several researchers have quoted delays in construction projects as a universal phenomenon including in developing countries (Kaliba et al, 2009). There are projects with only a few days behind schedule but quite a numbers are delayed over a year (Safri, 2009).Time is related to cost, the longer the delay exceed the initial time the more it exceed cost estimates. Thus, delays are usually accompanied by cost overruns (Mahamid et al., 2012).

2.4 Delay Classification

Delay is classified into three generally recognized: excusable, non-excusable and compensable delays (Braimah, 2008).

2.4.1 Excusable Delays

Othman et al. (2006) defined excusable delays as delay that occurs when the contractor is delayed by occurrences beyond his control. The contractor is entitled to extension of time (EOT) under the terms of the contract. For the period of EOT, the contractor is said to be excused liability for liquidated damages (LAD) which otherwise have been payable to the employer or client. Thus, excusable delay is one for which the employer is generally responsible although some excusable delays are outside the control of employer, e.g. inclement weather (Braimah, 2008). The Government of Malaysia P.W.D. Form 203 (Rev. 1/2010) form of contract provided list of 'excusable delay' under clause 43 – Delay and Extension of Time. The EOT approved to the contractor excuse them from performing works within the contract period. However, whether the delays

are excusable is depends on contract provision, site evaluation, justification, supported evident and even approval from higher level committee. The process is to determine that the cause of delay is not part of the contractor fault or negligence. Excusable delays can be further categorized into delays with compensation and without compensation. Whether a delay is with compensation or without compensable depend on allocation of risk between the employer and the contractor.

2.4.2 Non-Excusable Delays

Non-excusable delay is vice versa of excusable delay where the contractor was at fault or negligence. This is causes of their own actions or inactions that could have foreseen or prevented but failed to do so. No entitlement for time extension or compensation to the contractor. If the delays exceeded the actual completion period of the project, the clients could be entitled to damages for non-completion under Liquidated Ascertained Damages (LAD) of the condition of contract. The amount of damages is depends on the contract value of the project based on the length of delay and the rate of damages per day (PWD form of contract)

2.5 Delay Causes

Many researchers have identified the causes of delay for varies type of construction projects, scope, size and locations. Several researchers categorized the delay causes into groups according to the related source of delay. They also agreed on most of the delay causes although ranking them differently.

Most of the researchers suggested more than one severe delay causes (Mahamid et al., 2012; Kaliba et al., 2009; Sambasivan et al., 2007; Abdul-Rahman et al., 2006; Al-Ghafly et al., 1999; Chan et al., 1997).

Only three of the literature from Mahamid et al. (2011; 2012) and Kaliba et al. (2009) specifically studied the road construction delay causes. Table 2.1 shows the lists of literatures on delay causes.

Mahamid et al. (2012) identified 52 causes of delay in road construction projects in West Bank, Palestine. The study categorized the causes into eight related source groups. Top five severe causes were political situation, mobilization problem, award project to the lowest bidder, late payment by client, and shortage of equipment.

The first two of the causes were related to external factors source group, followed by project source groups that can also be categorize under client source groups with the fourth ranked.

Finally the fifth ranked was related to material, labor and plant source groups. From these top five delay causes, the external factors and client related source groups gave great influences to the delay causes for road construction projects.

Kikwasi (2012) conducted survey in construction projects in Tanzania. He identified that more than 50 percent of the respondent have experienced delays in projects they were involved. The study concluded the top seven highly rank causes were design changes, late payment to contractors, delays in information, funding problems, poor project management, compensation issues, and disagreement on the valuation of work done. The study also found out that the significant delay causes differ from one country to another.

Table 2.1 : Literature review on the delay causes.

Delay causes	Methods and Analysis	Type of Project	Region or Country	References
Varies with top five severe causes	Questionnaire S.I & Spearman's rank correlation.	Road projects	Palestine	Mahamid et al. (2012)
Varies with top seven factors causes	Questionnaire RII & regression model.	General construction projects.	India	Doloi et al. (2012)
Varies with top seven highly ranked causes.	Questionnaire RII.	General construction projects.	Tanzania	Kikwasi (2012)
Most severe factors are human related factors.	Questionnaire Risk matrix.	Road projects	Palestine	Mahamid et al. (2011)
Fourteen major causes.	Questionnaire & interview IM.I	Road projects	Zambia	Kaliba et al. (2009)
Varies with top five most severe causes	Questionnaire & interview, F.I, S.I, IM.I, Spearman's correlation.	Large construction projects.	Vietnam	Long et al. (2008)
Varies with top ten major causes	Questionnaire,RII&Spearman's rank correlation.	General construction projects.	Malaysia	Sambasivanet al. (2007)
Most of the delays were caused by excusable factors.	Data collectionCase studies. Multi regression	Civil engineering projects.	Malaysia	Othman et al. (2006)
Varies with change order as most common cause.	Questionnaire F.I, S.I &IM.I Spearman's rank correlation.	Large construction projects.	Saudi Arabia	Assaf et al. (2006)
Three major causes: Financial problems, manpower shortage and change order.	Questionnaire & interviews. Statistical method	General construction projects.	Malaysia	Abdul-Rahman et al. (2006)
Varies with top five most important.	Questionnaire RII&.Spearman's rank correlation.	Large construction projects.	Jordan	Odeh et al. (2002)
Varies with top ten most important causes.	Questionnaire & interview, F.I, S.I, IM.I, Spearman's rank correlation.	Public utility projects.	Saudi Arabia	Al-Ghafly et al. (1999)
Varies with 5 major causes of delay.	Questionnaire Importance index	General construction projects.	Hong Kong	Chan and Kumaraswamy (1997)

* F.I – Frequency index, S.I – Severity index, IM.I – Important index, RII – Relative important index

Doloi et al. (2012) conducted survey in Indian construction projects. They identified 45 causes of delay and classified them into six related source groups. The study concluded top seven factors or principal components as lack of commitment, inefficient site management, poor site coordination, improper planning, lack of clarity in project scope, lack of communication, and substandard contract. Dissociate into top five delay causes which were material delivery problem, delay of design works, difficulties in financing project, change order, and requirement of third parties approval. Related source groups involved for the top five causes are resources group, consultant, contractor, client, and external factors group.

Mahamid (2011) identified risk matrix for 43 factors affecting time delay in the road construction projects. The study concluded that the most severe factors were human related factors that can be controlled and improved.

Kaliba et al. (2009) conducted survey in road construction projects in Zambia. The study concluded fourteen major causes with the first ranked is late payments by client. Each six delay causes related source groups out of the fourteen causes were related to client and contractor group respectively. The type of delay equally divided between excusable and non-excusable delays for the fourteen causes.

Long et al. (2008) conducted survey in large construction projects in Vietnam. They identified 21 causes of delay and categorized them into six related source groups. The study concluded top five major causes as poor site management and supervision, poor site management assistance, financial difficulties of client and contractor, and design changes. Related source groups involved for the top five causes are client, contractor, consultant, and project related group. The study also found out that significant delay causes are more similar in developing countries.

Sambasivan et al. (2007) conducted survey in construction industry in Malaysia. They identified 28 causes of delay and categorized them into six related source groups. The study concluded top ten major causes with four related to

contractor, which are improper planning, poor site management, problems with subcontractors, and inadequate experience. Three related to resources which are shortage of material, labor supply and equipment availability. Another three are late payment by client, lack of communication between parties, and mistakes during construction stage. They also found out that some causes and effects may be unique to certain countries.

Othman et al. (2006) identified variables related to project characteristics and variables associated with excusable delay of 244 public sector civil engineering projects in Malaysia. The study concluded that most of the delays were caused by excusable delays. Land acquisition problems is the most frequently quoted reasons for road projects. Land allocated for the road project was not readily available due to illegal usage by other parties. Another factors was local residents did not allow contractors to use existing roads due to anticipated damage. Other most common reasons quoted for road project were relocation of existing services, design changes due to unexpected ground conditions, delay in approval by third parties and shortage of materials. The study also concluded on average overall extra time taken exceeded 37 percent of the original in road projects. They suggested steps to reduce the occurrence of excusable delays through improving the planning stage that can minimize the EOT reasons for relocation of services, unforeseen site conditions, bad weather period, and land acquisition problem. To provide mechanism whereby design are check by competent engineers and establish 'construction time' prediction model for public sector.

Assaf et al. (2006) identified 28 causes of delay and categorized them into six related source groups for different types of construction projects in Saudi Arabia. The study concluded top ten major causes with four related to contractor, which are improper planning, poor site management, problems with subcontractors, and inadequate experience. Three related to resources which are shortage of material, labor supply and equipment availability. Another three are late payment by client, lack of communication between parties, and mistakes during construction stage. All parties agreed that change order by client during construction is the most common cause of delay. The study provided recommendation points to all three

key stakeholders and suggested important future study to investigate the effect of financing and cash flow problems on delays in construction projects.

Abdul-Rahman et al. (2006) distributed questionnaires to 502 organizations of clients, consultants and contractors located in the Klang Valley, Malaysia. The study included interviews with top management of the three key stakeholders. All parties involved in the survey agreed that delay occur mostly in the construction phase. The top five major causes of delay during construction phase were change order, shortage of labor, poor planning and scheduling, poor site organizing and late payment. The top management summarized all the causes of delay into three most important attribute which are financial problems, skilled manpower shortage and change order. The study suggested the increasing in construction productivity and human resources expertise, knowledge information flow, frequently conduct site meeting, and the important of top management contribution in solving the issues.

Odeh et al. (2002) conducted a survey in large construction projects in Jordan. They identified 28 causes of delay and categorized them into eight related source groups. The study concluded top five most important factors were contractor inadequate experience, late payment of completed work, subcontractor problems, and slow decision making of the client. The study suggested the important of joint effort of all parties in the construction industry in solving the problems.

Al-Khalil et al. (1999) conducted a survey in public utility projects in Saudi Arabia. They identified 60 causes of delay and categorized them into six related source groups. The study concluded top ten most important factors were shortage of manpower, ineffective planning and scheduling, change order, mobilization problem, unforeseen site condition, late payment of completed works, award to lowest bidder, third parties approval, difficulties in financing and cash flow problems by the contractor, contractor's inadequate experience, late payment of completed work, subcontractor problems, and slow decision making of the client.

The study suggested the important of joint effort of all parties in the construction industry in solving the problems.

Chan et al. (1997) conducted a survey in building and civil engineering projects in Hong Kong. They identified 83 causes of delay and categorized them into eight related source groups. The study concluded top five common causes were poor site management and supervision, unforeseen site conditions, slow in decision making process, change order initiated by client, and change order of works. The study suggested the important of continuous professional development schemes, complete and clear data of site condition, clearly defined roles and responsibility of project team, value management technique to minimize variations, and bridging the gaps between all parties perception in the construction industry in solving the problems.

To summarize this section, table 2.2 showed comparison among researcher's top five delay causes with their similarities.

Table 2.2 :Comparison among researchers for the top five delay causes.

Researcher	Top five delay causes				
	1	2	3	4	5
Mahamid et al. (2012)	Political situation	Mobilization problems	Award project to lowest bid	Late payment for completed works	Shortage of equipment
Doloi et al. (2012)	Delay in material delivery	Delay in design work	Difficulties in financing project	Change order	Delay in approval by third parties
Kikwasi (2012)	Design changes	Late payment for completed works	Delay in information	Funding problems	Poor project management
Mahamid et al. (2011)	Poor communication	Poor resource management	Delay in commencement	Insufficient inspectors	Rework from poor material quality
Kaliba et al. (2009)	Late payment for completed works	Client's financial process	Client's financial difficulties	Contract modification	Economic problems
Long et al. (2008)	Poor site management & supervision	Poor site management assistance	Client's financial difficulties	Contractor's financial difficulties	Design changes
Sambasivan et al. (2007)	Contractor's improper planning	Poor site management & supervision	Contractor's inadequate experience	Late payment for completed works	Problems with subcontractors
Anuar-Othman et al. (2006)	Land acquisition	Relocation of existing services	Design changes	Delay in approval by third parties	Shortage of materials
Assaf et al. (2006)	Change order	Late payment for completed works	Contractor's improper planning	Poor site management supervision	Shortage of labor
Abdul-Rahman et.al. (2006)	Change order	Shortage of labor	Poor planning & scheduling	Poor site organizing	Late payment for completed works
Odeh et al. (2002)	Contractor's inadequate experience	Late payment for completed works	Problems with subcontractors	Client interference	Slow decision making
Al-Ghafly et al. (1999)	Shortage of labor	Contractor's improper planning	Change order	Mobilization problems	Unforeseen site condition
Chan et al. (1997)	Poor site management & supervision	Unforeseen site condition	Slow decision making	Change order by client	Change order of works

2.6 Effect of Delays

Delays or time overrun is considered to be one of the most recurring problems in the construction industry (Mahamid et al., 2012). Several researchers have concluded the main effects of delay in construction projects were cost overruns. Table 2.3 shows the lists of literatures on effects of delay. Only one of the literatures from Kaliba et al. (2009) specifically studied the road construction effects of delay.

