

# CONTRACTORS' PERCEPTION OF FACTORS CONTRIBUTING TO PROJECT DELAY: CASE STUDIES OF COMMERCIAL PROJECTS IN KLANG VALLEY, MALAYSIA

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## Abstract

Delay in construction projects is a situation where the project cannot be completed under the planned time. It is a common issue faced in the construction industry all over the world especially in developing countries. In the Malaysian construction industry, 17.3% of construction projects experience more than 3 months delay and some of them are abandoned. Hence, the study of factors contributing to delay is very important in order to reduce the number of projects that experience delay in project delivery. Three objectives of the research have been formulated, namely (1) to identify factors that contribute to delay in construction projects; (2) to analyse and rank the causes of delay rated by contractors; and (3) to study the effects of delay in construction projects. One hundred questionnaires were distributed during data collection stage and only 36 responses received. The respondents only consist of contractors and sub-contractors because the scope of the research focuses on contractors' perception. The data collected was analysed using SPSS software. Seven factors that contribute to delay were identified through literature review, namely contractors' financial difficulties, construction mistakes and defective work, labour shortage, coordination problems, shortage of tools and equipment, material shortage and poor site management. Of those factors, the three most important factors were found to be labour shortage, contractors' financial difficulties and construction mistakes and defective works. Besides project delay, the research shows that cost overrun and extension of time (EOT) are the most common effects of delay in construction projects.

Keywords: *Delay, Commercial Project, Construction Management, Malaysia*

## 1.0 Introduction

Aibinu and Jagboro (2002) defined delay as a situation where a contractor and the project owner jointly or severally contribute to the non-completion of the project within the original or the stipulated or agreed contract period. Besides that, Stumpf (2000) stated that delay is an act or event that extends the time required to perform the tasks under a contract. Delay is actually a postponement of time from the original estimated completion time which might be caused by contractor, owner or

consultant as well as by external factors. Construction delay is one of the most common, costly, complex and risky problems encountered in construction projects (Alaghbari *et al.*, 2005). Construction delay occurs all over the world and many studies have been carried out to assess the causes of delay in construction. Sambasivan and Yau (2007) stated that about 17.3% of government contract projects in Malaysia were considered sick, which means they are delayed by more than three months or abandoned completely. Besides that, Assaf and Al-Hejji (2006) from Saudi Arabia studied the causes of delay in large construction projects and discovered that only 30% of construction projects were completed within the scheduled completion dates and the average time overrun was between 10% and 30%.

## **2.0 Factors Contributing to Delay**

There are 4 factors of delay categorized in broad categories, namely contractor- related factors, consultant-related factors, client-related factors and external factors. This study will only focus on contractor-related factors and thus, seven most significant variables that are caused by the contractor have been identified. These are contractor's financial difficulties, material shortages, labour shortages, poor site management, equipment and tool shortage, coordination problems as well as construction mistakes and defective works. These significant variables are discussed below.

### **2.1 Contractors' Financial Difficulties**

According to Zagorsky (2007), financial difficulty is defined as getting into a situation where a respondent's credit is adversely impacted, such as not paying bills. Contractor's financial difficulties are defined as the contractor not having sufficient funds to carry out the construction works. This includes payment for the materials, labourers salaries and equipment to be used for the construction work.

Thornton (2007), in his survey, found that slow collection, low profit margins and insufficient capital or excessive debt are the 3 major causes of financial difficulties among contractors. Slow collections topped the list in the years 2007 and 2005, in which the contractor received late payment from the client. This is supported by Arshi and Sameh (2005), Majid and McCaffer (1998), Arditi *et al.* (1985), Al-Khalil and Al-Ghafly (1999), Frimpong *et al.* (2003), Assaf and Al-Hejji (2006), Sambasivan and Yau (2007) and Mansfield *et al.* (1994) who found that delay in payment from the client would eventually cause financial difficulties to the contractor. Thus, most of the construction works cannot be carried out due to these financial difficulties.

Insufficient profit is the second highest factor contributing to the financial difficulties of the contractor.

