CAUSES OF ABANDONED CONSTRUCTION PROJECTS IN MALAYSIA

By

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This work is dedicated to Papa, Mummy, and Koko …

… for their unwavering love, unfaltering support and immense patience.

ABSTRACT

CAUSES OF ABANDONED CONSTRUCTION PROJECTS IN MALAYSIA

Yap Eng Hoe

Abandonment of construction projects (ACP) is considered one of the most common and serious problems plaguing the Malaysian construction industry given the number and the value of the projects involved. It affects not only the immediate purchasers but also other project players and the general public. Sometimes it also involves expending public fund to revive abandoned projects. Yet, research is scarce on this issue; hence this research was conducted to investigate the problems. Firstly the issues surrounding the problem and existing literature on the causes of ACP are reviewed. Then, potential causes of ACP are also reviewed and summarized into 41 items to be rated in an industry wide questionnaire survey. The questionnaire also includes an open-ended question on suggestions to solve ACP. 225 questionnaire responses were received. Subsequently, a series of ten semi-structured interviews were conducted to obtain detailed opinions from experienced players in the industry concerning the causes of ACP and how to solve the problems. The interviewees include architects, developers, property consultants, the honorary secretary general of the National House Buyers Association etc. to ensure a comprehensive view was obtained. Quantitative analyses include ranking of the 41 potential causes of ACP with Spearman's ranking correlation between different groups of respondents, and factor analysis with Cronbach's α reliability analysis. Qualitative analyses include organizing into themes the

results of the open ended question on solving ACP and the results of the semi-structured interviews. Discussions include interpreting the underlying factors extracted from factor analysis in light of the qualitative results. The results show the owner to be mainly responsible for ACP (i.e. cash flow problems, incompetence, siphoning out of money, etc.), followed by the role of government regulations. A risk management expert system module within BIM, a middle ground solution between the sell-then-build and build-then-sell schemes, and others are proposed.

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APPROVAL SHEET

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Yours truly,

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(YAP ENG HOE)

DECLARATION

I **YAP ENG HOE** hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

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LIST OF ABBREVIATIONS

ACP	Abandonment/abandoned construction projects
BIM	Building Information Modelling
BNM	Bank Negara Malaysia (Malaysian Central Bank)
BTS	Build then sell scheme
CCC	Certificate of completion and compliance
CIDB	Construction Industry Development Board of Malaysia
GNP	Gross national product
HBA	National House Buyers Association
HDA	Housing Development Act 1966
ICT	Information and communication technology
LAD	Liquidated and ascertained damages
MHLG	Ministry of Housing and Local Government
SEM	Structural Equation Modelling
STB	Sell then build scheme

CHAPTER 1

INTRODUCTION

The construction industry plays a very important role in the economy of a developing country like Malaysia, contributing an average of over 3% to the overall gross domestic product over the last five years from 2008 to 2012 (BNM 2013). For instance, the industry contributed RM 34.9 billion to the overall gross domestic product of RM 937.5 billion in 2012. The total value of construction projects awarded in Malaysia in 2012 amounted to RM 112.5 billion (CIDB Malaysia 2013) and has created a lot of job opportunities to help boost the country's economy. The number of employed persons in the construction industry in Malaysia in 2011 is 1.134 million, which constitutes 9.2% of the total 12.284 million employed persons (Department of Statistics 2011). However, it must be noted that not all the construction projects are completed on time or ahead of schedule. It is also not uncommon for construction projects to be delayed, or in the worst scenario even abandoned due to various reasons.

A project may be abandoned at any stage of the lifecycle and incur significant amount of loss. For a housing project, the Ministry of Housing and Local Government considers that it has been abandoned if 1) there has been no substantial activity on site for six consecutive months, or 2) it is involved in a winding-up petition registered at the High Court under Section 218 of the Companies Act, or 3) it is under receivership, or 4) the developer has informed

the Housing Controller in writing of his inability to complete the project, or 5) the project has been certified to be abandoned by the Minister under Section 11 (1) (c) of Housing Development (Control and Licensing) Act 1966 (i.e. Act 118) (MHLG 2011). However, as aforementioned, this definition is only for housing projects whereas this study covers all types of construction projects which might not be governed by Act 118. Therefore, for the purpose of this study an abandoned project is defined as a project which has either been totally abandoned or indefinitely delayed.

The abandonment of construction projects is not unique to Malaysia as it is also present in other countries, e.g. United States (Hicks 2008), Spain (Carrero et al. 2009), Dubai, Abu Dhabi, Saudi Arabia, Qatar, Bahrain, Kuwait, and Russia (SPIEGEL 2009). However, in Malaysia this problem has been plaguing long enough at a scale that deserves more attention. In 2000, there were 514 abandoned housing projects in Malaysia with an estimated value of RM 7.5 billion (see Table 1.1). Even though the number has been gradually decreasing, it is reported that in September 2012 there are still a total of 95 abandoned housing projects involving 37,316 units of houses and 26,170 house buyers (MHLG 2012). On top of the figure, there are also other non-housing projects being abandoned throughout the years. For instance, the Plaza Rakyat, a RM 1.5 billion mix use project, remains abandoned even though it was scheduled to be completed in 1998 (Jayaraj, 2009). These are some of the problems of abandoned construction projects plaguing the construction industry in Malaysia. Despite the seriousness of the issue, there appears to be a lack of research. It is found that previous studies lack comprehensiveness, i.e.

involving both questionnaire survey and interviews, involving all the key players, and involving both housing and non-housing projects.

1.1 Rationale for Research

The abandonment of construction projects has resulted in many adverse consequences to the economy, society and environment. Economically, it is a waste of useful resources. The consequences of abandoned projects are far reaching as the construction industry plays a major role in the economy of a developing country like Malaysia. Moreover, a typical construction project involves many trades and participants, who are linked with other upstream and downstream industries (Ng 2009b). These include suppliers of construction materials, transportation companies, manufacturers of plant and machinery, etc. who will be seriously affected if a construction project is abandoned. For a public project, if it is abandoned the economic impacts are never directly felt by the general public as they are absorbed by the government's reserves. However, very often there will be loss of opportunity for the public to benefit from the intended purposes of the projects (Bavani 2009). Should additional public fund be utilised to revive such projects, it will incur additional opportunity cost, i.e. the cost of foregoing the opportunity to benefit from utilising the public fund in other ways.