Table 2.3 : Literature review on effects of delay

Effect of delays	Type of Project	Region or Country	References
Listed fourteen with five highly ranked effects.	General construction projects.	Tanzinia	Kikwasi(2012)
Listed six most important effects.	Public construction projects	Oman	Alnuaimi et al. (2010)
Listed four effects	Road construction projects	Zambia	Kaliba et al. (2009)
Listed six main effects	General construction projects	Malaysia	Sambasivanet al. (2007)

Kikwasi (2012) listed fourteen effects of delays for construction projects in Tanzania. The study concluded the top five highly ranked effects as time overrun, cost overrun, negative social impact, idling resources and disputes. These results followed with four medium ranked effects as arbitration, poor quality workmanship, late client's loans repayment and profit payback. Others low effect included bankruptcy, litigation, stress on contractors, total abandonment, and acceleration losses.

Alnuaimi et al. (2010) conducted a survey in public construction projects in Oman. The study focused on the effect of change order on the projects. They listed six important effects of change order included late completion date of projects, claims and disputes, cost overruns, adversely affect performance and moral of labor, additional costs to contractors and poor work quality.

Kaliba et al. (2009) listed four major effects of delays for road construction projects in Zambia. The effects included poor quality of end product, EOT, litigation, and cost overruns.

Sambasivan et al. (2007) concluded six main effects for construction projects in Malaysia. The effects included time overrun, cost overrun, disputes, arbitration, litigation, and total abandonment. The study also established the empirical relationships between the causes and effects of delays.

To summarize this section, by knowing the effects of delay will provide clearer scenario on the outcome of delay event for further actions to be taken especially by the project team.

2.7 Delay Responsibility and related Group

Several researchers have classified factors of delays under various groups. The benefit of grouping was to determine and divide each factor to related source of responsibility according to their common characteristic. These will helped to focus attention in generating the list of possible factors or attributes for a particular group.

The related source groups of delay causes from the previous researchers discussed in section 2.5 above are used to provide basis in establishing the source group for this study. Table 2.4 shows the groups of related sources of delays.

Table 2.4 : Group of related sources of delays causes.

Causes under each group		References
A	**Delays related to client**	
1	Award project to the lowest bid	
2	Unreasonable project duration/time frame	
3	Slow in decision making process	
4	Change order (VO)/design changes	
5	Late payment of completed works	
B	**Delays related to consultant/designer**	
6	Insufficient data collection before design works	
7	Discrepancies in documentation	
8	Delay of design works and approval of drawing	
9	Inadequate experience on ctt.admin, p.m&supervn.	
10	Delay issuing approval for inspection, valuation etc	
C	**Delays related to contractor**	
11	Inaccurate costing during tendering	
12	Difficulties in financing project	
13	Ineffective planning and scheduling	
14	Poor site management and supervision	
15	Work defects and rework	
D	**Delays related to rural road project**	
16	Unforeseen site condition	
17	Land acquisition/late land handover problem	
18	Lack of communication and coordination bet. parties	
19	Relocation of utilities/services	
20	Conflict/disturbance to public activities	
E	**Delays related to material, labor & plant**	
21	Shortage of materials and delivery problem	
22	Changes in quality of materials and specification	
23	Low productivity of laborers	
24	Inadequate skill operators and low efficiency	
25	Plant availability and transportation problems	
F	**Delays related to external factors**	
26	Inclement (unexpected) weather condition	
27	Fluctuation of price	
28	Problem with neighboring land owner	
29	Political influence	
30	Requirement of third parties approval	

2.8 Delay Claims

Time is the essence of construction's contract. However, a number of factors including the performance of the parties in contract affect the actual project duration causing the project to suffer time overruns. To recover such losses, claims often arise being claims by contractors against client for EOT and/or loss and expense. Delays continue to remain a difficult undertaking for all project parties (Braimah, 2013). The resolution of such claims involves identifying and quantifying the effects of one or more delay causes. Proper construction delay claim resolution requires an extensive documentation.

2.9 Delay Mitigation

Construction projects involve more variables and uncertainties than in manufacturing line. It is important to predict and diagnose the cause to find and implement appropriate and economical solutions (Abdul-Rahman et al., 2002).

2.10 Perception of Stakeholders

The previous researcher found despite some differing perceptions, there is general agreement between major stakeholders on the causes of delay (Mahamid et al., 2012; Sambasivan et al., 2007; Abdul-Rahman et al., 2006). Key stakeholders chosen by most of the researchers comprise of the clients, consultants and contractors. This study will further establish the perception of the three stakeholders for this project, namely the clients, consultants and contractors. Table 2.5 showed previous studied on perception of the stakeholders.

Table 2.5 : Previous studied on perception of the stakeholders

Perception of the Stakeholders	Methods of Analysis	Remark	References
Good agreement between the consultants and contractors in ranking of delay causes.	Questionnaire to the consultants & contractors using Spearman rank correlation	The relative agreement is 75%.	Mahamid et al. (2012)
In Malaysia, one party blaming the other, most often between clients and contractors.	Questionnaire to the clients, consultants & contractors using Spearman rank correlation	High correlation indicates that there is a high degree of agreement between the three key stakeholders on causes of delay, which is more than 77.2%.	Sambasivanet al. (2007)
Many causes are common between two parties, only one is common between all parties, which is change order by client.	Questionnaire to the clients, consultants & contractors using Spearman rank correlation	The highest degree of agreement is 72.4% between clients and consultants. The lowest is 56.8% between clients and contractors.	Assaf et al. (2006)
Different perception among the parties on the ranking of the major causes of delay.	Questionnaire to the clients, consultants & contractors using Spearman rank correlation	The results indicate lack of consensus among the three key stakeholders on the importance ranking of delay causes.	Al-Ghafly et al. (1999)
Different perception among the parties on the ranking of the major causes of delay.	Questionnaire to the clients, consultants & contractors using importance index.	The clients and consultants agreed to a large extent on the ranking of delay. Whereas the clients and contractors agreed less and the consultants and contractors agreed the least.	Chan and Kumaraswamy(1997)

Mahamid et al. (2012) identified top five delay causes in agreement between consultants and contractors as poor qualification of contractors' technical staff, shortage of labor, project financing problem, natural disaster and mobilization problem in road construction projects in West Bank, Palestine. These causes have the lowest difference in severity index (S.I) values between both of the stakeholders with results less than 1 percent. Vice versa the delay causes in disagreement between consultants and contractors have highest difference in S.I values. The study concluded that there is a relatively good agreement between the two stakeholders of 75 percent.

Sambasivan et al.(2007) concluded that there is good agreement between all three key stakeholders in ranking delay causes in Malaysia. The correlation coefficient is between 77.2 percent and 89.6 percent for all parties. The study identified most of the disputes in the construction industry here are between clients and contractors. The client blame contractor's ineffective planning and scheduling, and labor supply as important delay causes. Vice versa the contractors blame the client's late payment for completed work.

Assaf et al. (2006) concluded that there is differing perception between key stakeholders in ranking delay causes in Saudi Arabia. Only one causes of delay is common between all parties which is change order by client during construction. Correlation coefficients show that there is relative good agreement between each two groups of parties. The highest degree of agreement is 72.4 percent between clients and consultants. Both clients and contractors agreed that awarding to the lowest bidder is the highest frequent cause of delay. The lowest degree of agreement is 56.8 percent between clients and contractors. The contractors ranked severe causes of delay are related to clients.

Al-Khalil et al.(1999) concluded that there is lack of consensus among the three key stakeholder. The client and the consultant show slightly agreement, while the consultant and the contractor show disagreement. The ranking of the client and the contractor are considered independent of each other.

Chan et al. (1997) concluded that the client and the consultant have strong consistency in ranking delay causes. The highest degree of agreement is 87.5 percent for civil engineering and 62.5 percent for building works in Hong Kong. The lowest degree of agreement is 37.5 percent between consultants and contractors in building works. The client and the consultant ranked the contractor related source group the highest, while the contractor ranked the designer related source group the highest ranked causes of delay.

2.11 Rural Road Project in Southern Region

The several researchers found there is differing perceptions in different locality, especially in different countries according to Mahamid et al. (2012), Alnuaimi et al. (2010), Ogunlana et al. (2008) and Chan et al. (1997). Othman et al. (2006) conducted a studied on civil engineering works in four different regions in Peninsular Malaysia i.e. northern, eastern, western and southern region. The study concluded that from the data of eighty five road construction projects analyzed, there was no significant relationship between projects time performance index (TPI) with project regional location. This study will focus on three states in southern regions of Peninsular Malaysia as one regional location without differences in ranking the delay causes.

2.12 Conclusion

All in all, this chapter presented the theories of delay which are based on previous literature. The chapter also discuss on the relationships between delay and its effects. The general perception of the key stakeholders was presented in the end of this chapter.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter described and explained the research methodology used in this study. Research methodology is the significant section of the study that deals with how the study should be conducted from data collection to the analysis of the data. It outlines a complete and systematic process to ensure that adequate data was collected to achieve the objective of this study.

The effective analysis outcome will support the findings and how the study was concluded. This chapter described the research design, target organization, population of the study, instrument, field survey, the pilot test, and data analysis that were used in this study.

3.2 Research Design

Descriptive and used survey sample were designed to obtain views from clients, consulting firms, project team and contractors in regard to causes of delays

in rural road construction projects. Surveys were the primary method used in quantitative research.

The main objective was to simplify and organize summaries information about data collected from relevant people. A self-appraisal questionnaire was filled out by participants and easily distributed to a large number of people to fulfill the study objectives.

According to the objectives and research questions indicated in Chapter 1, the information such as opinions on the frequency and severity of effect should be asked. The research method of survey was used to find out reactions and attitudes, to measure opinions about various project stakeholders. Survey was a primary source of information because the questions would be answered by participants directly. The surveys were conducted by using different type of media i.e. posted, email or face to face survey. The self-appraisal questionnaire allowed for result to be collected in the spare time and hopefully will get high response rate.

3.3 Operational Framework

The research methodology adopted in this study to achieve the objective is summarized as shown in the Table 3.1 operational framework and flow chart in Figure 3.1 below:

Table 3.1 :Operational framework

Objectives	Tasks	Methodology
• To identify the causes of delays in rural road projects implementation under JKR.	To understand the what cause delay and why delay occurred.	• Literature review • Review of papers from journals and conference.
• To establish the ranking of significant causes of delays for rural road projects.	To identify the important or major factors of delays and their severe effects.	• Questionnaires survey distributed among the three stakeholders.
• To compare the differences in perceptions of the three key stakeholders, namely, the clients, contractors and consultants.	Differentiate the perceptions and find the common agreement.	• Questionnaires survey distributed among the three stakeholders. • Informal discussion with respondent as required.

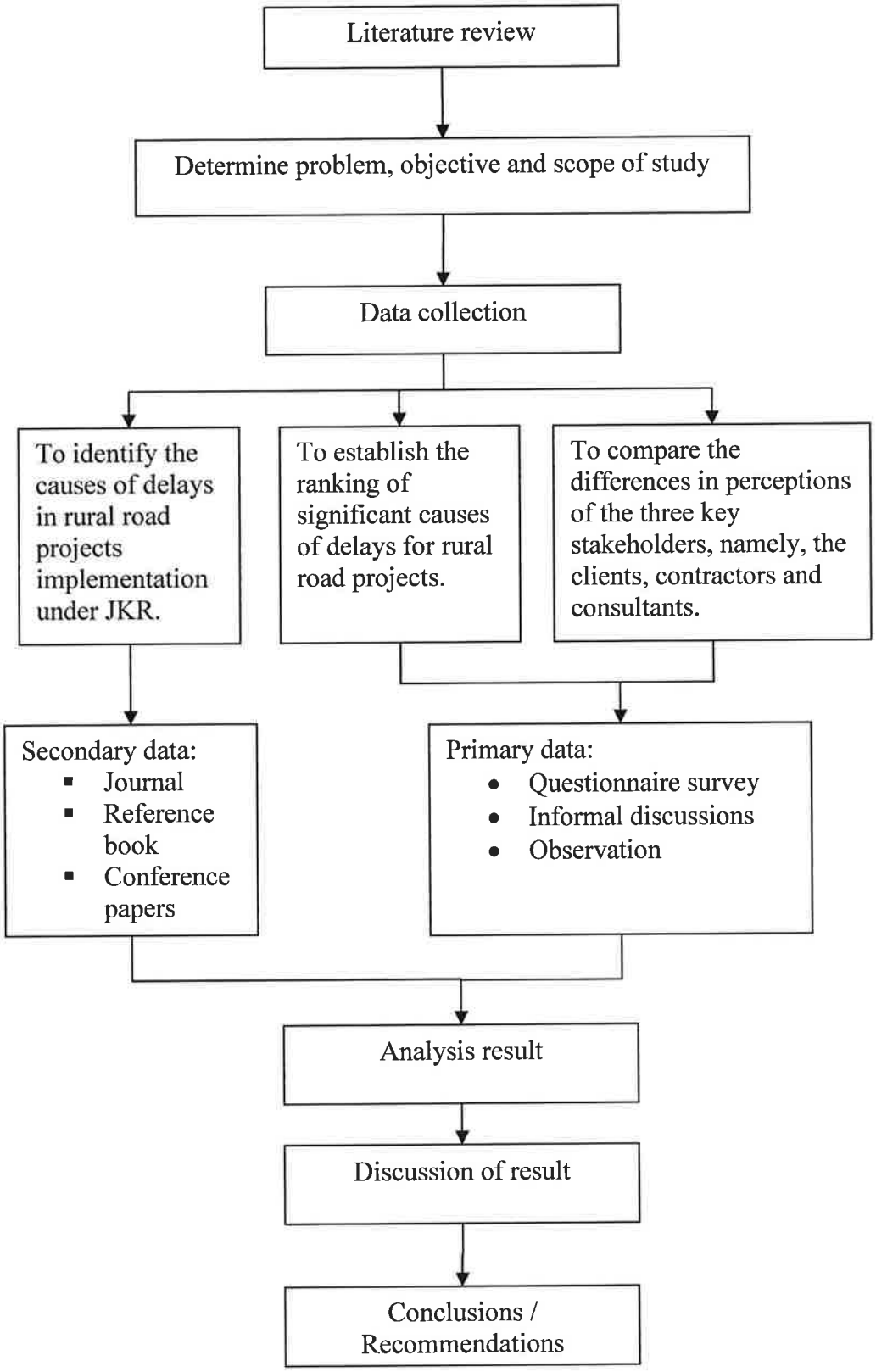

Figure3.1 : Operational flow chart

3.4 Target Organization

According to the problem statement in Chapter 1, one of the reasons to do this research was to solve the recurring delay problem in rural road projects implemented by JKR. JKR's managing teams have to understand the important to deliver project on time at effective cost and satisfied all stakeholders. Thus, the significant causes of delay should be identified through the analysis between frequency of occurrence and severity of effects.