Coulter and Kelley (1992) also agree with this and they further explained that insufficient profit cannot be controlled because it is due to bad economic conditions. Coulter and Kelley (1992) and Thornton (2007) both postulated that insufficient capital is one of the major causes of financial difficulties among contractors. Poor financial control by the contractor can lead to insufficient capital (Liu, 2010). Hence, the contractor will have excessive debt which causes them to face financial difficulties as they cannot pay back the debt.

## **2.2 Material Shortage**

According to Majid and McCaffer (1998), material shortages are due to poor materials planning, inefficient communication, unreliable suppliers and late delivery. Mochal (2003) stated that poor planning is mistake number one in project management. This is reflected in the scenario in which poor materials planning from the contractor could lead to material shortage because the materials needed for construction may not be available within a certain time frame. This is due to mistakes in the planning stage relating to when the materials are expected to be used in the construction phase. Hence, it will cause a delay to the project.

Inefficient communication is another factor that will lead to material shortage. Dunkelberger (2009), in her articles on 'How to Stop Losing Money on Inefficient Communication' stressed that the success or failure of a business is directly related to the ability to communicate. Inefficient communication is, therefore, a significant problem because misunderstandings between contractors and suppliers will lead to either early or late delivery of materials to the site. Earlier delivery might affect the quality of the materials while on the other hand, late delivery will postpone the work to be carried out on the construction site. This will significantly delay the work and thus, delay the project.

Dada *et al.* (2003, 2007) defined "unreliable supplier" as a factor whereby the quantity of material delivered by the supplier is less than the quantity ordered. This clearly shows that unreliable suppliers will lead to material shortage because the quantity of materials ordered are not delivered to site. Hence, it will lead to material shortage and delay the work of the contractor.

According to Ruiz-Torres and Farzad (2006), supplier failure to deliver on time can disrupt operations and delay the completion of a project. In the study conducted by Van der Rhee *et al.* (2009), they found that delivery by supplier is one of the most significant factors in choosing supplier and it is very important for the supplier to deliver materials on time. They showed that late delivery

by the supplier is an important factor because it will directly affect the completion time of a project.

This is further supported by Aibinu and Odeyinka (2006) who conducted a study of causes of delay in Nigerian construction projects in which they found that late delivery of materials is the main cause of delay. In addition, a study of causes and effects of delays in the Malaysian construction industry which had 150 respondents from clients, consultants and contractors (Sambasivan and Yau, 2007) found that the shortage of material is ranked number six. In Turkey, Arditi *et al.* (1985) ranked material shortages as the number one factor for delays in construction projects. They also found that cement, which is one of the most important materials to be used in the construction industry, cannot be kept for long periods of time. Thus, this may lead to shortages of cement. From all the studies mentioned above, it shows material shortage is a very significant factor that will contribute to delay in construction projects.

### **2.3 Labour Shortage**

Bruce and Dulipovici (2001) defined labour shortages in simple terms as the difficulty in finding the right people to fill the available job. Labour shortage is a problem faced by many countries all over the world. This is shown by the reports by Wang (2010), Anonymous (2010) and Hanim (2010). These three newspaper reports indicated the labour shortages in three different places in the world namely Beijing, Dong Nai and Malaysia respectively.

There are several causes of labour shortages. As stated by Trendle (2008), a shortage of skilled labour can result from an increase in the demand for labour. This is due to the increase in demand for the goods or services provided. In the construction industry context, the buying power of the consumer increases and this will lead to higher quality buildings being produced to meet increasing demands. Thus, more labours are required to produce high quality work.

The second cause of labour shortage is the cost of foreign labour. Hanim (2010) claimed that higher recruitment costs of foreign labour due to payment for the levy, medical checkup, security bond and medical costs by the employers lead to labour shortages in Malaysia. In the Malaysian construction industry, unskilled foreign labourers are widely used because the prices of foreign labourers are much cheaper compared to local labourers. Hence, the increasing cost to hire foreign labour will result in labour shortages in the construction industry and at the same time, contribute to delays in construction projects in Malaysia.