For private housing projects, however, tens of thousands of house buyers are immediately victimised every year (See Table 1.1). The impacts on the house buyers are twofold: Despite the fact that the purchased properties

will not be completed, the house buyers still have to service bank loans for the unfinished houses (NST Online 2009; Ng 2011; Rahman 2012) and meanwhile have to rent another house to stay (Chan 2009; Ng 2009b). They also suffer losses for being unable to reap the benefit from potential property value appreciation and rental collection (Chow 2009). Some house buyers have even been blacklisted by the banks as they fail to service their bank loans (Yip 2009b; Yip 2009a). Consequently, they are unable to buy another property unless they pay back their loans (Yip 2009a).

House buyers of abandoned projects have often been left without any assistance from the developer and have to resort to the tedious process of forming a committee to deal with the developers and the authorities (Ali 2011; Chan 2009; Chow 2009). There are cases which have been dragged on for so long that some owners have even passed away before any plan to revive the project is in place (Chan 2009). Although occasionally settlements are reached between the developers and the house buyers, the settlement amount might be disproportionate to the actual losses suffered by the house buyers (Lim 2009; Yip 2009a). The buyers often have no choice but to reluctantly accept the settlement offered as they become financially stressed. For some revived projects on leasehold land, owners are left with less years remaining on the lease after many years of abandonment (The Star Online 2009). All these have negative effects on the image of the country in the eyes of foreign property investors (Chang 2009).

Table 1.1 Statistics on abandoned housing projects

Year	Total number of abandoned housing projects (Peninsular Malaysia)			
	No. of projects	**No. of houses**	**No. of buyers**	**Estimated Value (RM million)**
2000	514	107702	68340	7524.41
2001	544	125649	80070	9496.68
2002	-	-	-	-
2003	-	-	-	-
2004	227	75356	50813	7033.08
2005	261	88410	58685	8043.00
2006	-	-	-	-
2007	-	-	-	-
2008	270[a]	87725[a]	60159[a]	-
2009/12/03	136[b]	-	30567[b]	-
2010/06/30	151[c]	-	-	-
2011/02/06	104[d]	34309[d]	22558[d]	-
2012/09/30	95[e]	37316[e]	26170[e]	-
Source	Unmarked - Ministry of Housing and Local Government (HBA 2006) [a] Ministry of Housing and Local Government (MHLG 2008) [b] Minister of Housing and Local Government (Kong 2009) [c] Kabit (2010) [d] Heng (2011) [e] Ministry of Housing and Local Government (MHLG 2012)			

Apart from house buyers, contractors, developers, banks, land owners, and government may also be the victims. Contractors may be the most severely affected victim after house buyers. Normally the contractors would not abandon the projects if the developers have paid them accordingly. The contractors may be forced to wind up the company just because of the failure of collection of payment from one single project. The consequences may be extended to businesses along the supply chain such as subcontractors, suppliers and construction workers. For the developers, they may suffer from bad reputation and financial losses (Perumal 2009a). Banks may suffer because of bad debts (Kong 2009), while land owners suffer because their lands are stranded (Tan & Rajendra 2009). Government may have to step in and utilise public fund to revive abandoned construction projects (Gasper 2010; Cheong 2012). The Ministry of Housing and Local Government (MHLG) also has to be

burdened with the task of mediating between all the parties involved (Kong 2009). When it comes to legal battles, it incurs huge amount of expenses to all the parties involved. The utilisation of public fund in these ways comes with it opportunity cost as mentioned earlier.

Abandoned construction projects also affect the society and environment negatively. For instance, some abandoned projects have pools of stagnant water that serve as breeding ground for mosquitoes (Bavani 2009; RC 2010; Stuart 2009) and threaten public health. Abandoned construction projects also attract people like drug users, criminals and vagrants to occupy the abandoned sites (Chan 2009; Perumal 2009b; RC 2010) and hence threaten public security. Abandoned construction sites may pose danger to the public, particularly children who venture into the area to play (Stuart 2009). Abandoned construction projects affect the environment negatively as it may be used as a rubbish dump (Bavani 2009) and for the sludge discharged (Phuah 2009). Also, some have become unsightly overgrown with undergrowth (Bavani 2009). In Spain, the unpleasant view caused by abandoned projects is known to reduce the value of the surrounding properties (Carrero et al. 2009).

Even though the problems of abandoned construction projects are far reaching, there is hitherto a lack of research into this area. Khalid (2010), Dahlan (2010), Ibrahim (2006) and Rusli (2006) have done similar researches but only focused on housing projects. Carrero et al.'s (2009) research focuses entirely on the negative impacts of abandoned construction projects in the Spanish coast and its regulation in the law but not on the causes of the problem.

Khalid (2010) investigated the causes from the view point of neo-classical and institutional economic theories. According to Khalid (2010) the neo-classical economic view point emphasises the importance of market information, whereas the institutional economic view point concerns formal rules or institutions and the unwritten rules or informal institutions that may affect the decisions of the market agents. Khalid (2010) conducted literature review, interviews, and a questionnaire survey involving housing developers from six states in Peninsular Malaysia. However, the questionnaire survey did not involve other players of the industry like contractors and consultants. Dahlan (2010) studied the problems of abandoned housing projects from the legal perspectives by conducting case studies and literature review on undergraduate theses and research reports. However, Dahlan's (2010) study did not involve a questionnaire survey. Similarly Ibrahim's (2006) and Rusli's (2006) studies also did not involve questionnaire surveys. Ibrahim's (2006) study was only based on literature review, interviews and case studies; Whereas, Rusli's (2006) study was only based on literature review and interview with the Ministry of Housing and Local Government. Therefore, there is a need for a research that investigates the causes of abandoned construction projects from an industry wide perspective facilitated by a questionnaire survey and supplemented by semi-structured interviews involving all the key players (i.e. developers, contractors, and consultants) covering both housing and non-housing projects. This will allow for a more comprehensive view of the problem of abandoned project in this country to be obtained.

1.2 Aim and Objectives

The aim of this research is to investigate the problems of abandoned construction projects in Malaysia. This is achieved through the following objectives:

- To review the issues surrounding the problems;
- To review existing research on causes of the problems;
- To investigate the causes of the problems;
- To investigate the potential solutions to the problems; and
- To propose solutions to the problems.

1.3 Research Methodology

The steps start from a comprehensive literature review on the issues and causes of abandoned construction projects in Malaysia. As there is a lack of research conducted and hence the lack of peer-reviewed articles published on the topic, the literature search is extended to cover the potential causes of abandoned construction projects by reviewing factors that could negatively affect the success of a project. A list of 41 potential causes is identified which is then used as a basis for an industry wide questionnaire survey involving clients/developers, consultants, contractors, and other relevant parties. Respondents are asked to rate each variable on a Likert scale. Besides, the questionnaire also includes an open-ended question on suggestions to solve abandonment of construction projects.