3.5 Research Population and Sampling

The respondents of this study included of the three key stakeholders namely the clients, the consultants and the contractors.

The increasing demand for study had created a need for an efficient method of determining the sample size. This sample size was needed to represent the given population. A few factors should be taken into consideration before determining the size of the sample. According to the statistic reference book, there are four factors to be determined:

i. How much error of sampling can be tolerated,
ii. Population size,
iii. How varied the population is with the respect to the characteristic of interest, and
iv. The smallest sub-group within the sample for which estimates are needed.

Estimation of sample size in this study will be based on the nineteen rural road projects and using Krejcie and Morgan Table which is a common employed method. According to Krejcie and Morgan (1970) Table, when population in this case rural road projects referred are nineteen and the key stakeholders are three parties – 19x3=57, take 60 from the table which indicated minimum 52 samples to be analyzed (refer Krejcie and Morgan (1970) Table in the Appendix A)

3.6 Data Collection

Data collection is the most critical part in this research methodology since the accuracy of obtained data will determine the success or failure of this research. The data of this research were collected through quantitative method that refer to literature review and research instrument of questionnaire survey.

3.7 Research Instrument

3.8 Research Questionnaire

This research is on the basis of a survey design to gather all necessary information. The survey will present lists of identifying causes generated from related research work on construction delay together with input, revision, and modifications. A questionnaire will be developed to evaluate the severity of the identified causes. A question will be asked: What is the degree of severity of this cause of project delay? Purposive sampling by using the simple random sampling technique will be used to select the participants from an available list. A few respondents will be attended for discussion based on the feedback and comments given in the questionnaire forms to gather further information

The questionnaires were divided into two (2) sections. The respondents were first asked about their personal background as respondent's profile in section A. Subsequently in section B, the respondents were asked to indicate their opinion on the frequency of occurrence and severity of effect using the same questions. In addition, respondents were encouraged to write their opinion on other causes of delay and/or any suggestion to improve the problem. (Please refer the Appendix B for the example of the questionnaire survey).

The questionnaire is based on Likert Scale of five measures from one (1) to five (5). The rating for frequency of occurrence and severity of effect for the thirty identified causes of delay are shown Tables 4.1 and 4.2 below:

Table 3.2 : Likert scale for frequency of occurrence

Category	*Never happen*	*Rarely happen*	*Sometimes happen*	*Often happen*	*Always happen*
Rating	1	2	3	4	5

Table 3.3 : Likert scale for severity of effect

Category	*No effect*	*Little effect*	*Moderate effect*	*Great effect*	*Extreme effect*
Rating	1	2	3	4	5

3.9 Data Analysis

The data gathered will be analyzed by using the frequency index, severity index and important index with statistical analyses tools e.g. Excel and SPSS.

According to Odeh et al. (2002), Relative Importance Index (RII) is the appropriate method in determining the ranking of different factors from the different group of the respondents. For this study using the frequency of occurrence and severity effect, RII is named as Frequency Index (F.I) and Severity Index (S.I) as adopted from Long et al., (2008). He used the frequency and severity index method to determine the frequency of occurrence and level of severity effects on the delay causes.

Index Analysis:

The data are processed through 3 types of indices:

- Frequency index, F.I. (%) = $\sum$ a(n/N) * 100/5
- Severity index, S.I. (%) = $\sum$ a(n/N) * 100/5
- Importance index, IMP.I = F.I. x S.I.

Where: a = constant expressing the weight assigned to each responses (1 to 5 for Always or Extreme),

n = frequency of each response, and

N = total no. of responses.

(Mahamid et al., 2012 ; Long et al.,2008)

Frequency index scale and occurrence level

- 0 - 20 Never happen
- 21- 40 Rarely
- 41- 60 Sometimes
- 61- 80 Often
- 81 – 100 Always happen

Severity index scale and impact level

- 0 - 20 No effect
- 21- 40 Little effect
- 41- 60 Moderate
- 61- 80 Great effect
- 81 – 100 Extreme effect

(Mahamid et al., 2012)

3.10 Pilot Test

The pilot test is necessary for this research to ensure the reliability of the questionnaire. The survey should conduct pilot test with a small group of respondents similar to those who will be in the final sample. This research tested

the reliability of questionnaire before distributing them to actual research sample. This research selected ten respondents randomly in JKR and a contractor for the pilot study.

Only five respondents completed the questionnaire and were asked to examine this survey on several aspects: clarity of expression of terms, depth and breadth of items. Using SPSS version 18 reliability analysis was performed for the pilot test which read 0.962. This Cronbach's coefficient alpha for the pilot test was more than 0.6 indicating consistency and reliability of the data.

Reliability Statistics

Cronbach's Alpha	N of Items
.962	65

Organization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	contractor	1	20.0	20.0	20.0
	client	2	40.0	40.0	60.0
	consultant	2	40.0	40.0	100.0
	Total	5	100.0	100.0	

3.11 Conclusion

The methodology used throughout this research is to ensure all the data and information gathered is reliable and it is systematically collected and analyzed. Any raw obtained data from the respondent will be analyzed in the next chapter and studied in depth before deriving conclusion.

CHAPTER 4

SIGNIFICANT CAUSES OF DELAY

4.1 Introduction

This chapter discusses the finding of the study based on the collected data and detailing analysis carried out on those data. First discussion will be on the respondents' profile.

Next, the discussion on the ranking causes of delay for frequency of occurrence (F.I), severity of effect (S.I) and important of problems (IMP.I). Finally, make comparison and validate the top five results of S.I, F.I and IMP.I with approved reasons for EOT of nineteen delayed projects been referred.

4.2 Distribution of Questionnaire

Table 4.1: Distribution of Questionnaire Survey Forms.

Questionnaire Survey Forms	Distribution (No.)	Returned (No.)	Rate of Response (%)
Pilot test	10	5	50.0
Actual survey	90	52	57.8
Total	100	57	57.0

Table 4.1 shows the number of survey forms distributed and returned in term of rate of response. One hundred (100) survey forms were sent out to the target group, where initially ten (10) survey forms were sent out as a pilot test. Subsequently ninety (90) survey forms were distributed to the client's department, JKR's managing and in-house design team, the consultants and the contractors.

As for the internal stakeholders of JKR, twenty five (25) survey forms were sent by hand, in which the researcher had to follow up at least twice from all four (4) respective JKR's headquarters offices located in the Klang Valley within the two (2) weeks survey period. Another twenty (22) survey forms were sent by email to the respondents in all JKR's states and districts offices involved in the southern region of peninsular Malaysia.

Whereas for the external stakeholders of JKR, five (5) survey forms were sent by hand to the client's department, KKLW in Putrajaya enclosed with the self-addressed envelope plus goodies. The addresses of nineteen (19) contractors were checked from the Construction Industry Development Board of Malaysia (CIDB) official website. More than half of the contractors were grade G7 and had completed at least one rural road delayed project managed by JKR. Likewise the addresses of nineteen (19) consultants were checked from consultants' procurement electronic official website - ePerunding. The survey forms for the contractors and consultants were sent through post enclosed with self-addressed envelope. Overall the response rate was satisfactory that enable statistical analysis to be performed and conclusions to be made.

Using SPSS version 18 reliability analysis was performed for the questionnaire survey which read 0.943. This Cronbach's coefficient alpha for the pilot test was more than 0.6 indicating consistency and reliability of the data.

Cronbach's Alpha	N of Items
.943	65

Organization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	contractor	14	26.9	26.9	26.9
	client	19	36.5	36.5	63.5
	consultant	19	36.5	36.5	100.0
	Total	52	100.0	100.0	

4.3 Demographic Profile of the Respondents

From fifty two (52) survey forms returned in Table 4.1 above, the results were shown below:

4.3.1 Respondent's Organization

Table 4.2: Distribution of Respondents by Organization.

Organization	Frequency (No.)	Percent (%)	Cumulative Percent (%)
Contractor	14	26.9	26.9
Client's department / JKR's managing team	19	36.5	63.5
Consultant / JKR's designer team	19	36.5	100.0
Total	52	100.0	

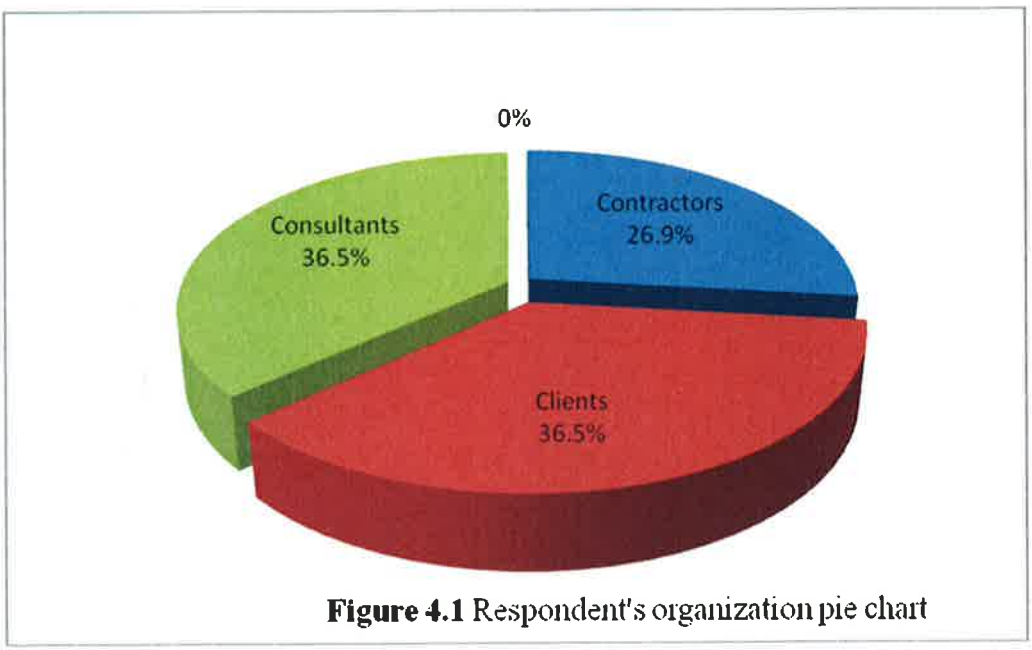

Figure 4.1 Respondent's organization pie chart

Table 4.2 represents the statistical distribution of the respondent by their organization. The results were fairly distributed where both client and consultant group make up of 36.5%. However the contractor was slightly lower (26.9%), as shown in Figure 4.1.

4.3.2 Respondent's Position

Table 4.3 shows the statistical distribution of respondent by their position. The highest percentage consist of professional at seventy five percent (75%), followed by managerial at 11.5 percent, owner at 7.7 percent and technical staff at 5.8 percent. The illustration of the distribution is shown in the pie chart of Figure 4.2.

Table 4.3: Distribution of Respondents by Position.

Position	Frequency (No.)	Percent (%)	Cumulative Percent (%)
Owner	4	7.7	7.7
Managerial	6	11.5	19.2
Professional	39	75.0	94.2
Technical staff	3	5.8	100.0
Total	52	100.0	

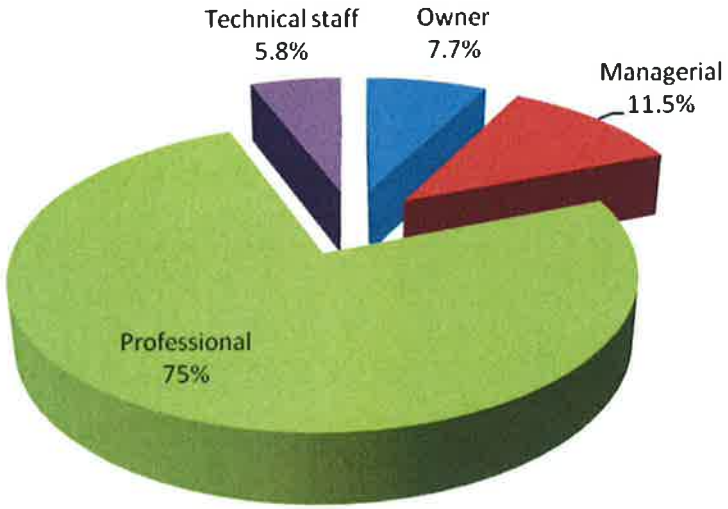

Figure 4.2 Respondent's position pie chart

4.3.3 Respondent's Education Level

Table 4.4 shows the statistical distribution of the respondent by their education level. The highest education level of respondents are of graduate level at 69.2 percent, followed by post graduate level at 17.3 percent, certificate at 9.6 percent and diploma level at 3.8 percent. Figure 4.3 illustrated the distribution on the pie chart.