Wang (2010) and Anonymous (2010) postulated that the global economic crisis is another reason for the occurrence of labour shortages. Both reported that labourers chose to reside in places with low living costs because their salaries are insufficient to enable them to reside in large cities with higher living costs.

Sweis *et al.* (2008) also indicated that shortage of manpower including skilled, semi-skilled and unskilled labour causes delays in construction projects. This is further supported by Sambasivan and Yau (2007) who conducted a study in Malaysia and found out that labour supply is ranked number seven out of twenty eight causes of construction delay. It shows that labour supply is the major cause of delay due to the construction industry in Malaysia making use of foreign workers, some of which are working illegally in Malaysia. These illegal workers are frequently detained by Malaysian immigration officials and deported, causing further shortages of labour in the construction industry.

#### **2.4 Poor Site Management**

Effective and efficient site management by contractors is very important to ensure projects are completed on time. Poor coordination contributes to delay from estimated completion time. Poor site management may occur when contractors do not have enough experience and suffer from a lack of knowledge in managing the project team (Kadir *et al.*, 2005). A project manager is the leader in a construction project in the sense that he is required to manage all the works on site from monitoring progress of construction works to managing all the administrative work in the project. It is of utmost importance for the project manager to manage the work and project teams effectively. Hence, poor site management from the project manager will affect the whole team and also the progress of works, resulting in the eventual outcome of project delay. This view is supported by studies conducted by Augustine and Mangyvat (2001), Arshi and Sameh (2006), Arditi *et al.* (1985), Faridi and El-Sayegh (2006), Toor and Ogunlana (2008), Yang and Ou (2008), Sweis *et al.* (2008), Aibinu and Odenyika (2006) and Ahmed *et al.* (2003) who concluded that poor site management is one of the factors that contribute to delay in construction projects.

#### **2.5 Equipment and Tool Shortage**

Chang *et al.* (1991) highlighted that the input of tools and equipment used in the construction site are either provided through direct investment by the contractor or acquired through leasing. Some contractors may acquire tools and equipment using both methods. The contractor has to plan the usage

of equipment according to the construction work to be carried out during a particular period of time because equipment obtained by leasing has to be returned to the supplier by the due date at the end of the lease period. Joyce (2006) added that the construction of high rise buildings is increasing and, as a result, the use of cranes is also increasing. However, this is contributing to equipment shortage as the crane suppliers do not have a sufficient number of cranes to be leased out in order to meet this increasing demand. Hence, it is less likely that the contractor would be able to extend the lease period of cranes if it was necessary to do so. This shows that failures in effectively planning the usage of equipment will cause equipment and tool shortages.

Wendle (2008) reports that the construction industry in Russia faces equipment shortages because theft is prevalent on construction sites whereby heavy trucks and equipment are frequently stolen. He further report that, during a three month period, 40 heavy trucks, 13 cranes, 1 cement mixer and various other equipment had been stolen from construction sites in Moscow. Therefore, it appears that thefts may be one of the factors in the construction industry facing tool and equipment shortages.

Shree (2007) stated that the cost of renting construction equipment has risen by around 30% to 40% in only a few years. The increasing cost of equipment affects the contractor greatly as they will face financial difficulty in renting that equipment. Therefore, the contractor will have to suffer from tools and equipment shortage which consequently, contributes to delay in the project.

## **2.6 Construction Mistakes and Defective Works**

Gerskup (2010) claimed that poor workmanship, carelessness and shortcuts are the three key factors that will contribute to defective works. Zanis (2010) also agrees that poor workmanship is the main contributor to defective works. She reported that the quality of schools constructed in Zambia are poor due to poor workmanship by the contractor. In addition, Kedikilwe (2009), in another case, mentioned that poor workmanship is the main factor that produces dysfunctional solar panels in buildings.