The questionnaire survey is followed by a series of semi structured interviews conducted on some of the questionnaire respondents who were involved in an abandoned construction project, and individual professionals in the industry who are known to be well experienced. The interviewees include architects, developers, property consultants, and the honorary secretary general of the National House Buyers Association etc. to ensure a comprehensive view was obtained. The semi-structured interviews serve to complement and provide detailed information on the problems.

Quantitative data from the questionnaire survey are analysed using basic descriptive methods, ranking of potential causes with Spearman's ranking correlation coefficient, and factor analysis with Cronbach's α reliability analysis. Qualitative data from the open ended question in the questionnaire on solving abandonment of construction projects, and from the semi-structured interviews are grouped into themes/categories by means of assigning categories/labels/codes to segments of the data, followed by studying of the interrelationship between the themes/categories. The research is finalised by writing up discussion of the results, conclusions, proposals to manage the problem, limitations and implications.

1.4 Organisation of Chapters

This thesis is organised into six chapters as detailed below:

Chapter 1 – Introduction: This chapter discusses the background of the problems of abandoned construction projects in Malaysia, including definition of abandoned projects, the rationale behind this research, the aim and objectives of this research, the research methodology, and the organisation of chapters.

Chapter 2 - Causes of Abandoned Construction Projects – A Review of the Literature: This chapter covers the review of existing literature on the causes of abandoned construction projects. It also reviews existing literature on potential causes of abandoned construction projects by reviewing factors that could negatively affect the success of a project.

Chapter 3 – Research Methodology: This chapter describes the methods used in this research to accomplish the aim and objectives. It reviews existing literature on the meaning and background philosophy of research and research methodology. It also reviews the quantitative, qualitative, and triangulation methods, with discussions on the selection of a suitable method for this research. This is followed by discussions on the methods used in this research, i.e. literature review, questionnaire survey, and semi-structured interviews. Then, the techniques used for analysis of data are also presented.

Chapter 4 – Analysis of Data: This chapter covers the analysis of both the quantitative data obtained from the questionnaire survey and the qualitative data obtained from the questionnaire survey as well as the semi-structured interviews. Quantitative analyses cover the general characteristics of questionnaire respondents, ranking of the causes of abandoned construction projects with Spearman's ranking correlation between different groups of respondents, and factor analysis with Cronbach's α reliability analysis. Qualitative analyses cover the results of the open ended question on solving abandonment of construction projects, which include the characteristics of the respondents, the suggested solutions, and also causes of abandoned construction projects voluntarily provided. Qualitative analyses also cover the results of the semi-structured interviews, which include the background of the interviewees, the causes of abandoned construction projects, and suggestions to manage or mitigate abandonment of construction projects.

Chapter 5 – Discussion of Results: This chapter starts with the discussion on the general adequacy of both the quantitative and qualitative data in complementing the lack of available literature. This is followed by the discussion on the ranking of potential causes of abandoned construction projects. Then, the comparison of causes of abandoned construction projects between results of literature review, open-ended question of questionnaire and semi-structured interviews is presented. Lastly this chapter presents the interpretation of the underlying factors extracted from factor analysis with the results of literature review, open-ended question of questionnaire and semi-structured interviews.

Chapter 6 – Conclusions: This chapter covers the conclusions of this research, the proposals to manage the problem of abandoned construction projects, limitations of this research, and the implications of this research for research and for practice.

CHAPTER 2

CAUSES OF ABANDONED CONSTRUCTION PROJECTS – A REVIEW OF THE LITERATURE

This chapter covers the review of existing literature on the causes of abandoned construction projects. It also reviews existing literature on potential causes of abandoned construction projects by reviewing factors that could negatively affect the success of a project.

2.1 Causes of Abandoned Construction Projects in Malaysia

Despite the seriousness of the problem, there is hitherto a lack of research in this area. It is found that existing literature on this subject is limited to the types of sources such as unpublished thesis, conference papers, and particularly news articles. Furthermore, the types of project discussed in these sources are mainly housing projects. This may be due to the greater number of abandoned housing projects and the fact that it has greater immediate impact to the general public than commercial (e.g. office building) and government projects. Generally, the causes of abandoned construction projects identified from existing literature can be broadly grouped into five categories, i.e. 1) mismanagement, 2) unfavourable government policies, 3) inefficient public delivery system, 4) unfavourable economic conditions, and 5) financial problems.

2.1.1 Mismanagement

Mismanagement is mentioned by the Ministry of Housing and Local Government (MHLG) (Kaur 2011) as one of the causes of abandoned housing projects. Mismanagement may happen due to the lack of experience of developers (Ibrahim 2006). Examples of mismanagement that may lead to abandoned housing projects include 1) lack of proper feasibility studies (Ibrahim 2006) particularly inaccurate market research (Khalid 2010; Kong 2009), 2) unattractive marketing strategies (Ibrahim 2006), 3) fraud (MHLG, as cited in Kaur 2011; Khalid 2010), 4) conflict among project participants (Dahlan 2010), and 5) incompetent and poor financial management by the developers (Ibrahim 2006; Khalid 2010).

The first two of these examples are particularly concerned with the sales of house units as important source of cash flow for housing developers. The lack of proper feasibility studies and inaccurate market research may result in inaccurate forecast of demand and supply for certain types of properties as well as unsuitable project scheme to be undertaken for the prevailing market (Kaur 2011). Unattractive marketing strategies may further exacerbate a less attractive scheme of project already undertaken by a developer. Khalid (2010) points out that the developer will face problems in obtaining bridging loans from financial institutions to continue with a housing project if the sale percentage is less than 80%. One particular example of the lack of proper feasibility is when the developer of a housing project was issued a stop work order by the authorities for failing to strengthen a slope near the construction

site (Ali 2011). The developer did not include the strengthening of the slope in their feasibility studies therefore the houses sold did not include the extra cost. The viability of the project was affected, the project had to be abandoned and the developer had to refund the house buyers. Another aspect of the lack of proper feasibility studies is the failure to recognise the problems by the presence of illegal squatters in the project site, i.e. the difficulty and cost incurred in removing them could lead to abandonment of housing projects (Dahlan 2010).