Table 4.4: Distribution of Respondents by Education Level.

Position	Frequency (No.)	Percent (%)	Cumulative Percent (%)
Certificate	5	9.6	9.6
Diploma	2	3.8	13.5
Graduate	36	69.2	82.7
Post Graduate	9	17.3	100.0
Total	52	100.0	

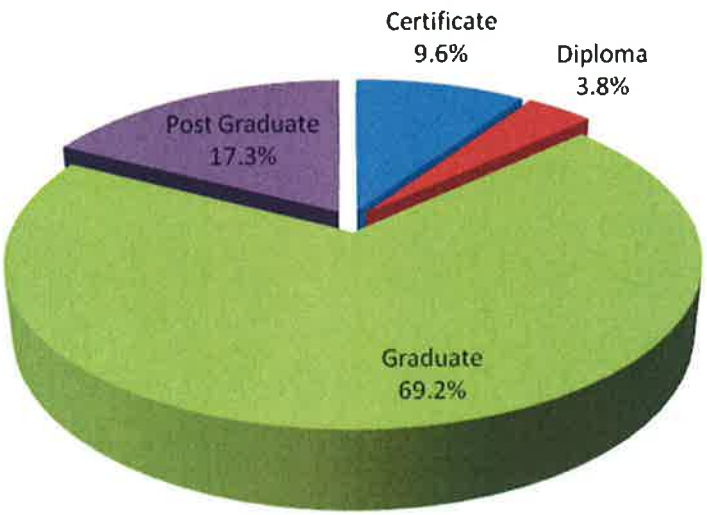

Figure 4.3 Respondent's education level pie chart

4.3.4 Respondent's Working Experience

Table 4.5: Distribution of Respondents by Working Experience.

Period (Year)	Frequency (No.)	Percent (%)	Cumulative Percent (%)
Less than 5 years	3	5.8	5.8
5-10 years	19	36.5	42.3
11-15 years	14	26.9	69.2
More than 15 years	16	30.8	100.0
Total	52	100.0	

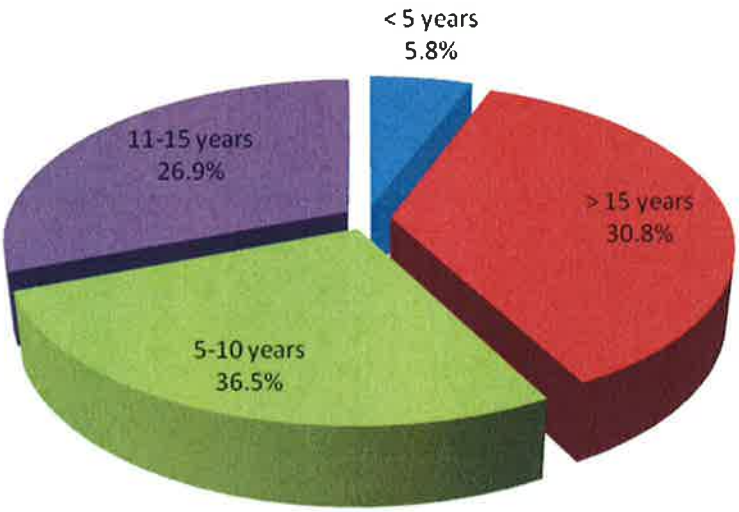

Figure 4.4 Respondent's experience pie chart

Table 4.5 shows the statistical distribution of the respondent by their experience or service. The highest respondent's service duration is between 5-10 years, or about 36.5 percent. This group is followed by respondents in the category of more than 15 years at 30.8 percent and service between 11-15 years at 26.9 percent. Those service less than 5 years account for 5.8 percent. Figure 4.4 illustrated the distribution on the pie chart.

4.3.5 Respondent's Place of Project Supervision

Table 4.6: Distribution of Respondents by Place of Project Supervision.

State in Southern Region	Frequency (No.)	Percent (%)	Cumulative Percent (%)
Johor	20	38.5	38.5
Melaka	6	11.5	50.0
Negeri Sembilan	26	50.0	100.0
Total	52	100.0	

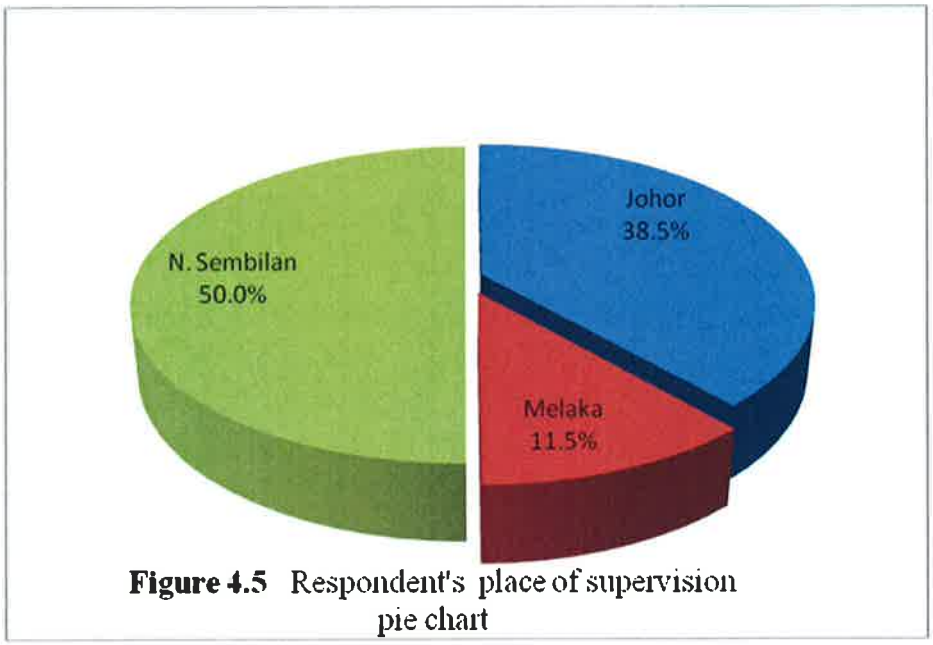

Figure 4.5 Respondent's place of supervision pie chart

Table 4.6 shows the statistical distribution of the respondent by their place of project supervision. Nearly 50 percent of respondents supervised projects in state of Negeri Sembilan. This group is followed by state of Johor at 38.5% and state of Melaka at 11.5%. Figure 4.5 illustrated the distribution on the pie chart.

4.3.6 Summary of Demographic Profile of Respondents

Fifty two officers and employees in the client department, JKR's rural road program manager office, JKR's southern zone road project managing unit, the consultants, JKR's road designer division, JKR's southern region district offices, JKR's southern states offices and the contractors are respondent for this study.

The respondent's position result showed that the highest percentage consist of professional at 75%.Thus the professional from the three stakeholders participated had given this survey a professionals view.

It also showed that the education level of graduate and post graduate represent 86.5% of the respondents. In term of experience, 57.7% of the respondents had more than 11 years of service.

4.4 Ranking of the Causes of Delay in Rural Road Project

This section analyzes the delay causes focus directly to the rural road projects in the southern region of peninsular Malaysia under the implementation of JKR. The analysis was performed to fulfill the first objective which is to identify the causes of delays in rural road projects implementation under JKR. Firstly, the discussion addresses the frequency of occurrence and followed by severity effect on the extension of project duration. To test for the frequency of occurrence from the list of thirty (30) typical delay causes divided into six (6) related sources. The respondent rate each of the causes on a five point scale as mentioned in Chapter 3. The respondent will also rate the same list and related groups for the severity of effect.

4.4.1 Delay Causes Based on Frequency of Occurrence.

Table 4.7 : Top Five Delay Causes Based on Frequency of Occurrence.

Cause	Related to	Rank	Frequency index (%)
Shortage of materials and delivery problem	Material, labor and plant	1	67.3
Inadequate skill of plant operators and low performance/efficiency	Material, labor and plant	2	65.4
Discrepancies in documentation	Consultant / Designer	3	61.5
Delay in performing and issuing approval for testing, inspection and valuation.	Consultant / Designer	4	61.5
Plant availability and transportation problems.	Material, labor and plant	5	61.5

Table 4.7 presents the result for frequency of occurrence on delay causes and their ranking measured by F.I. Three causes rank first, second and fifth were from delay related to 'material, labor and plant' source. Whereas the causes rank third and fourth are related to 'consultant/designer' source.

According to 'Frequency index scale and occurrence level' in Chapter 3, the 'often' level was from 61% to 80%, thus the top five causes below are in the 'often' level. These mean that the top five causes from the two (2) sources are the most frequently happens in the rural road project implementation.

4.4.2 Delay Causes Based on Severity of Effect

Table 4.8: Top Five Delay Causes Based on Severity of Effect.

Cause	Related to	Rank	Severity index (%)
Inaccurate costing during tendering	Contractor	1	76.9
Poor site management and supervision	Contractor	2	59.6
Ineffective planning and scheduling	Contractor	3	57.7
Plant availability and transportation problems.	Material, labor and plant	4	57.7
Relocation of utilities / services	Road project	5	55.8

Table 4.8 presents the result for severity effects on delay causes and their ranking measured by S.I. Three causes rank first, second and third are from delay related to 'contractor' source. The cause rank fourth is related to 'material, labor and plant' source, whereas the fifth cause is related to 'road project'.

According to 'Severity index scale and impact level' in Chapter 3, the 'moderate effect' level is from 41% to 60% and the 'great effect' level is from 61% to 80%, thus the top five causes above are in the 'moderate' to 'great effect' level. These mean that causes from contractor sources group are the most severely impacts on extension of project duration in the rural road project implementation.

4.4.3 Summary on the ranking of frequency and severity indexes.

According to the analysis above, table 4.7 and table 4.8 showed that there is deviation of the occurrence ranking order from severity ranking order rated by the respondents. These mean that there are inverse effect between occurrence and impact for each cause. The more the cause frequently happen, it might not have severely impact the project duration. Except for 'plant availability and

transportation problems', the delay cause is frequently happen and severely impacts the project duration. This results differ from the previous study in Vietnam where there is small deviation and can be negligible between occurrence and severity ranking order (Long et al.,2008).

4.5 Ranking of Significant Causes of Delay in Rural Road Project

This section analyzes the significant delay causes using measurement of the important index (IMP.I) that expresses the overview of factor based on their frequency and severity discussed in section 4.4. The IMP.I is essential to point out the significant causes that contribute to project delay. The rationale is that the significant cause is the result of the combination effect of frequency and severity (Al-Khalil et al., 1999; Long et al., 2008; Safri, 2009).

4.5.1 Significant Delay Causes Based on Important Index

This analysis is purposely conducted for the second objective which is to establish the ranking of significant causes of delays for the rural road projects.

Table 4.9 presents the result for top five significant causes of delay for the rural road construction project measured by IMP.I. Two causes rank first and fifth are from delay related to 'contractor' source. The second rank is related to 'material, labor and plant' source. Whereas the causes rank third is related to 'consultant/designer' source and the fourth rank is related to 'road project' source.

Table 4.9: Top Five Significant Causes of Delay Based on Important Index.

Cause	Related to	Rank	Importance index (%)
Inaccurate costing during tendering	Contractor	1	37.0
Plant availability and transportation problems.	Material, labor and plant	2	36.0
Inadequate experience on contract administration, project management and supervision work.	Consultant	3	31.0
Relocation of utilities / services	Road project	4	30.0
Poor site management and supervision	Contractor	5	26.0

According to 'Severity index scale and impact level' in Chapter 3, the 'little effect' level is from 21% to 40%, thus the top five significant causes above are in the 'little effect' level in the rural road project implementation. It is because there is an inverse effect between frequency of occurrence and severity of effect for each cause. Another important factor is that only one cause which is 'relocation of utilities/services' was acceptable reason for EOT approval, other four causes are non-excusable delays.

4.5.2 Approved reasons for EOT in 19 Delayed Rural Road Projects

This section analyses the approved excusable delay for the nineteen delayed rural road projects in southern region of peninsular Malaysia. The results of the analyses are used to compare and validate finding of section 4.5.1 above.

Table 4.10 : Approved reasons for EOT in Rural Road Projects.