The use of poor quality materials is one example of poor workmanship. In Turkey, several of the building collapses in the Bingol–Karlioiva earthquakes were due to the use of improper aggregate in the concrete during construction (Binici, 2007). In the same study, Binici, (2007) found that the reinforcement bars used had corroded, leading to the strength of the concrete being greatly reduced. Poor workmanship which leads to defective works has to be rectified by the contractor but in order to do that, the project will require postponement of time.

Careless mistakes such as taking incorrect measurements from plans and specifications will lead to construction mistakes (Thomas, 1991). Additionally, incorrect units and measures during construction will produce defective work. As a result, the contractors need to reconstruct those construction mistakes which results in taking additional time to complete the project.

A shortcut can be defined as the path that takes lesser time to complete compared to the usual path. Thomas (1991) emphasized that contractors usually use shortcuts to complete the construction work due to time and cost constraints. Shortcuts will, however, eventually produce defective works which need to be rectified later in the completion stage. This will subsequently delay the project.

## **2.7 Coordination Problems**

In a construction project, there are many parties involved such as contractor, consultant, sub-contractor and client. Often, it may be difficult for these various separate parties to coordinate well in order to complete the project. In one study conducted by Assaf *et al.* (1995) it was found that difficulty in coordination between the parties is one of the factors that contributes to delay. In addition, Majid and McCaffer (1998) also agreed that coordination problems will contribute to delay.

Ali *et al.* (2008) and Kadir *et al.* (2005) stated that lack of coordination between contractors and subcontractors will lead to delay, for example in the situation that newly revised construction drawings of a project may be issued later by the contractors to the subcontractors. This leads to construction mistakes and the work requiring to be redone. Reconstruction work takes additional time, therefore impacting upon the completion time of the project.

According to Sambasivan and Yau (2007), most of the unskilled labourers used in the Malaysian construction industry are foreign labourers. These foreign labourers have little formal education (Santoso *et al.*, 2003). Thus, coordination is very important to guide and instruct these labourers to perform their work correctly. Without coordination, the project will be delayed due to rectifying defective works and low productivity of labourers.

## **3.0 Effects of Delay**

Many previous studies have been carried out regarding the effects of delay. Studies from Aibinu and Jagboro (2002), Sambasivan and Yau (2007); and Sun and Meng (2009) found many effects of delay in construction projects. Out of all the effects of delay, six most common effects of delay were identified

and these are discussed below.

### **3.1 Cost Overrun**

Cost overrun is a situation where the amount of money used is greater than the initial project cost or estimated cost (Singh, 2009). Aibinu and Jagboro (2002) found that cost overrun is the most frequent effect of delay in Nigeria. This is further supported by Sambasivan and Yau (2007) who found that cost overrun was ranked second in their study of delay effects in the Malaysian construction industry. This is due to overtime costs in order to continue the construction work and any compensation required as a result of the delay (Hanna *et al.*, 2004). Besides that, additional money is required for rework if any construction mistakes have occurred. According to Sun and Meng (2009), the cost of rework can be as high as 10-15% of the estimated project cost. This shows that cost overrun is one of the most frequent effects of delay in the construction industry.

### **3.2 Extension of Time (EOT)**

Extension of time is an event where extra time is requested in order to complete the project (USLegal, 2010). According to Odeh and Battaineh (2002), client-related delay is the major factor contributing to delays. Thus, contractors can claim suitable EOT if the cause of delay is beyond the control of the contractor and is brought about by client-related factors (Othman *et al.*, 2006). This is mentioned by Williams (2003) in his study on assessing Extension of Time delays on major projects. Usually contractors can claim EOT due to client or owner related delays in construction projects.

### **3.3 Late Payment**

According to Nichol (2008), late payment is a common problem especially during times of economic crisis. This is supported by Still (2000) who found that late payment is a major problem in Western countries. In the study by Odeh and Battaineh (2002), late payment was the second highest factor contributing to delay, ranked by consultants. Late payment may occur during the construction process and it is likely to be more severe during delay periods. The owner or client may use postponement of the project as a reason to delay the payment to the contractor.