An example of fraud is non-payments or arbitrarily reduced payments of progress billings which can result in cash flow problem of contractors, subcontractors and suppliers and eventually late delivery or abandonment of projects (Home Guru 2011). Fraud may also be due to extravagant dissipation of purchasers' fund that leads to the abandonment of housing projects (Dahlan 2010). Another example of fraud is the involvement of developers in fraudulent claims (Khalid 2010; Cheong 2012). Developers collude with their architects so that the architects issue progress claim certificates that falsely reflect higher levels in the progress of construction, then the developers siphon the money out of the project (Cheong 2012). Dahlan (2010) points out that conflict that may lead to abandoned housing projects involves developers, land proprietors, purchasers, contractors, consultants and financiers. As on how poor financial management by the developers cause abandonment of construction projects, however, Ibrahim (2006) and Khalid (2010) did not provide any detailed elaboration.

2.1.2 Unfavourable government policies

Causes of abandoned housing projects related to unfavourable government policies include 1) the sell then build system (Chang 2009), 2) the unavailability of Home Indemnity Insurance (Ibrahim 2006), 3) the limitation of the jurisdiction of the Tribunal for Homebuyer Claims (Ibrahim 2006), and 4) the requirement for private developers to build 30% of low cost houses (Khalid 2010).

2.1.2.1 Sell then build system

Former Prime Minister Abdullah Ahmad Badawi (HBA 2006) and the President of Federated Association of Consumer Malaysia (FOMCA) (as cited in Khalid 2010) stated the sell-then-build system as one of the causes of abandoned housing projects. The sell-then-build system is intended to enable more houses to be built at a faster rate and a lower price (Chen 2007). As the name implies, houses can be sold before the houses are being built, therefore there is more cash flow from the start of the construction phase and less requirement for the developer's own capital. This has enabled more developers of smaller capital to be involved in the business (Alagesh 2013). According to Chang (2009), however, having smaller developers in the housing industry is the main cause of the abandonment of housing projects. Being small, these developers have to rely critically on their sales to meet their cash flow. When the sales are not up to expectation, the cash flow might be affected. Consequently, the projects may be delayed and eventually some might become

abandoned. The sell-then-build system is also less risky than a build-then-sell system from bankers' point of view (Teoh & Lim n.d.). This might have resulted in banks not exercising a duty of care by often relying on architects employed by the developer to sign off progress certificates, knowing that they can still collect repayment from house buyers even if a project is abandoned (Heng 2011). This might encourage over claiming of fund by the developer, either resulting in mismanagement of fund or fraud and eventually abandonment of project.

2.1.2.2 Unavailability of Home Indemnity Insurance

Home Indemnity Insurance, as practiced in Western Australia, is an insurance policy which a builder is required by law to take out on behalf of the house buyer to assist to ensure that the house can be finished in the event that the builder dies, disappears or becomes insolvent (Anon n.d.). This insurance is applicable to residential building work worth over 20,000 Australian dollars. In the event of any claims, the law requires the insurance company to pay up to 100,000 Australian dollars or the value of the contract work, whichever is lesser. For loss of deposits, the law requires the insurance company to pay no more than 20,000 Australian dollars. However, this is not practised in Malaysia (Ibrahim 2006). Therefore, when the developer in this country is unable to continue with the development of the project there is no similar protection for the house buyers.

Related to this, in February 2011, the Real Estate and Housing Developers Association of Malaysia (REHDA) proposed a home completion guarantee scheme (Heng 2011). Under this scheme, the government and the developer will each contribute 5% and 2% of the gross development cost of a project respectively into a fund managed by an independent third party. The project would be rated first before entering into this scheme, and a seal will be provided to signify a guarantee that the project will be completed.

2.1.2.3 Limitation of the Tribunal for Homebuyer Claims

The Tribunal for Homebuyer Claims is a channel for aggrieved homeowner to seek redress against developers without having to go through a lengthy legal process in Malaysia (Chen 2007). Ibrahim (2006) found that the limitation of the jurisdiction of the Tribunal for Homebuyer Claims is one of the causes of abandoned housing projects, but contrary to Ibrahim's (2006) finding, Chen (2007) claimed that the Tribunal for Homebuyer Claims has proven to be very effective. It is however believed that the developers being sued are often insolvent and getting compensation is highly unlikely.

2.1.2.4 Requirement to build 30% of low cost houses

Khalid (2010) found that the government's requirement for private housing developers to build 30% of low cost houses contribute to the abandonment of some housing projects. The reason given is that the developers will abandon the low cost projects if the number of purchasers is low, rather

than complete the housing projects and struggle to find purchasers. The low number of purchasers may partly be due to the fact that the low cost houses can only be sold to the lower income groups, and that the locations of the projects lack purchasers from these groups. This requirement to build 30% low cost houses is especially affecting smaller size projects as these projects are less flexible in terms of cross subsidy from the non low cost to the low cost housing units.

2.1.3 Inefficient public delivery system

Delivery system is "a means or procedure for providing a product or service to the public" (Anon 2003), usually by the government. Chen (2007) argues that it is the inefficient public delivery system rather than unfavourable government policies that causes the abandoned project problem. A number of sources have mentioned the lack of enforcement of control and monitoring by the government as a cause of abandoned housing projects (Dahlan 2010; Heng 2011; Ibrahim 2006; Khalid 2010). Ibrahim (2006) states, among others, that there should be stricter licensing for developers, better system to detect abandonment of projects, harsher punishment for errant developers, and less bureaucracy in the approval process of housing plans. In October 2010, the Minister of Housing and Local Government said that many developers have been blacklisted by the ministry, and the ministry would tighten conditions on developer's licences to avoid the problems of abandoned projects (The Star Online 2010). Corresponding to this, HBA has proposed to change the deposit to get a housing developer's license from RM 200 thousand to 5% of

construction costs (Heng 2011). However, it is unclear whether blacklisting by the ministry alone is able to prevent rogue developers who had become insolvent to use the identity of others to register another company to start another new development. Developers may also use a proxy to protect themselves from being liable in case of abandonment of project (Heng 2011). As of 2010, the Minister of Housing and Local Government reported a remarkable improvement in planning and building plans approval (Phoon 2010). But, whether or not this will lead to less abandonment of housing projects is left to be seen.

2.1.4 Unfavourable economic conditions

There is a consensus that economic crisis or financial crisis is one of the causes of abandoned construction projects (eg. Carrero et al. 2009; Fernandez 2009; Lim 2009; Ng 2009a; RC 2010). Other unfavourable economic conditions that may lead to the problem include 1) the rise of the prices of raw material such as steel and cement in 2008 (Cheah 2008), 2) "selfish" financial system, i.e. one that "lends an umbrella on a fine day and takes it away when it rains" (Chen 2007), 3) higher interest charge that discourages potential home buyers to buy residential properties and reduces the profitability of a project (Ibrahim 2006), and 4) competition of new residential projects (Ibrahim 2006) that affects the sales and hence the cash flow of a project.