Reasons for EOT approval	Related to	Rank	Percent (%)
Land acquisition/late handover	Road project	1	46.20
Requirement of third parties approval	External factors	2	19.85
Relocation of utilities / services	Road project	3	16.10
Design changes/change order	Client	4	6.42
Discrepancies in documentation	Consultant	5	5.02
Others and technical problems			6.41

Table 4.10 presents the top five approved reasons for EOT as excusable delays extracted from Table 1.1. Two reasons or causes rank first (46.20%) and third (16.10%) are from delay related to 'road project' source group. The second rank (17.69%) is related to 'external factors' source. Whereas the causes rank fourth (6.42%) and fifth (5.02%) are related to 'client' and 'consultant/designer' source group respectively. The sixth ranked (6.41%) is mixed of other reasons in small percentage e.g. fluctuation of price, inclement weather, delay in instruction, and technical problems.

This section validated the only one result of excusable delay in section 4.5.1 which is 'relocation of utilities/services'. The approved EOT reason was rank fourth (30%) by IMP.I. The other four reasons of EOT were ranked lower at twenty first (18.7%) for 'land acquisition', twenty sixth (38.5%) for 'third parties approval', twenty third (17.6%) for 'design changes', and ranked sixth (26%) for 'discrepancies in documentation'.

4.6 Comparison of Top Five findings of Overall Causes Ranking.

This section make a comparison of the top five findings based on F.I, S.I, IMP.I and validate with approved reasons for EOT for the 19 referred projects.

Table 4.11 : Comparison of Top Five findings of Delay Causes.

Rank	Frequency of occurrence	Severity of effect	Significant causes	Reasons for EOT approval
1	Shortage of materials and delivery problem	Inaccurate costing during tendering	Inaccurate costing during tendering	Land acquisition/late handover
2	Inadequate skill of plant operators and low performance or efficiency	Poor site management and supervision	Plant availability and transportation problems.	Requirement of third parties approval
3	Discrepancies in documentation	Ineffective planning and scheduling	Inadequate experience on contract administration, project management and supervision work.	Relocation of utilities / services
4	Delay in performing and issuing approval for testing, inspection and valuation.	Plant availability and transportation problems.	Relocation of utilities / services	Design changes/change order
5	Plant availability and transportation problems.	Relocation of utilities / services	Poor site management and supervision	Discrepancies in documentation

Table 4.12 : Overall Ranking of Delay Causes

		Frequency (%)		Severity (%)		Importance (%)	
	Causes of delay	F.I	Rank	S.I	Rank	IMP.I	Rank
A	**Delays related to client**						
1	Award project to the lowest bid	46.2	15	36.5	24	16.9	25
2	Unreasonable project duration/time frame	34.6	30	50.0	9	17.3	24
3	Slow in decision making process	44.2	16	42.3	13	18.7	19
4	Change order (VO)/design changes	48.1	13	36.5	25	17.6	23
5	Late payment of completed works	44.2	17	42.3	14	18.7	20
B	**Delays related to consultant/designer**						
6	Insufficient data collection before design works	51.9	12	42.3	15	22.0	16
7	Discrepancies in documentation	61.5	**3**	42.3	16	26.0	6
8	Delay of design works and approval of drawing	44.2	18	51.9	7	22.9	13
9	Inadequate experience on contract administration, project management and site supervision work	57.7	6	53.8	6	31.0	**3**
10	Delay in performing and issuing approval for inspection, valuation and testing	61.5	**4**	38.5	21	23.7	11
C	**Delays related to contractor**						
11	Inaccurate costing during tendering	48.1	14	76.9	**1**	37.0	**1**
12	Difficulties in financing project	44.2	19	51.9	8	22.9	14
13	Ineffective planning and scheduling	36.5	28	57.7	**3**	21.1	17
14	Poor site management and supervision	44.2	20	59.6	**2**	26.3	**5**
15	Work defects and rework	57.7	7	42.3	17	24.4	9
D	**Delays related to rural road project**						
16	Unforeseen site condition	42.3	23	48.1	10	20.3	18
17	Land acquisition/late land handover problem	44.2	21	42.3	18	18.7	21
18	Lack of communication and coordination between parties	57.7	8	44.2	11	25.5	7
19	Relocation of utilities/services	53.8	11	55.8	**5**	30.0	**4**
20	Conflict/disturbance to public activities	40.4	24	36.5	26	14.7	28
E	**Delays related to material, labor & plant**						
21	Shortage of materials and delivery problem	67.3	**1**	34.6	27	23.3	12
22	Changes in quality of materials and specification	57.7	9	44.2	12	25.5	8
23	Low productivity of laborers	57.7	10	42.3	19	24.4	10
24	Inadequate skill operators and low efficiency	65.4	**2**	34.6	28	22.6	15
25	Plant availability and transportation problems	61.5	5	57.7	**4**	35.5	**2**
F	**Delays related to external factors**						
26	Inclement (unexpected) weather condition	44.2	22	42.3	20	18.7	22
27	Fluctuation of price	40.4	25	34.6	29	14.0	29
28	Problem with neighboring land owner	38.5	27	38.5	22	14.8	27
29	Political influence	36.5	29	32.7	30	11.9	30
30	Requirement of third parties approval	40.4	26	38.5	23	15.6	26

Tables 4.11 and 4.12 presents the comparison ranking for top five and overall causes ranking. Table 4.11 shows that there are two cause which appear in three places of the top five findings. Whereas, they are three causes that appear in two places of the top five findings:

- 'Plant availability and transportation problems' ranked fifth (61.5%) by F.I, fourth (57.7%) by S.I, and second (35.5%) by IMP.I. It means that this is significant causes that frequently happen and severely impacts the project duration.
- 'Relocation of utilities/services' ranked fifth (55.8%) by S.I, fourth (30%) by IMP.I, and validated as third (16.1%) highest approved reason for EOT in the nineteen delayed rural road projects. This is a significant cause that severely impacts the project duration and supported as third highest approved excusable delay.
- 'Poor site management and supervision' ranked second (59.6%) by S.I and fifth (26.3%) by IMP.I. This is a significant cause that severely impacts the project duration.
- 'Discrepancies in documentation' ranked third (61.5%) by F.I and validated as fifth (5.02%) highest approved reason for EOT in the nineteen delayed rural road projects. This is a frequently happen cause and supported as fifth highest approved excusable delay.
- 'Inaccurate costing during tendering' ranked first in S.I (76.9%) and IMP.I (37%). It means that this is the most significant cause that severely impacts the project duration.

4.7 Comparison of Top Five findings of related Group Source.

This section make a comparison of the top five findings by their related source group and validate with source group of approved reasons for EOT for the 19 referred projects.

Table 4.13 : Comparison of Top Five findings of related Source Group.

Rank	Frequency of occurrence	Severity of effect	Significant causes	Reasons for EOT approval
1	Material, labor and plant	Contractor	Contractor	Road project
2	Material, labor and plant	Contractor	Material, labor and plant	External factors
3	Consultant/ Designer	Contractor	Consultant/ Designer	Road project
4	Consultant/ Designer	Material, labor and plant	Road project	Client
5	Material, labor and plant	Road project	Contractor	Consultant/ Designer

Tables 4.13 present the comparison ranking for top five findings of related source group. There are two source groups which appear in five times on the top five findings. Whereas, they are two source groups that appear in four times on the top five findings:

- 'Material, labor and plant' appear in top five of F.I, S.I and IMP.I. It means that significant delay causes from this source group frequently happen and severely impacts the project duration.
- 'Contractor' appears in top five of S.I and IMP.I. It means that significant delay causes from this source group can severely impacts the project duration.
- 'Road project' appears in top five of S.I, IMP.I and reasons for EOT approval. It means that significant delay causes from this source group can severely impacts the project duration and supported by two highest approved excusable delays – first and third.
- 'Consultant' appears in top five of F.I, IMP.I and reason for EOT. It means that significant delay causes from this source group frequently happen in rural road construction projects. It was supported by fifth highest approved excusable delay.

CHAPTER 5

PERCEPTION OF THE KEY STAKEHOLDERS

5.1 Introduction

In Chapter 2 many previous studies found that there are difference perceptions among the stakeholders on the ranking of delay causes. This section will discuss the differences between the clients, consultants and the contractors' perception based on the collected data. First discussion will be on the combined perception of two stakeholders. Ranking of delay causes for the source group. Next, the discussion on the agreement between each two group of stakeholders. Finally, make comparison on the agreement between all three key stakeholders.

This analysis was performed to fulfill the third objective which is to compare the differences in perceptions of the three key stakeholders, namely the clients, contractors and consultants. Their perceptions were ranked by the measurement of the severity index (S.I.).

Table 5.1 : Ranking of Delay Causes between Clients and Consultants

		Clients		Consultants		Combined	
	Causes of delay	S.I	Rank	S.I	Rank	S.I	Rank
A	**Delays related to client**						
1	Unreasonable project duration/time frame	63.20	1	57.90	2	60.55	1
2	Slow in decision making process	52.60	2	47.40	4	50.00	2
3	Late payment of completed works	36.80	4	63.20	1	50.00	3
4	Award project to the lowest bid	36.80	5	52.60	3	44.70	4
5	Change order (VO)/design changes	42.10	3	31.60	5	36.80	5
B	**Delays related to consultant/designer**						
6	Delay of design works and approval of drawing	57.90	1	47.40	2	52.65	1
7	Insufficient data collection before design works	47.40	3	52.60	1	50.00	2
8	Inadequate experience on contract administration, project management and supervision.	47.40	4	47.40	3	47.40	3
9	Discrepancies in documentation	52.60	2	36.80	4	44.70	4
10	Delay issuing approval for inspection, valuation etc	47.40	5	36.80	5	42.10	5
C	**Delays related to contractor**						
11	Inaccurate costing during tendering	63.20	1	73.70	1	68.45	1
12	Poor site management and supervision	63.20	2	47.40	2	55.30	2
13	Ineffective planning and scheduling	52.60	3	47.40	3	50.00	3
14	Work defects and rework	47.40	4	42.10	5	44.70	4
15	Difficulties in financing project	36.80	5	47.40	4	42.10	5
D	**Delays related to rural road project**						
16	Relocation of utilities/services	63.20	1	52.60	3	57.90	1
17	Land acquisition/late land handover problem	47.40	3	63.20	1	55.30	2
18	Lack of communication and coordination bet. parties	52.60	2	47.40	4	50.00	3
19	Unforeseen site condition	36.80	4	57.90	2	47.35	4
20	Conflict/disturbance to public activities	36.80	5	47.40	5	42.10	5
E	**Delays related to material, labor & plant**						
21	Plant availability and transportation problems	57.90	1	47.40	4	52.65	1
22	Changes in quality of materials and specification	47.40	2	52.60	3	50.00	2
23	Low productivity of laborers	42.10	4	57.90	1	50.00	3
24	Inadequate skill operators and low efficiency	47.40	3	47.40	5	47.40	4
25	Shortage of materials and delivery problem	31.60	5	57.90	2	44.75	5
F	**Delays related to external factors**						
26	Problem with neighboring land owner	36.80	4	47.40	1	42.10	1
27	Requirement of third parties approval	47.40	1	36.80	3	42.10	2
28	Inclement (unexpected) weather condition	36.80	5	42.10	2	39.45	3
29	Fluctuation of price	42.10	2	36.80	4	39.45	4
30	Political influence	42.10	3	36.80	5	39.45	5

5.2 Ranking of Delay Causes between Clients and Consultants

Table 5.1 presents the ranking of each delay causes under the six source groups from the perceptions of clients and consultants. Combination of clients and consultants' perception was also discussed as given below:

5.2.1 Delay related to Clients Source Group

Table 5.1 shows that the top affecting cause from the combined and clients' perception are the 'unreasonable project duration or time frame'. The consultants ranked the cause as second, instead ranked 'late payment of completed works' first. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to clients' source group ranges from 37 to 60 percent. The ranges of impact level are from 'little' to a 'moderate effect'.

5.2.2 Delay related to Consultants/designers Source Group

The top affecting cause from the combined and clients' perception are the 'delay of design works and approval of drawing'. The consultants ranked the cause second instead ranked 'insufficient data collection and survey before design works' first. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to consultants/designers source group have a short span; it ranges from 42.10 to 52.65 percent. The ranges of impact level range are within the 'moderate effect'.

5.2.3 Delay related to Contractor Source Group

Table 5.1 shows that the most severe cause from all perceptions is 'inaccurate costing during tendering'. The result shows that both perceptions are quite similar with the S.I from combined perception for causes related to contractors' source group have a wide span; it ranges from 42.10 to 68.45 percent. The ranges of impact level are from 'moderate' to 'great effect'.

5.2.4 Delay related to Rural Road Project Source Group

The top affecting cause from the combined and clients' perceptions are the 'relocation of utilities/services'. The consultants ranked the cause third instead ranked 'land acquisition/late handover problem' first. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to rural road project source group have a short span; it ranges from 42.10 to 57.90 percent. The ranges of impact level range are within the 'moderate effect'.

5.2.5 Delay related to Material, Labor and Plant Source Group

The top affecting cause from the combined and clients' perceptions are the 'plant availability and transportation problems'. The consultants ranked the cause fourth instead ranked 'low productivity of laborers' first. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to material, labor and plant source group have a short span; it ranges from 44.75 to 52.65 percent. The ranges of impact level range are within the 'moderate effect'.

5.2.6 Delay related to External Factors Source Group

The top affecting cause from the combined and consultants' perceptions are the 'problem with neighboring land owners'. The clients ranked the cause fourth instead ranked 'requirement of third parties approval' first. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to external factors have a short span; it ranges from 39.45 to 42.10 percent. The ranges of impact level are from 'little' to 'moderate effect'.