### **3.4 Rescheduling**

According to Vieira *et al.* (2003), rescheduling is the change of original schedule of time in order to respond to disruption and problems which have occurred. In the construction industry, schedules may be updated in order to monitor the time and work in construction projects (Liu and Shih, 2009). The



importance of schedule updates are as mentioned by Liu and Shih (2009): (1) compare the original schedule with the actual progress of the project; (2) identify all delayed activities; (3) identify who or what is responsible for delays; and (4) forecast and modify projected work progress based on actual progress. Based on the schedule update, delayed activities can be identified and usually, rescheduling is required due to the delayed work. Thus, rescheduling is one of the effects of delay in construction projects.

### **3.5 Affect Company Reputation**

According to Djordjevic and Djukic (2008), company reputation is one of the most important intangible assets. Ismail *et al.* (2006) support this statement and add that reputation is built from the overall performance of the company. The reputation of a company is very important because an adversely affected reputation can become a business threat (Murray, 2003). Strategic planning, corporate governance and corporate codes of conduct are the top three factors that affect company reputation according to the study conducted by Ismail *et al.* (2006). Thus, delay in construction projects will affect the company reputation indirectly.

### **3.6 Lost Productivity and Efficiency**

According to McDonald and Zack (2004), productivity is the measurement of labour efficiency to complete the required work. Lost productivity and efficiency of the labourers always occurs when delays happen (Bramble and Callahan, 2000). This occurs due to acceleration of the schedule and also the pressure to complete the work. In addition, delays caused by construction mistakes will need rework and this leads to a significant increase in the amount of work the labourers are required to complete. This directly reduces the productivity and efficiency of the working labourers.

## **4.0 Research Methodology**

This research takes a quantitative approach and will be conducted in four stages, namely literature review, data collection, data analysis and conclusion.

Literature review is an essential stage in conducting the research project. Before undertaking the literature review, a problem statement and objectives of the research will be identified by using sources such as academic research journals, dissertations, textbooks, articles and the internet.

The second stage is to collect raw data to be analysed in this research in order to achieve the set of objectives identified. A questionnaire survey was used for data collection. The targeted respondents for

this questionnaire survey are either contractors or sub- contractors because this research aims to study the perspective of contractors. Additionally, only commercial projects in Klang Valley which experienced delays in project delivery were chosen in this questionnaire survey. Klang Valley is an area of Malaysia comprising Kuala Lumpur and its suburbs and adjoining cities in Selangor State.

The projects must be carried out by contractors registered with the Construction Industry Development Board (CIDB) Grade 7 with unlimited tendering capacity, or the Contractor Services Centre (PKK) Grade A with project cost above RM 10 million. Lastly, projects completed between year 2000 and 2010 will be the target to enable any more recent factors contributing to delay to be identified. One hundred sets of questionnaires were distributed to either contractors or sub-contractors by email, fax and direct meeting. Out of these 100 set questionnaires, 39 responses were received while only 36 of the questionnaires are valid. Why are the others invalid? This suggests that the set of questionnaires is reliable as at least 30% response rate is required to produce a reliable result (Gillham, 2000) while in this study, a response rate of 39% was received, with a useable response rate of 36%.

The third stage is to convert the raw data collected to required information. Data was analysed using the Statistical Package for the Social Science (SPSS) software. From there, the main factors contributing to delay and their effect can be identified.

In the final stage, the findings of the study were analysed in relation to the objective of this research. In addition, recommendations and suggestions are given based on the findings.

## 5.0 Data Analysis and Discussion

The level of significance on factors contributing to delay is determined by using mean and standard deviation. Mean score was used by Toor and Ogunlana (2008), Aibinu and Odenyika (2006); and Lo *et al.* (2006) in their studies on similar research topics. The result of the ranking is shown in Table 1.