2.1.5 Financial problems

A number of sources cited financial problems as a cause of abandoned construction projects (Bavani 2009; Ibrahim 2006; Kong 2009; Rajan 2005; Rusli 2006). However, it is felt that financial problem is the effect of other aforementioned causes prior to being abandoned. For instance, increases in project costs (Teoh & Lim n.d.) may be due to mismanagement or unfavourable economic conditions; and, the lack of proper feasibility study to determine the right type of development and unattractive marketing strategy ultimately affect the sales and hence lead to the financial problem.

It is noticed that a big proportion of the available literature (which is mainly news articles) lacks credibility and cannot be held as conclusive findings to represent the actual causes of abandoned construction projects in Malaysia. In addition, almost all of the literature available is mainly concerned with abandoned housing projects. Therefore, the actual causes identified are not comprehensive and representative of the actual causes of abandoned construction projects in this country. Hence, a more detailed research concerning abandoned construction projects that includes housing and non-housing projects in Malaysia is necessary.

2.2 Factors Affecting the Success of Projects

As an abandoned construction project is one type of failed or unsuccessful project, it is therefore believed that some of the factors that

adversely affect the success of projects might also be the actual causes of abandoned construction projects. Since the available literatures on actual causes of abandoned construction projects are limited, a thorough review on all the factors that adversely affect the success of projects is necessary with the aim to identify a list of potential causes of abandoned construction projects. These will be subsequently verified through an industry wide questionnaire survey.

Before the negative factors affecting the success of projects are studied individually in detail, ways that factors can be grouped are first explored. This is because groups or categories of factors help to organize in order to ease comprehension and analysis on a multitude of factors, sub-factors and beyond. Categories help to group similarities together, therefore shed light onto the relationships of certain common features. Different ways of categorizing emphasize different characteristics of the factors, therefore revealing more different relationships between the factors. It is found from the literature that these appear to fall into four groups such as:

1. Categories according to different project phases;
2. Categories according to different success criteria;
3. Categories according to different functional entities in and around a project; and
4. Special categories.

Categories of factors according to different project phases are shown in Table 2.1 and categories of factors according to different success criteria are

shown in Table 2.2. The project phases shown in Table 2.1 seem to be generic for most construction projects. As for the success criteria shown in Table 2.2, it seems that these are a far cry from what could be the causes of abandoned construction projects as identified from the literature review in the previous section, e.g. failing to achieve outstanding project performance does not mean that the project is a failed/abandoned project.

Table 2.1 Categories of factors according to different project phases

Lim and Mohamed (1999)	El-Diraby and Gill (2006)	Pinto and Prescott (1988)
Conceptual	Pre-project	Conceptual
Planning	Planning	Planning
Design	Design	
Tender		
Construction	Construction	Execution
		Termination
Operation	Operation	

Table 2.2 Categories of factors according to different success criteria

Cooke-Davies (2002)	Jaselskis and Ashley (1991)	Dissanayaka and Kumaraswamy (1999)
Project management success (measured against cost, time, and quality)	Achieving better schedule performance	Time
	Achieving better budget performance	Cost
Project success (measured against the overall objectives of the project)	Achieving outstanding project performance	
Corporate success (measured by consistently successful projects)		

There are also special categories found (see Table 2.3) that serves to categorize very specific issues affecting the success of projects, i.e. the risks according to their association with a specific project component (El-Diraby &

Gill 2006), the competencies of superior project managers (Cheng et al. 2005), the quality affecting human error factors grouped according to different hierarchy (Atkinson 1998), and the risk factors according to their influence and dependence on other risk factors (Jha & Devaya 2008).

Table 2.3 Special categories

El-Diraby and Gill (2006)	Cheng et al. (2005)	Atkinson (1998)	Jha and Devaya (2008)
• Sub-structure • Super-structure • Power system • Equipment installation	• Behavioral competencies • Job-task competencies	• Primary factors (factors related to the individual) • Managerial factors • Global factors	• Influent factors • Relay factors • Depending factors • Autonomous factors

Categories of factors according to different functional entities in and around a project are depicted in Table 2.4 (see APPENDIX A for full details). Similar categories on the same row are merged and stated on the leftmost columns of these tables. The groups of functional entities are groups of highly related processes/functions such as the processes related to the procurement of a project, the functions of a project manager in particular, and other participants of projects such as the client/owner, the consultant and the contractor. To cover all factors that affect the success of projects, there are also the groups for factors related to the characteristics of the project and external factors.

Table 2.4 Categories of factors according to different functional entities in and around a project (see APPENDIX A for full details)

Merged categories	**Chan et al. (2004)**	**Belassi and Tukel (1996)**	**Chua et al. (1999)**
Project characteristic related factors	Project-related factors	Factors related to the project	Project characteristics
Procurement related factors	Procurement-related factors		Contractual arrangements
Project management factors	Project management factors	Factors related to the project manager and the team members	
Project participants related factors	Project participants-related factors		Project participants
External factors	External factors	Factors related to the external environment	
Other factors		Factors related to the organization	Interactive processes

On choosing the right way of categorizing factors, firstly the grouping of the actual causes of abandoned construction projects reviewed in the previous section is considered, i.e. mismanagement, unfavourable government policies, inefficient public delivery system, unfavourable economic conditions, and financial problems. It suggests that the causes of abandoned construction projects tend to correspond more with the categories found in Table 2.4, i.e. categories according to different functional entities in and around a project. Furthermore, it also appears that the most common ways of categorizing factors affecting the success of projects are those found in Table 2.4 judging by the number of literature found (see APPENDIX A for full details). Therefore, in the following subsections, the negative factors are reviewed according to the merged categories of Table 2.4 namely:

1. Project characteristic related factors;
2. Procurement related factors;
3. Project management factors;
4. Project participants related factors;
5. External factors; and

6. Other factors.

2.2.1 Project characteristic related factors

Project characteristic related factors are related to the inherent nature of a project, e.g. type, size, complexity, etc. As every project is unique, so are its characteristics.

2.2.1.1 Type

There are many types of project in the construction industry. They are built on the needs of the world's inhabitants to provide shelter, conquer distances, harness energy, create public spaces, protect from natural disasters and build historical monuments (Gould 2005). Typical examples are buildings, highways, drainages, bridges, city sidewalks, dams, tunnels, marinas, harbours, structures in the deep open sea, thermal power plants, petroleum refineries, mining developments, rapid transit systems and water treatment plants (Barrie & Paulson 1992; Gould & Joyce 2003).