5.2.7 Summary for Perceptions between Clients and Consultants

Commonly the clients and consultants' perceptions are quite similar except for causes related to contractors source group have a wide span.

5.3 Ranking of Delay Causes between Clients and Contractors

Table 5.2 presents the ranking of each delay causes under the six source groups from the perceptions of clients and contractors. Combination of clients and contractors' perception was also discussed as given below:

5.3.1 Delay related to Clients Source Group

Table 5.2 shows that the top affecting cause from the combined perception is the 'slow in decision making processes'. Both the clients and contractors ranked the cause as second, instead the contractors ranked 'late payment of completed works' first and 'unreasonable project duration/time frame' for the clients.

Table 5.2 : Ranking of Delay Causes between Clients and Contractors

		Clients		Contractors		Combined	
	Causes of delay	S.I	Rank	S.I	Rank	S.I	Rank
A	**Delays related to client**						
1	Slow in decision making process	52.60	2	64.30	2	58.45	1
2	Late payment of completed works	36.80	4	71.40	1	54.10	2
3	Unreasonable project duration/time frame	63.20	1	35.70	4	49.45	3
4	Change order (VO)/design changes	42.10	3	42.90	3	42.50	4
5	Award project to the lowest bid	36.80	5	35.70	5	36.25	5
B	**Delays related to consultant/designer**						
6	Inadequate experience on contract administration, P.M and supervision.	47.40	3	92.90	1	70.15	1
7	Delay issuing approval for inspection, valuation etc	47.40	4	71.40	2	59.40	2
8	Discrepancies in documentation	52.60	2	57.10	3	54.85	3
9	Delay of design works and approval of drawing	57.90	1	50.00	4	53.95	4
10	Insufficient data collection before design works	47.40	5	42.90	5	45.15	5
C	**Delays related to contractor**						
11	Inaccurate costing during tendering	63.20	1	100.00	1	81.60	1
12	Poor site management and supervision	63.20	2	71.40	4	67.30	2
13	Ineffective planning and scheduling	52.60	3	78.60	2	65.60	3
14	Difficulties in financing project	36.80	5	78.60	3	57.70	4
15	Work defects and rework	47.40	4	35.70	5	41.55	5
D	**Delays related to rural road project**						
16	Relocation of utilities/services	63.20	1	50.00	2	56.60	1
17	Land acquisition/late land handover problem	47.40	3	50.00	3	48.70	2
18	Lack of communication and coordination bet. parties	52.60	2	42.90	5	47.75	3
19	Conflict/disturbance to public activities	36.80	4	57.10	1	46.95	4
20	Unforeseen site condition	36.80	5	50.00	4	43.40	5
E	**Delays related to material, labor & plant**						
21	Plant availability and transportation problems	57.90	1	71.40	1	64.65	1
22	Low productivity of laborers	42.10	4	71.40	2	56.75	2
23	Inadequate skill operators and low efficiency	47.40	2	50.00	4	48.70	3
24	Shortage of materials and delivery problem	31.60	5	64.30	3	47.95	4
25	Changes in quality of materials and specification	47.40	3	42.90	5	45.15	5
F	**Delays related to external factors**						
26	Requirement of third parties approval	47.40	1	57.10	1	52.25	1
27	Inclement (unexpected) weather condition	36.80	4	50.00	2	43.40	2
28	Problem with neighboring land owner	36.80	5	42.90	3	39.85	3
29	Political influence	42.10	2	35.70	4	38.90	4
30	Fluctuation of price	42.10	3	28.60	5	35.35	5

Generally, both perceptions are quite similar with the S.I from combined perception for causes related to clients' source group ranges from 36 to 58 percent. The ranges of impact level are from 'little' to a 'moderate effect'. There is a significant difference in the ranking of the following causes:

- 'Late payment of completed works' which gets rank 1 and 4 from the contractors' and clients' perception respectively.
- 'Unreasonable project duration/time frame' which gets rank 4 and 1 from the contractors' and clients' perception respectively.

5.3.2 Delay related to Consultants/designers Source Group

The top affecting cause from the combined and contractors' perception are the 'inadequate experience on contract administration, project management and supervision'. The clients ranked the cause third instead ranked 'delay of design works and approval of drawing' first. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to consultants/designers source group have a wide span; it ranges from 45.15 to 70.15 percent. The ranges of impact level range are from 'moderate' to 'great effect'. There is a significant difference in the ranking of the following causes:

- 'Delay of design works and approval of drawing' which gets rank 4 and 1 from the contractors' and clients' perception respectively.

5.3.3 Delay related to Contractor Source Group

Table 5.2 shows that the most severe cause from all perceptions is 'inaccurate costing during tendering'. The result shows that both perceptions are quite similar with the S.I from combined perception for causes related to contractors' source group have a wide span; it ranges from 41.55 to 81.60 percent. The ranges of impact level are from 'moderate' to 'extreme effect'.

5.3.4 Delay related to Rural Road Project Source Group

The top affecting cause from the combined and clients' perceptions are the 'relocation of utilities/services'. The contractors ranked the cause second instead ranked 'conflict/disturbance to public activities' first. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to rural road project source group have a short span; it ranges from 43.40 to 56.60 percent. The ranges of impact level range are within the 'moderate effect'. There is a significant difference in the ranking of the following causes:

- 'Conflict/disturbance to public activities' which gets rank 1 and 4 from the contractors' and clients' perception respectively.

5.3.5 Delay related to Material, Labor and Plant Source Group

Table 5.2 shows that the most severe cause from all perceptions is 'plant availability and transportation problems'. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to material, labor and plant source group have a short span; it ranges from 45.15 to 64.65 percent. The ranges of impact level range are from 'moderate' to 'great effect'.

5.3.6 Delay related to External Factors Source Group

The most severe cause from all perceptions is 'requirement of third parties approval'. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to external factors have a short span; it ranges from 35.35 to 52.25 percent. The ranges of impact level are from 'little' to 'moderate effect'.

Table 5.3 : Ranking of Delay Causes between Contractors and Consultants

		Contractors		Consultants		Combined	
	Causes of delay	S.I	Rank	S.I	Rank	S.I	Rank
A	**Delays related to client**						
1	Late payment of completed works	71.40	1	63.20	1	67.30	1
2	Slow in decision making process	64.30	2	47.40	4	55.85	2
3	Unreasonable project duration/time frame	35.70	4	57.90	2	46.80	3
4	Award project to the lowest bid	35.70	5	52.60	3	44.15	4
5	Change order (VO)/design changes	42.90	3	31.60	5	37.25	5
B	**Delays related to consultant/designer**						
6	Inadequate experience on contract administration, project management and supervision.	92.90	1	47.40	2	70.15	1
7	Delay issuing approval for inspection, valuation etc	71.40	2	36.80	4	54.10	2
8	Delay of design works and approval of drawing	50.00	4	47.40	3	48.70	3
9	Insufficient data collection before design works	42.90	5	52.60	1	47.75	4
10	Discrepancies in documentation	57.10	3	36.80	5	46.95	5
C	**Delays related to contractor**						
11	Inaccurate costing during tendering	100.00	1	73.70	1	86.85	1
12	Difficulties in financing project	78.60	2	47.40	2	63.00	2
13	Ineffective planning and scheduling	78.60	3	47.40	3	63.00	3
14	Poor site management and supervision	71.40	4	47.40	4	59.40	4
15	Work defects and rework	35.70	5	42.10	5	38.90	5
D	**Delays related to rural road project**						
16	Land acquisition/late land handover problem	50.00	2	63.20	1	56.60	1
17	Unforeseen site condition	50.00	3	57.90	2	53.95	2
18	Conflict/disturbance to public activities	57.10	1	47.40	4	52.25	3
19	Relocation of utilities/services	50.00	4	52.60	3	51.30	4
20	Lack of communication and coordination bet. parties	42.90	5	47.40	5	45.15	5
E	**Delays related to material, labor & plant**						
21	Low productivity of laborers	71.40	1	57.90	1	64.65	1
22	Shortage of materials and delivery problem	64.30	3	57.90	2	61.10	2
23	Plant availability and transportation problems	71.40	2	47.40	4	59.40	3
24	Inadequate skill operators and low efficiency	50.00	4	47.40	5	48.70	4
25	Changes in quality of materials and specification	42.90	5	52.60	3	47.75	5
F	**Delays related to external factors**						
26	Requirement of third parties approval	57.10	1	36.80	3	46.95	1
27	Inclement (unexpected) weather condition	50.00	2	42.10	2	46.05	2
28	Problem with neighboring land owner	42.90	3	47.40	1	45.15	3
29	Political influence	35.70	4	36.80	4	36.25	4
30	Fluctuation of price	28.60	5	36.80	5	32.70	5

5.4 Ranking of Delay Causes between Consultants and Contractors

Table 5.3 presents the ranking of each delay causes under the six source groups from the perceptions of consultants and contractors. Combination of consultants and contractors' perception was also discussed as given below:

5.4.1 Delay related to Clients Source Group

Table 5.3 shows that the most severe cause from all perceptions is 'Late payment of completed works'. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to clients' source group have a medium span; it from 37.25 to 67.30 percent. The ranges of impact level are from 'little' to a 'great effect'.

5.4.2 Delay related to Consultants/designers Source Group

The top affecting cause from the combined and contractors' perception are the 'inadequate experience on contract administration, project management and supervision'. The consultants ranked the cause second, instead ranked 'insufficient data collection before design works' first. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to consultants/designers source group have a wide span; it ranges from 46.95 to 70.15 percent. The ranges of impact level range are from 'moderate' to 'great effect'.

There is a significant difference in the ranking of the following causes:

- 'Insufficient data collection before design works' which gets rank 5 and 1 from the contractors' and consultants' perception respectively.

5.4.3 Delay related to Contractor Source Group

Table 5.3 shows that the most severe cause from all perceptions is 'inaccurate costing during tendering'. The result shows that both perceptions are quite similar with the S.I from combined perception for causes related to contractors' source group have a very wide span; it ranges from 38.90 to 86.85 percent. The ranges of impact level are from 'little effect' to 'extreme effect'.

5.4.4 Delay related to Rural Road Project Source Group

The top affecting cause from the combined and consultants' perceptions are the 'land acquisition/late land handover problem'. The contractors ranked the cause second instead ranked 'conflict/disturbance to public activities' first. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to rural road project source group have a short span; it ranges from 45.15 to 56.60 percent. The ranges of impact level range are within the 'moderate effect'. There is a significant difference in the ranking of the following causes:

- 'Conflict/disturbance to public activities' which gets rank 1 and 4 from the contractors' and consultants' perception respectively.

5.4.5 Delay related to Material, Labor and Plant Source Group

Table 5.3 shows that the most severe cause from all perceptions is 'low productivity of laborers'. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to material, labor and plant source group have a short span; it ranges from 47.75 to 64.65 percent. The ranges of impact level range are from 'moderate' to 'great effect'.

5.4.6 Delay related to External Factors Source Group

The top affecting cause from the combined and contractors' perceptions are the 'requirement of third parties approval'. The consultants ranked the cause third instead ranked 'problem with neighboring land owner' first. Generally, both perceptions are quite similar with the S.I from combined perception for causes related to external factors have a short span; it ranges from 32.70 to 46.95 percent. The ranges of impact level are from 'little' to 'moderate effect'.

5.4.7 Summary for Perceptions between Consultants and Contractors

Commonly the consultants and contractors' perceptions are quite similar except for causes related to contractors and consultants source group have a wide span. There are significant difference in the ranking delays related to consultants/designer and rural road project source group.

5.5 Top Five Delay Causes in Agreement between the Three Key Stakeholders

The perceptions of the three key stakeholders are ranked by the measurement of severity index (S.I). Referring to S.I indexes in Tables 5.1, 5.2 and 5.3, the causes in agreement between the three key stakeholders have the lowest difference in the S.I values (Mahamid et al., 2012).

Table 5.4 : Top Five Delay Causes in Agreement between the three Key Stakeholders Based on Severity of Effect.

Cause	Agreement between	Rank	Differences in S.I (%)
Inadequate experience on contract administration, project management and supervision work	Client and Consultant	1	0.0
Inadequate skill operators and low efficiency	Client and Consultant	2	0.0
Change order (V.O) / design changes	Client and Contractor	3	0.8
Award project to the lowest bidder	Client and Contractor	4	1.1
Political influence	Contractor and Consultant	5	1.1

Table 5.4 shows the top five delay causes in agreement between the three stakeholders. The current study show that the most agreement is between clients and consultants, which rank first and second. Agreement between client and contractor followed in third and fourth rank. Next, the fifth rank of agreement on the delay causes are between contractor and consultant. The results show that the differences are between 0.0 to 1.1 percent compare to less than 1.0 percent in the previous study on road construction project by Mahamid et al., 2012.

5.6 Conclusion

This chapter presented and analyzed the findings to fulfill the objective three of this study and further discussion will be continued in the next chapter

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Introduction

This chapter would further discuss the findings of the study in Chapters 4 and 5. Its main purposes are to identify the causes of delay, ranking the significant causes and comparing the differences in perception of the three key stakeholders.