Table 1: Responses on Factors Contributing to Delay

Factors contributing to delay	Mean (n=36)	Standard Deviation	Rank
Labour Shortage	4.50	0.811	1
Contractors' Financial Difficulties	4.44	0.607	2
Construction Mistakes and Defective works	3.67	1.195	3
Coordination Problem	3.61	1.202	4
Material Shortage	3.31	1.215	5
Poor Site Management	3.14	1.268	6

Based on Table 1, labour shortage is the first factor that contributed to delay in construction project ranked by contractor. According to MALBEX (2005), 20% of the labourers in the Malaysian construction industry are foreign workers. A portion of the foreign workers are illegal workers and are often caught by immigration officials and this directly affects the completion time of the project. Besides that, 7 of the respondents stated that the increasing cost and the complicated stages of hiring foreign labourers contributes to labour shortage. This reconfirms the statement made by Hanim (2010).

The second highest ranked factor is financial difficulties faced by the contractor. Three of the respondents commented that late payment by the client causes delay in project delivery whereby the contractor has insufficient cash flow to sustain the expenses of the construction work. Additionally, the economic crisis which affects the profit of the contractors causes delay in construction works because the work cannot be carried out on time. This probably due to the individual contractors has gone out of business or simply do not have the financial capability to complete the project. This statement was made by 3 of the respondents in the questionnaire. Financial difficulties are not a recent issue. A previous study by Arditi *et al.* (1985) found that this is the number one factor contributing to delay in Turkey.

Construction mistakes and defective works ranked number three out of the seven factors. This reflects the statement made by Gerskup (2010) and Zanis (2010) where defective works are one of the main contributors to delay. Most respondents rank this factor highly because it takes time to rework the construction mistakes. They further explained that further investigation may have to be carried out in order to identify the causes of the defective work. This will eventually affect the completion time of the project as certain activities are classified as critical activities that cannot be delayed.

It is shown in Table 1 that coordination problems ranked number four by the contractors. The respondents commented that they faced problems in coordinating with other parties such as client and consultants. This is in accordance with Assaf *et al.* (1995) who stated that coordinating between parties is very difficult. Two of the respondents stated that communication between foreign labourers gives them problems in coordinating the work on site. Santoso *et al.* (2003) mentioned that situation before in their study on assessment of risks in high rise building construction in Jakarta.

Table 2: Responses of Effects of Delay

<b>Effect of Delay</b>	<b>Percentage (n=36)</b>	<b>Rank</b>
Cost Overrun	55.6	1

Extension of Time (E.O.T)	16.7	2
Late Payment	11.1	3
Rescheduling	8.3	4
Affect Company Reputation	5.6	5
Lost Productivity and Efficiency	2.8	6
<b>Total</b>	<b>100.0</b>	

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Table 2 shows that cost overrun is the most frequent effect ranked by the contractors. As suggested by Sun and Meng (2009), time overrun and cost overrun are inter-related whereby delay will cause cost overrun in most cases. Two respondents claimed that delay will cost more money due to labour salaries and leasing of equipment and tools. Extra expenditure is required to hire labour and for leasing equipment for construction because the budget calculated for those fees is based on the original time estimate for project completion. Besides that, required rework due to construction mistakes and defective works which was ranked as the third most important factor in Table 2 requires a further amount of additional expenditure. This will consequently lead to cost overrun.

Extension of time (EOT) is the second highest ranked effect by the contractors. The contractor normally will require extension of time in order to complete project. One of the reasons to apply for EOT is inclement weather as stated in PAM contract 2006. The weather of Malaysia is rainy all year round, leading to the situation that construction work cannot be completed on site. One of the respondents gave an example of concreting work, which cannot be completed during rain because the strength of the concrete will be adversely affected. As a result, the contractor applies for EOT because of the inclement weather of the country.

## **6.0 Conclusion**

Seven factors that contribute to delay were identified through literature review namely contractors' financial difficulties, construction mistakes and defective work, labour shortage, coordination problem, shortage of tools and equipment, material shortage and poor site management. Of those factors, the three most important factors found were labour shortage, contractors' financial difficulties and construction mistakes and defective works. Besides, effects of delay as ranked by the respondents shows that cost overrun and extension of time (EOT) are the most common effects of delay in construction projects.

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