2.2.1.2 Size

The size of a project will determine a project's cost. However, the absolute cost of a project will also depend on the location of the project. Although the size and complexity of a project are related in the way that most complex projects are big in size and vice versa, there are projects that are small

and yet relatively more complex, and big projects that are relatively less complex. For example, a hospital block is more complex than a school classroom block because of extra electrical services and internal fittings; constructing a building in the middle of a city is more complex than constructing a building in a non-urban area because of the need to control noise pollution, and accommodate traffic and smaller working space.

2.2.1.3 Complexity

The higher the complexity of a project, the higher are its risk and its requirement for higher skilled labour. The higher its requirement for higher skilled labour, the higher is the cost of the project. Complexity of project may also be discussed in terms of the level of technology required.

From a client's perspective, the knowledge of the consequences of these factors might enable the client to weigh the risks of different design alternatives before selecting a final design. From a constructor's perspective, this would enable the constructor to be more proactive in dealing with projects of different risks.

Sometimes, the inherent nature of a project can be inevitable, which leads to difficulty of design and construction. For example, the need to construct on hill slopes at the eastern side of Kuala Lumpur, or the need to adopt innovative and new technology (Dissanayaka & Kumaraswamy 1999), just like the SMART Tunnel of Kuala Lumpur to solve its flood problems.

Other than the inherent nature of the project, the difficulty of design and construction factor can also be due to incompetent designers who produce designs that are impractical and lack in standardization, therefore difficult to construct, or, over-designing and therefore increasing the overall cost (Toor & Ogunlana 2008). Difficult design, be it the result of the project's inherent need or due to incompetent designers, can cause delays in the approval process (Dissanayaka & Kumaraswamy 1999).

All in all, the type, size, location and level of technology required determine the complexity of a project. Higher complexity raises the difficulty of design and construction thus risking delays, besides incurring a higher cost. These may lead to abandonment of projects.

2.2.2 Procurement related factors

The scope of procurement is defined as the framework within which construction is brought about, acquired or obtained (Dissanayaka & Kumaraswamy 1999). Procurement related factors are concerned with the process of getting together the required resources, such as land, material, equipment, money, and people, generally via contractual arrangements prior to the actual construction process. Procurement related factors include 1) inadequate feasibility study, 2) inappropriate contract arrangements, 3) poor contract administration, 4) faulty tender process, and 5) site acquisition problems.

2.2.2.1 Inadequate feasibility studies

The feasibility study seeks to determine whether the project is capable of execution in terms of its physical complexities, planning requirements and economics (Ashworth 2002). Examples given include whether the available site is too prohibitive in terms of its size or shape, or whether the ground conditions would make the proposed structure too costly, and whether planning authorities would refuse permission for the specific type of project or impose restrictions that limit its overall viability in terms of the return of capital invested. Delays can be resulted from inadequate project feasibility studies (Toor & Ogunlana 2008), specifically deficiencies in cost estimates prepared (Frimpong et al. 2003) and improper technical study by the contractor during the bidding stage (Sweis et al. 2008). Deficiencies in cost estimates prepared can also cause cost overruns (Frimpong et al. 2003). Delays and cost overruns may eventually lead to the abandonment of a project.

2.2.2.2 Inappropriate contract arrangements

Contract arrangements can be divided into four categories, i.e. 1) separated and cooperative, e.g. traditional contracts, 2) management oriented contracts, 3) integrated, e.g. design and build contracts, and 4) discretionary, e.g. partnering (Harris et al. 2006). Different categories are distinguished by the responsibility and authority of the contracting parties. Different contract arrangement may also entail different mode of financing a project, e.g. the different mode of financing between Build Own Operate and Transfer (BOOT),

Design Build Finance and Lease (DBFL), and Public Private Partnership (PPP) of integrated contracts. The Latham Report (as cited in Holroyd 2003) detailed how different contract options (management, prime cost, approximate quantities, lump sum, fixed price, design and build, and package deal) are different in terms of risk allocation between the client and the contractor.

Inappropriate contract arrangements contribute to disputes in international projects (Chan & Tse 2003). Unclear lines of responsibility and authority (Toor & Ogunlana 2008) and inappropriate mode of financing project (Elinwa & Joshua 2001) may cause delays. Inappropriate risk allocation among project team members (Dissanayaka & Kumaraswamy 1999; Toor & Ogunlana 2008) means risk is not shared proportionately according to each team members' financial ability. When problems arise, they usually affect the one who assumed too much risk. When the one is unable to absolve the impacts of the risk, the resultant liquidation may potentially lead to delay, cost overrun or even abandonment of project.

2.2.2.3 Poor contract administration

Poor contract administration includes problems such as incomplete contract documents (Toor & Ogunlana 2008), ambiguities or mistakes in scope of work (Chan & Tse 2003), specifications or drawings (Sweis et al. 2008). Poor contract administration also includes lack of appropriate dispute resolution method which means either no dispute resolution mechanism is integrated in contract (Chan & Tse 2003), or that the method used is

inappropriate (Toor & Ogunlana 2008). These result in delays and disputes in a construction project which might eventually render a project to be abandoned.

2.2.2.4 Faulty tender process

The most common tendering methods in Malaysia are open tendering, selective tendering, and negotiated tendering (Abdul Rashid 2002). Faulty tender process may be due to a lack of clear bidding process (Toor & Ogunlana 2008) or that tender has not been properly prepared and assessed (Chan & Tse 2003). It results in wrong choice of contractor or consultant for the project (Toor & Ogunlana 2008). Tenders that are not properly prepared and assessed contribute to disputes in international project (Chan & Tse 2003).

Another aspect of faulty tender process is the inappropriate pricing/incentives of services rendered by contractors or consultants (Dissanayaka & Kumaraswamy 1999). The inappropriate pricing/incentives might be due to low bid (Frimpong et al. 2003) in the presence of many competitors (Belassi & Tukel 1996). It can cause low motivation and higher risk of cash flow problems among the project team members. Low motivation and higher risk of cash flow problems among the project team members can also be due to the lack of perceived profitability for all groups in the project team (Dissanayaka & Kumaraswamy 1999), regardless of the actual reality.

2.2.2.5 Site acquisition problems

Site acquisition problems may involve problems related to the presence of squatters, technical issues of conversion, amalgamation or subdivision of the land, or the approval of the land use by the authorities. The approval of land use is not governed by any statute but merely depends on the prevalent political and socio economic conditions, resulting in diversity of land use planning policy, creating uncertainty and confusion (Awang 1997). If the client fails to acquire the land for the project then the project cannot go ahead and may be abandoned.

2.2.3 Project management factors

Project management factors are factors that are resulted from an ineffective project manager, such as problems of communication and coordination, inappropriate project planning and scheduling, project control problems, and poor safety management on site, etc.