This study was conducted through questionnaire survey which fulfilled three objectives as discussed in Chapters 4 and 5. The data for this study was collected from one hundred respondents from JKR, client's department (KKLW), consultant firms and contractors but only fifty two were returned back. The discussion was also validated and/or supported by the previous studies.

Therefore in this final chapter, the overall conclusion was briefly described for each objective. Finally, a few suggestions were recommended and proposal for further study is presented.

6.2 To identify the Causes of Delays in Rural Road Projects Implementation under JKR

The findings of this study were summarized based on the research objectives and supported by literature review in Chapter 3. This section discusses the results obtained in section 4.3 and 4.4 of Chapter 4. Thirty causes of delay were identified and questionnaire survey was conducted with fifty two participants. The top five most frequently happen causes of delay based on Frequency Index (F.I) as shown in the Table 4.7 were:

- 'Shortage of materials and delivery problem' (F.I = 67.3%), delay related to material, labor and plant source group.
- Inadequate skill of plant operators and low performance or efficiency (F.I = 65.4%), delay related to material, labor and plant source group.
- Discrepancies in documentation (F.I = 61.5%), delay related to consultant/designer source group.
- Delay in performing and issuing approval for testing, inspection and valuation (F.I = 61.5%), delay related to consultant/designer source group.
- Plant availability and transportation problems (F.I = 65.4%), delay related to material, labor and plant source group.

The top five most severely impact causes of delay based on Severity Index (S.I) as shown in the Table 4.8 were:

- 'Inaccurate costing during tendering' (S.I = 76.9%), delay related to contractors source group.
- 'Poor site management and supervision' (S.I = 59.6%), delay related to contractors source group.
- 'Ineffective planning and scheduling' (S.I = 57.7%), delay contractors source group.
- 'Plant availability and transportation problems' (S.I = 57.7%), delay related to material, labor and plant source group.

- 'Relocation of utilities/services' (S.I = 55.8%), delay related to road project group.

6.2.1 Shortage of Materials and Delivery Problem

Road construction depend most of their materials supply from nearest located quarry. Shortage in supply might happen when there are many projects running at the same time. Purchasing planning is very important in materials procurement. Sometimes delivery problem occur when contractor opt for distance supplier to get better price. Materials price speculation and escalation were also reported in previous studies that causes delay. This study is supported by Long et al. (2008), Sambasivan et al. (2007) and Othman et al. (2006).

6.2.2 Inadequate skill of plant operators and low performance or efficiency.

Equipment or plant efficiency depends on capacity of the machine and the skill of plant operators. Rent or hire plant usually include their plant operator and both resource determine the output and productivity. Supply of poor maintains plant was reported to cause delay in previous studies especially during high demand season. This result is in line with Doloi et al. (2012), Long et al. (2008) and Sambasivan et al. (2007).

6.2.3 Discrepancies in documentation.

Improper preparation of documentation attribute to delay when its involved clarification of underestimate or overestimate quantities. Dispute between drawing, specification and the bill of quantities (BQ) usually happen in project

implementation. The consultant or designer should carefully check and verified all documents and drawings to prevent discrepancies. Any discrepancies will attribute to delay, contractual disputes, claims and cost overrun. This result is validating by fifth highest approved reason for EOT (5%) in the nineteen delayed projects referred. This result is in line with Odeh et al. (2002).

6.2.4 Delay in performing and issuing approval for testing, inspection and valuation.

Method of statement and standard operation procedure in road construction included procedure for inspection and approval before any works could proceed. Delay actions by authorize personnel in performing and issuing approval will attribute to delay. Very important that the project team coordinate and include every inspection process in the work program. This result is supported by Mahamid et al. (2011) in that insufficient inspectors are one of the main delay causes.

6.2.5 Plant availability and transportation problems.

Most of the contractors do not own plants and equipments that are required especially for road construction projects. The plants were rent when required. Problem arises when there are many constructions and in short supply. In rural road projects, relocation of services and unsettle land acquisition create the transportation problem. Multiple mobilization and demobilization of plants were required that create extra cost to contractor and delay to the project. This result is in line with Mahamid et al. (2012), Doloi et al. (2012) and Sambasivan et al. (2007).

6.2.6 Inaccurate costing during tendering.

Improper costing will affect project cash flow and sustainable of the contractor financially. The contractor should have knowledge on market price and price fluctuation of materials, plants' rental and labor wages. Knowledge on the site condition is very crucial for accurate estimates. During site visit of procurement process, good explanation of the site condition would help contractor in having good pricing. This result is supported by Long et al. (2008).

6.2.7 Poor site management and supervision.

One of the most significant causes of delay is contractor's poor site management. These include delays in responding to any issues that arise at the site (Sambasivan et al., 2007). Experience technical staff is very important to foresee problems and mitigate delays before they arose. Lack of site coordination between main contractor and other contractors were reported in previous stidies. Inadequate experience will leads to improper management of site and thus cause delays (Doloi et al., 2012).

6.2.8 Ineffective planning and scheduling.

Effective work program is very essential during the construction phase for planning and monitoring. Improper planning at the initial phase of a project will cause delay at various stages of project implementation (Sambasivam, 2007). Thus, work program should be checked and approved before it is use in monitoring project. Some projects have proper work program but not regularly updated. Most contractors prefer to use linked bar chart format over scheduling software e.g. Microsoft Project. The contractor should have basic knowledge on project scheduling. They should have the ability to do the tracking as well as justifying

EOT using the software. On the other hand, most baseline program is not subjected to resources loading. This practice has negative effects on the reliability of baseline program in their use to mitigate delay or for resolving delay claims. Work program is seldom discussed in detail in the site meeting. In the rural road construction project, many unforeseen site problem occurred which need to reschedule the program. Only a project that is properly planned can be well executed. This result is in line with Assaf et al. (2006) and Abdul-Rahman et al. (2006).

6.2.9 Plant availability and transportation problems.

Plant availability problem was frequently happen as mentioned in section 6.25 above. This problem also significantly causes severe impact to project duration if not attended earlier.

6.2.10 Relocation of utilities/services

This is one of the main encumbrances that hinder project progress especially in road construction. Relocation or shifting of existing utilities or services involve third parties i.e. utilities companies. The delay on the part of utilities undertakers included approval from main office on financial implication and time disturbance to their customers. This result is supported by Othman et al. (2006) in that the most common reasons quoted for EOT approval is delays by utilities undertakers in relocating existing services.

6.3 To establish the Ranking of Significant the Causes of Delays for Rural Road Projects.

This section discusses the results obtained in section 4.5 of Chapter 4. The top five most significant causes of delay based on Important Index (IMP.I) as shown in the Table 4.9 were:

- 'Inaccurate costing during tendering' (IMP.I = 37.0%), delay related to contractors source group.
- 'Plant availability and transportation problems' (IMP.I = 36.0%), delay related to material, labor and plant source group.
- 'Inadequate experience on contract administration, project management and supervision work' (IMP.I = 31.1%), delay contractors source group.
- 'Relocation of utilities/services' (IMP.I = 30.0%), delay related to road project group.
- 'Poor site management and supervision' (IMP.I = 26.0%), delay related to contractors source group.

6.3.1 Inaccurate Costing during Tendering

This is a significant cause which severely effect the project duration as mentioned in section 6.26 above.

6.3.2 Plant availability and transportation problems

This is a significant cause which frequently happens and severely effect the project duration as mentioned in sections 6.25 and 6.2.9.

6.3.3 Inadequate Experience on Contract Administration, Project Management and Supervision Work

Project manager and member of the project team should be experienced in contract administration, project management and supervision works. They should lead to project to success through coordination and clear communication to all parties involved. They should be appointed once the project takes off the ground. Early appointment will assist the project teams to digest the necessary information and make decision fast. Inadequate experience of project team will jeopardized the project implementation and resulting delay. This result is in line with Odeh et. Al (2002) and Chan et al. (1997) in that slow decision making is one of the main delay causes.

6.3.4 Relocation of Utilities/Services

This is a significant causes which severely effect the project duration as mentioned in section 6.2.10 above.

6.3.5 Poor Site Management and Supervision

This is a significant causes which frequently happen and severely effect the project duration as mentioned in section 6.2.7 above.

6.4 To Compare the Differences in Perception of the Three Key Stakeholders, namely the Clients, Contractors and Consultants.

This section discusses the results obtained in section 5.5 of Chapter 5. The top five agreement between clients, contractors and consultants on ranking of causes of delay based on difference in Severity Index (S.I) value as shown in the Table 5.4 were:

- 'Inadequate experience on contract administration, project management and supervision work' (S.I = 0.0%), agreement between clients and consultants.
- 'Inadequate skill operators and low efficiency' (S.I = 0.0%), agreement between clients and consultants.
- 'Change order (V.O) / design changes' (S.I = 0.8%), agreement between clients and contractors.
- 'Award project to lowest bidder' (S.I = 1.1%), agreement between clients and contractors.
- 'Political influence' (S.I = 1.1%), agreement between contractors and consultants.

6.4.1 Inadequate Experience on Contract Administration, Project Management and Supervision Work

The clients and consultant are in agreement that inadequate experience in the part of the consultants and project team will jeopardized the project implementation and create delay. This is a significant cause which severely effect the project duration as mentioned in section 6.3.3 above.

6.4.2 Inadequate Skill Operators and Low Efficiency

The clients and consultant are in agreement that inadequate skill operators and low efficiency in the part of the resources group will jeopardized the project implementation and create delay. This is a significant cause which frequently happens as mentioned in section 6.2.2 above.

6.4.3 Change Order (V.O) / Design Changes

The clients and contractors are in agreement that change order or design changes in the part of the clients will jeopardized the project implementation and create delay. Change order and design changes occurred due to inadequate information of site condition in the design and procurement stages. Changes can also due to client or end user requirement which were not taken care during the planning stage. This result is supported by Doloi et al (2012), Kikwasi (2012), Othman et al. (2006), Long et al. (2008) and Chan et al. (1997).

6.4.4 Award Project to the Lowest Bidder

The clients and contractors are in agreement that award project to lowest bid price in the part of the clients will jeopardized the project implementation and create delay. Low bidders are usually low qualified contractor as mentioned by Mahamid et al. (2012). In the other hand, Othman et al.(2006) studied road projects in Malaysia concluded that low bidder are very experienced contractor that can successfully completed their project.

6.4.5 Political Influence

The consultants and contractors are in agreement that political influence in the part of the external factors group will jeopardized the project implementation and create delay. Political influence is indirect or undisclosed matters that indirectly effected the project implementation. Only Mahamid et al. (2012) mentioned the influence of politic that cause delay in road projects in Palestine.

6.5 Recommendation

The results are in line with many previous studies in that the most causes of delay relate to the human and management problems. Thus, improving ability of all parties involved in road construction project is very important and necessary. (Long et al.,2008 ; Mahamid, 2011).

To minimizing the delay in road construction projects, the following points can be recommended:

1. The client should handover site clear from all obstacles that can improve accuracy in planning, designing and costing to achieve more realistic time and cost target for projects.
2. JKR should tighten the implementation of 'Gerbang Nilai Review' proposed by JKR's PROKOM based on U.K's Gateway™ to improve the delivery of projects. Where in Gerbang Nilai 1 focuses on projects implementation readiness which are the availability of project brief, budget and land.
3. The relevant agencies i.e. CIDB should assist and give training to the contractor on contract administration, project management and site supervision. Knowledge on financial management is also important for the successful of project.

4. The relevant professional bodies should provide training of competency to the consultants' project manager and site staff.
5. JKR's project team should acquire relevant level of 'Project Management Competency' certification to ensure project executed successfully, effectively and efficiently.
6. Impose contribution charges to Utilities Company that use the road for future development. The contribution charges can be used in advance to prevent delays due to late implementation by utilities undertakers.

The future research should focus more deeply in road construction project delay in Malaysia to fill the gap especially in urban condition.

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APPENDIX A

Sampling Technique

N	S	N	S	N	S
55	48	320	181	2400	331
60	52	340	186	2600	335
65	56	360	191	2800	338

Krejcie, R. V and Morgan D.W (1970) Table

N = Population size

n = Sampling size

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APPENDIX B

QUESTIONNAIRE SURVEY

Causes of Rural Road Project Delay in Southern Region of Peninsular Malaysia

This questionnaire form is set up to identify the causes of delays, frequency of occurrence, severity of effect on extension of project duration and compare the differences in perception of major stakeholders for rural road projects implementation under JKR. Your time spent in completing this survey is greatly appreciated and all information will be used for research purposes only. Thank you for your kind cooperation and participation.

Kajian ini dijalankan untuk mengenalpasti punca-punca kelewatan, kadar kekerapan berlaku kelewatan, kesan terhadap tempoh projek dilanjutkan dan membandingkan perbezaan tanggapan pihak yang terlibat dengan projek jalan luar bandar yang dilaksanakan oleh JKR. Perhatian tuan/puan dalam memberi maklum balas amat dihargai dan semua maklumat hanya untuk kegunaan penyelidikan. Terima kasih atas kerjasama dan penyertaan tuan/puan.