2.2.3.1 Problems of communication and coordination

Communication system is critical towards the success of a project. A successful project manager is to ensure that design and other production information are appropriately and effectively communicated to members of the project team (Cheng et al. 2005). A good communication system will ensure that information be carried around and exchanged among all project

participants (Fryer 2004). Communication of information also involves the recording of information into explicit forms to facilitate communication across dimensions of space and time. ICT technologies adopted by a firm can be considered tangible communication systems. The level of implementation of ICT technologies can be measured by looking at how much a firm has adopted ICT technologies.

In construction, communication and coordination are closely related. Successful coordination often entails good communication. Problems of communication and coordination consists of three aspects, i.e. 1) the lack of communication among project team member (Toor & Ogunlana 2008), 2) ineffective communication among project team members (Dissanayaka & Kumaraswamy 1999), and 3) slow response to communication among project team members (Dissanayaka & Kumaraswamy 1999; Sweis et al. 2008; Toor & Ogunlana 2008). Examples of the lack of communication among project team members include the lack of contractor's request for information or the response to it (Dissanayaka & Kumaraswamy 1999), the lack of coordination between contractor and design team (Elinwa & Joshua 2001) and the lack of consultation with client (Toor & Ogunlana 2008), etc. Examples of ineffective communication among project team members include inadequacy of contractor's progress reports to clients or consultants (Dissanayaka & Kumaraswamy 1999; Sweis et al. 2008) and the lack of use of information technology (Toor & Ogunlana 2008). Examples of slow response to communication among project team members include contractor's slow response to instruction (Dissanayaka & Kumaraswamy 1999), slow decision

making from owner or client (Dissanayaka & Kumaraswamy 1999; Sweis et al. 2008; Toor & Ogunlana 2008), and slow response by the consultant engineer regarding testing and inspection and to contractor's inquiries (Sweis et al. 2008).

2.2.3.2 Inappropriate project planning and scheduling

In Oxford Dictionaries (Oxford Dictionaries 2010b), a plan is: "1) a detailed proposal for doing or achieving something, 2) an intension or decision about what one is going to do . . .". And, to plan is to: "1) decide on and make arrangements for in advance, 2) design or make a plan of (something to be made or built)".

According to Griffith and Watson (2004), planning is coupled with programming. Planning is defined as the process of determining, analysing, devising and organizing the resources required for a construction project, while programming is defined as sequencing of those resources. Accurate short-term planning is key to maintaining progress and control. Inappropriate project planning and scheduling (Frimpong et al. 2003; Sweis et al. 2008) can result in high frequency of schedule adjustments (Dissanayaka & Kumaraswamy 1999).

2.2.3.3 Project control problems

According to Fryer (2004), controlling involves comparing performance/feedback on costs, progress and the quality of materials and

workmanship with plan. A cost control system should enable a manager to observe current cost levels, compare them with a standard plan or norm, and institute corrective action to keep cost within acceptable bounds (Harris et al. 2006). Progress control involves progress monitoring, charting, evaluation and review at appropriate and regular meetings (Griffith & Watson 2004). Project control problems such as problems of time and cost control might cause delay and cost overrun (Frimpong et al. 2003).

Quality control is a process of inspecting and confirming that the finished installation or work has indeed met the design specifications enumerated in the contract documents (Lambeck & Eschemuller 2009). The causes of human errors which affect the quality of construction are failures in communications, errors caused by concurrency of several phases of a project, errors caused by changes, failures in checking, supervision and control, time pressures and lack of proper education and training (Atkinson 1998). Also, project managers need to be vigilant of the temptations of bribery by subcontractors so as not to lose control of the quality of the construction work (Chiang 2008). Poor quality control may lead to delay (Toor & Ogunlana 2008).

2.2.3.4 Poor safety management on site

Poor safety management on site (Sweis et al. 2008) might cause serious disruption to a construction project. According to Griffith and Watson (2004), principal contracting organizations need to ensure that health and safety aspects

of a construction project are clearly recognized, risk-assessed, planned, organized, controlled, monitored, recorded, audited and reviewed in a systematic and robust way. One way to achieve this is to implement a health and safety management system. Apart from site safety officers, project managers also play an important role in instilling the right safety work culture (Chiang 2008).

Another project management factor is bureaucracy and red tape within the project (Toor & Ogunlana 2008) which means there are too much unnecessary procedures and paperwork within the project that could result in delays.

2.2.4 Project participants related factors

Project participants related factors are mainly concerning clients/owners, consultants, contractors, subcontractors, site workers, and suppliers. These include unavailability of materials and equipment, financial difficulties faced by the owner and contractor, problems related to change orders / variation orders, and poor relationship among project team members.

2.2.4.1 Clients/owners

Clients of construction projects may consist of private and public clients, and they are usually the initiators and paymasters of the construction projects. As initiators, they are usually responsible for initial design

requirements. Factors identified by Chan et al. (2004) that are related to providing initial design requirements are clients' experience, emphasis on high quality of construction, emphasis on quick construction, ability to brief and ability to make decision. Besides, due to the competitiveness of subcontracting, clients' emphasis on low construction cost (Chan et al. 2004) could drive contractors and subcontractors into offering unrealistically low price, then cutting corners and offering bribes to recover their losses (Chiang 2008). Therefore, clients may influence the success of projects, and may lead to the abandonment of projects.

2.2.4.2 Consultants

Consultants in a construction project typically consist of architects, civil and structural (C&S) engineers, and mechanical and electrical (M&E) engineers. Incomplete or poor detail design on the part of consultants can cause delay (Zhi 1995). Designers should also avoid out of sequence design process (due to design changes and incomplete or delayed information by the customer) which could lead to schedule delay, but this must be well-balanced with the trade-off of meeting customer requirements in the best possible manner (Koskela et al. 1997). In order to minimize design-related risks, consultants may follow the risks identification and assessment system outlined by Chapman (2001) which is 'knowledge acquisition', 'selection of the core design team', 'presentation of the process', 'identification', 'encoding' and 'verification'.

2.2.4.3 Contractors, subcontractors, and site workers

Incompetent contractors or subcontractors are due to many reasons such as, 1) the lack of contractor's past experience (Toor & Ogunlana 2008), 2) the shortage of technical professionals in the contractor's organization (Frimpong et al. 2003; Sweis et al. 2008), and 3) the lack of competent administrative personnel in the contractor's organization (Chan & Tse 2003; Dissanayaka & Kumaraswamy 1999; Sweis et al. 2008). Incompetent contractors or subcontractors often use obsolete and poor construction techniques (Awakul & Ogunlana 2002; Sweis et al. 2008; Toor & Ogunlana 2008). These incompetent contractors or subcontractors are also often seen handling work on more than one site (Elinwa & Joshua 2001), where the amount of work is beyond their capability.