Respondent's Profile (Please tick (✓) appropriate answer in the given spaces)

Name (optional) : _____ Email (optional) : _____

Organization	: ☐ Contractor	☐ Client's Department/JKR's Managing Team		☐Consultant/JKR's Designer Team
Position	: ☐ Owner	☐ Managerial	☐ Professional	☐ Technical Staff
Education level	: ☐ Certificate	☐ Diploma	☐ Graduate	☐ Post Graduate
Working experience	: ☐ < 5 years	☐ 5 – 10 years	☐ 11 – 15 years	☐ > 15 years
Place of project supervision	: ☐ Melaka	☐ Negeri Sembilan	☐ Johor	

Following are the typical causes of delay for road projects in Malaysia.
Please **circle** the appropriate scale to indicate your opinion on the frequency of occurrence and the severity of effect on extension of the project duration for the road projects under your supervision.

Berikut adalah punca-punca lazim bagi kelewatan projek jalan di Malaysia.
*Sila **bulatkan** skala yang sesuai untuk menunjukkan pandangan tuan/puan terhadap kekerapan berlakunya kelewatan dan tahap kesan ke atas lanjutan tempoh projek bagi projek jalan di bawah kawalan atau seliaan tuan/puan.*

		Frequency of occurrence					Severity of effect on extension of project duration				
		Never happen	Rarely	Sometimes	Often	Always	No effect	Little effect	Moderate effect	Great effect	Extreme effect
A.	Delays related to client *Kelewatan berkait dengan pihak klien*	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇
1	Award project to the lowest bid *Setuju terima penender/pembida terendah*	1	2	3	4	5	1	2	3	4	5
2	Unreasonable project duration/time frame *Tempoh projek/jangka masa yang tidak munasabah*	1	2	3	4	5	1	2	3	4	5
3	Slow in decision making process *Lewat dalam proses membuat keputusan*	1	2	3	4	5	1	2	3	4	5
4	Change order (VO)/design changes *Arahan perubahan kerja/perubahan reka bentuk*	1	2	3	4	5	1	2	3	4	5
5	Late payment of completed works *Lewat membuat bayaran bagi kerja yang siap*	1	2	3	4	5	1	2	3	4	5

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APPENDIX B

1	2	3	4	5
Never happen	Rarely	Sometimes	Often	Always
Tidak berlaku	*Kurang berlaku*	*Sederhana*	*Kerap berlaku*	*Amat kerap berlaku*
No effect	Little effect	Moderate effect	Great effect	Extreme effect
Tiada kesan	*Kesan pendek*	*Sederhana*	*Kesan panjang*	*Kesan amat panjang*

		Frequency of occurrence					Severity of effect on extension of project duration				
		Never happen	Rarely	Sometimes	Often	Always	No effect	Little effect	Moderate effect	Great effect	Extreme effect
B.	Delays related to consultant/designer *Kelewatan berkait dengan pihak perunding/pereka bentuk*	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇	⬇
6	Insufficient data collection and survey before design works *Kekurangan pengumpulan data dan kerja ukur sebelum reka bentuk*	1	2	3	4	5	1	2	3	4	5
7	Discrepancies in documentation *Percanggahan dalam dokumentasi*	1	2	3	4	5	1	2	3	4	5
8	Delay of design works and approval of drawing *Kelewatan bagi kerja reka bentuk dan kelulusan lukisan*	1	2	3	4	5	1	2	3	4	5
9	Inadequate experience on contract administration, project management and supervision work. *Kekurangan pengalaman dalam pentadbiran kontrak, pengurusan projek dan pengawasan kerja.*	1	2	3	4	5	1	2	3	4	5
10	Delay in performing and issuing approval for inspection, valuation and testing *Lewat melaksana dan mengeluarkan kelulusan bagi kerja-kerja pemeriksaan, penilaian dan ujian*	1	2	3	4	5	1	2	3	4	5
C.	Delays related to contractor *Kelewatan berkait dengan pihak kontraktor*										
11	Inaccurate costing during tendering *Kesilapan membuat harga semasa peringkat tender*	1	2	3	4	5	1	2	3	4	5
12	Difficulties in financing project *Kesukaran dalam pembiayaan projek*	1	2	3	4	5	1	2	3	4	5
13	Ineffective planning and scheduling *Perancangan dan penjadualan kerja yang tidak efektif*	1	2	3	4	5	1	2	3	4	5
14	Poor site management and supervision *Kelemahan dalam pengurusan dan penyeliaan tapak bina*	1	2	3	4	5	1	2	3	4	5
15	Work defects and rework *Kecacatan kerja, bongkar dan bina semula*	1	2	3	4	5	1	2	3	4	5
D.	Delays related to rural road project *Kelewatan berkait dengan projek jalan di luar bandar*										
16	Unforeseen site condition *Keadaan tapak bina di luar jangkaan*	1	2	3	4	5	1	2	3	4	5
17	Land acquisition/late land handover problem *Masalah pengambilan balik tanah/kebenaran masuk tapak*	1	2	3	4	5	1	2	3	4	5
18	Lack of communication and coordination between parties *Kelemahan komunikasi dan koordinasi di antara pihak yang terlibat*	1	2	3	4	5	1	2	3	4	5

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APPENDIX B

1	2	3	4	5
Never happen	Rarely	Sometimes	Often	Always
Tidak berlaku	*Kurang berlaku*	*Sederhana*	*Kerap berlaku*	*Amat kerap berlaku*
No effect	Little effect	Moderate effect	Great effect	Extreme effect
Tiada kesan	*Kesan pendek*	*Sederhana*	*Kesan panjang*	*Kesan amat panjang*

		Frequency of occurrence					Severity of effect on extension of project duration				
		Never happen	Rarely	Sometimes	Often	Always	No effect	Little effect	Moderate effect	Great effect	Extreme effect
19	Relocation of utilities/services *Kerja pengalihan utiliti/perkhidmatan*	1	2	3	4	5	1	2	3	4	5
20	Conflict/disturbance to public activities *Konflik/halangan kepada aktiviti pengguna jalan*	1	2	3	4	5	1	2	3	4	5
E.	Delays related to material, labor & plant *Kelewatan berkait dengan bahan binaan, buruh & loji*										
21	Shortage of materials and delivery problem *Masalah kekurangan bahan binaan dan penghantaran ke tapak*	1	2	3	4	5	1	2	3	4	5
22	Changes in quality of materials and specification *Perubahan kualiti bahan binaan dan spesifikasi*	1	2	3	4	5	1	2	3	4	5
23	Low productivity of laborers *Produktiviti buruh yang rendah*	1	2	3	4	5	1	2	3	4	5
24	Inadequate skill of plant operators and low performance/efficiency *Operator loji yang kurang mahir dan kurang berprestasi/cekap*	1	2	3	4	5	1	2	3	4	5
25	Plant availability and transportation problems *Masalah ketersediaan loji dan pengangkutan*	1	2	3	4	5	1	2	3	4	5
F.	Delays related to external factors *Kelewatan berkait dengan faktor-faktor luaran*										
26	Inclement (unexpected) weather condition *Keadaan cuaca di luar jangkaan*	1	2	3	4	5	1	2	3	4	5
27	Fluctuation of price Turun naik kadar harga	1	2	3	4	5	1	2	3	4	5
28	Problem with neighboring land owner *Masalah dengan pemilik tanah yang berjiran*	1	2	3	4	5	1	2	3	4	5
29	Political influence *Pengaruh politik*	1	2	3	4	5	1	2	3	4	5
30	Requirement of third parties approval *Keperluan kelulusan pihak ketiga*	1	2	3	4	5	1	2	3	4	5

Please give your opinion below on other causes of delay that effect the project duration and/or any suggestion to improve the problem of project delay in the country. *Sila berikan input lain-lain punca kelewatan yang memberi kesan terhadap lanjutan masa projek dan/atau cadangan bagi menangani permasalahan projek lewat di negara ini pada ruang di bawah.*

Thank you. *Sekian terima kasih*

Appendix C : Nineteen (19) Delayed Rural Road Projects in Southern Regions of Peninsular Malaysia

		Project reference																					
	Reason for EOT	J1	J2	J3	J4	J5	J6	J7	J8	M1	M2	N1	N2	N3	N4	N5	N6	N7	N8	N9	Total (days)	%	Rank
1	Land acquisition		90	142	275	270	478	330	23	121		30		273	237			150	120		2539	46.20	1
2	Relocation of utilities /services			50		213	126			70	90	60	50			150	76				885	16.10	3
3	Unforeseen site condition			20																	20	0.36	10
4	Discrepancies in documentation							210	66												276	5.02	5
5	Design changes	80					30			66	127		10	40							353	6.42	4
6	Delay in instruction																			59	59	1.07	9
7	Inclement weather													93							93	1.69	8
8	Third parties approval																			119	119	2.17	7
9	Fluctuation of price	90						90													180	3.28	6
10	Third parties approval				692				280												972	17.69	2
	Total (days) delay	170	90	212	967	483	634	630	369	257	217	90	60	406	237	150	76	150	120	178	5496	100.00	
	Planned project duration (days)	783	699	665	546	490	730	419	914	365	458	504	365	728	546	365	549	336	731	454			
	% Delays	22	13	32	177	99	87	150	40	70	47	18	16	56	43	41	14	45	16	39			

APPENDIX D : Overall Ranking of Delay Causes

	Causes of delay	Frequency F.I	Frequency Rank	Severity S.I	Severity Rank	Importance Index IM.I	Importance Index Rank
A	**Delays related to client**						
1	Award project to the lowest bid	46.2		36.5		16.9	25
2	Unreasonable project duration/time frame	34.6		50.0		17.3	24
3	Slow in decision making process	44.2		42.3		18.7	19
4	Change order (VO)/design changes	48.1		36.5		17.6	23
5	Late payment of completed works	44.2		42.3		18.7	20
						17.8	**5**
B	**Delays related to consultant/designer**						
6	Insufficient data collection before design works	51.9		42.3		22.0	16
7	Discrepancies in documentation	61.5		42.3		26.0	6
8	Delay of design works and approval of drawing	44.2		51.9		22.9	13
9	Inadequate experience on ctt.admin, p.m & supervn.	57.7		53.8		31.0	3
10	Delay issuing approval for inspection, valuation etc	61.5		38.5		23.7	11
						25.1	**3**
C	**Delays related to contractor**						
11	Inaccurate costing during tendering	48.1		76.9		37.0	1
12	Difficulties in financing project	44.2		51.9		22.9	14
13	Ineffective planning and scheduling	36.5		57.7		21.1	17
14	Poor site management and supervision	44.2		59.6		26.3	5
15	Work defects and rework	57.7		42.3		24.4	9
						26.3	**1**
D	**Delays related to rural road project**						
16	Unforeseen site condition	42.3		48.1		20.3	18
17	Land acquisition/late land handover problem	44.2		42.3		18.7	21
18	Lack of communication and coordination bet. parties	57.7		44.2		25.5	7
19	Relocation of utilities/services	53.8		55.8		30.0	4
20	Conflict/disturbance to public activities	40.4		36.5		14.7	28
						21.9	**4**
E	**Delays related to material, labor & plant**						
21	Shortage of materials and delivery problem	67.3		34.6		23.3	12
22	Changes in quality of materials and specification	57.7		44.2		25.5	8
23	Low productivity of laborers	57.7		42.3		24.4	10
24	Inadequate skill operators and low efficiency	65.4		34.6		22.6	15
25	Plant availability and transportation problems	61.5		57.7		35.5	2
						26.3	**2**
F	**Delays related to external factors**						
26	Inclement (unexpected) weather condition	44.2		42.3		18.7	22
27	Fluctuation of price	40.4		34.6		14.0	29
28	Problem with neighboring land owner	38.5		38.5		14.8	27
29	Political influence	36.5		32.7		11.9	30
30	Requirement of third parties approval	40.4		38.5		15.6	26
						15.0	**6**

APPENDIX E : Output of SPSS Version 18 on Frequency

Organization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	contractor	16	30.8	30.8	30.8
	client	18	34.6	34.6	65.4
	consultant	18	34.6	34.6	100.0
	Total	52	100.0	100.0	

Position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	owner	4	7.7	7.7	7.7
	managerial	6	11.5	11.5	19.2
	profesional	39	75.0	75.0	94.2
	technical	3	5.8	5.8	100.0
	Total	52	100.0	100.0	

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	certificate	5	9.6	9.6	9.6
	diploma	2	3.8	3.8	13.5
	graduate	36	69.2	69.2	82.7
	postgraduate	9	17.3	17.3	100.0
	Total	52	100.0	100.0	

Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less 5 yrs	3	5.8	5.8	5.8
	5-10 yrs	19	36.5	36.5	42.3
	11-15 yrs	14	26.9	26.9	69.2
	more 15 yrs	16	30.8	30.8	100.0
	Total	52	100.0	100.0	

Place

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	malacca	7	13.5	13.5	13.5
	NS	25	48.1	48.1	61.5
	johor	20	38.5	38.5	100.0
	Total	52	100.0	100.0	

Awardbid

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	rarely	9	17.3	17.3	17.3
	sometimes	24	46.2	46.2	63.5
	often	16	30.8	30.8	94.2
	always	3	5.8	5.8	100.0
	Total	52	100.0	100.0	

Timeframe

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	rarely	14	26.9	26.9	26.9
	sometimes	15	28.8	28.8	55.8
	often	18	34.6	34.6	90.4
	always	5	9.6	9.6	100.0
	Total	52	100.0	100.0	