Contractors can significantly improve the chances of overall project success by reducing team turnover, implementing constructability programs, and increasing the number of construction control meetings (Jaselskis & Ashley 1991). Constructability programs can also enhance schedule performance (Jaselskis & Ashley 1991). Contractors can also achieve better budget performance by reducing team turnover, increasing the number of budget updates and having four to six control meetings per month (Jaselskis & Ashley 1991).

Shortage of site workers (Elinwa & Joshua 2001; Frimpong et al. 2003; Sweis et al. 2008; Toor & Ogunlana 2008) might result in severe overtime and

shifts (Toor & Ogunlana 2008). Site workers include technical personnel and hard labour. Lack of motivation of site workers might be due to the lack of proper incentives to the site workers (Elinwa & Joshua 2001), and this might result in poor productivity and absenteeism problems (Toor & Ogunlana 2008).

As for relationship between contractor and labour (industrial relation) (Elinwa & Joshua 2001), unionized workers are generally better off. For example union workers tend to perceive better safety climate than non-union workers (Gillen et al. 2002). However, union influence in this part of the world, especially Malaysia, is practically nil due to the inherent subcontracting culture as increased subcontracting is correlated with reduced union influence (Croucher & Druker 2001). The proliferation of subcontracting and contractors' exploitation of small craft-based subcontractors are believed to be partly, if not mostly, responsible for the fragmentation of the industry and the persistent problems of quality, productivity, non-payments and safety (Chiang 2008). There may be other non-union employee representation (NER) in the industry, but these NER structures are used as devices for consultation and communication rather than as bargaining agents (Gollan 2001).

According to Lai (as cited in Chiang 2008), contractors divide the works into small packages because small contractors would 1) have their heads being the gangers actually working on site, 2) be obedient and cooperative, 3) offer lower prices and 4) be less claim conscious. The main contractor would then spend much of their time managing and coordinating their large pool of small contractors instead of doing the works themselves.

Arditi and Chotibhongs (2005) suggest that clients' project managers can mitigate the problems of non-payment to workers by asking contractors to list their subcontractors in their own tender documents. Once their tender is accepted, the contractor cannot change their subcontractors without clients' approval, thus helping prevent the exploitation of subcontractors' weak bargaining position in a post award bid shopping. Project managers, from both the clients' and contractors' sides, can also ensure that payments are paid when they become due to the subcontractors.

Although site managers do not have direct authority over sub-contract operatives and do not dictate the rewards to sub-contractors, the attention they give to target setting, planning and co-ordination can create better prospects for sub-contract staff to achieve their goals (Fryer 2004).

2.2.4.4 Unavailability of materials and equipment

Unavailability of materials and equipment might be due to three reasons, i.e. 1) transportation problem (Al-Momani 2000; Elinwa & Joshua 2001; Frimpong et al. 2003; Sweis et al. 2008), 2) shortage of materials or equipment (Elinwa & Joshua 2001; Frimpong et al. 2003; Sweis et al. 2008; Toor & Ogunlana 2008), and 3) material procurement problem (Frimpong et al. 2003), as in the case of imported materials or incompetent contractor. As for unavailability of equipment, it might also be due to frequent breakdowns of the equipment (Frimpong et al. 2003; Sweis et al. 2008) which will result in more maintenance work for the equipment (Elinwa & Joshua 2001). The contractor

might partly be blamed for this, either for neglecting maintenance in the first place, or using cheap but aged equipment.

2.2.4.5 Financial difficulties faced by the owner and contractor

Financial difficulties faced by the contractor (Frimpong et al. 2003; Sweis et al. 2008; Toor & Ogunlana 2008), financial difficulties faced by the owner (Sweis et al. 2008), and delays in interim payments (Dissanayaka & Kumaraswamy 1999) are all interrelated. Financial difficulties faced by the contractor might be due to delay of payments by the owner (Sweis et al. 2008; Toor & Ogunlana 2008). Like the domino effect, it might result in delay in contractor's payments to subcontractors (Frimpong et al. 2003; Sweis et al. 2008). Delay in interim payments might also be due to inappropriate payment modality, i.e. pricing mechanisms (e.g. whether 'lump sum fixed price' or 'remeasure') and the timing of payments for completed work (Dissanayaka & Kumaraswamy 1999). When a contractor abandons due to delay in payment, it may incur additional time and cost, and lead to abandonment of project.

2.2.4.6 Problems related to change orders / variation orders

Lambeck and Eschemuller (2009) identify change order / variation order as a cause for a new scope of work that was not indicated on the bid construction documents. A request for a change order / variation order can be initiated by any of the following (Lambeck & Eschemuller 2009):

1. The owner;

2. The architect or other design consultant;
3. Unforeseen conditions (i.e., soil conditions different from the submitted boring logs);
4. Municipal government requirements;
5. Missing information as determined by RFIs (request for information);
6. Design discrepancies;
7. Latent conditions;
8. Potential coordination problems with owner provided equipment;
9. Acceleration to the schedule;
10. Damage caused by insurance claims (hurricanes, tornados, earthquakes); or
11. Changes to equipment or finishes that were initially specified but no longer manufactured.

Time and cost overruns can be resulted from changes in design and materials (Elinwa & Joshua 2001), changes in construction techniques (Elinwa & Joshua 2001; Toor & Ogunlana 2008), and changes in quantity of work (Al-Momani 2000; Dissanayaka & Kumaraswamy 1999). These problems could be due to inexperienced client/owner (Dissanayaka & Kumaraswamy 1999), incompetent consultants (Sweis et al. 2008) and incompetent contractors. Problems related to change orders / variation orders can be exacerbated by high frequency and significance of change orders (Dissanayaka & Kumaraswamy 1999).

2.2.4.7 Poor relationship among project team members

Poor relationship among project team members (Toor & Ogunlana 2008) could happen when its importance is overlooked, as in one off, non-local project where there is a lack of need to worry about long term business relationship (Chan & Tse 2003).

Other factors include involvement of large number of participants of project (Toor & Ogunlana 2008), and unskilled/incompetent site workers (Dissanayaka & Kumaraswamy 1999; Sweis et al. 2008; Toor & Ogunlana 2008) that could result in time and cost overruns.

2.2.5 External factors

External factors are factors out of the control of project participants, such as the unexpected location difficulty, adverse weather or acts of god, negative impact of project towards society or environment, unexpected bad economic conditions, lack of cooperation from local authorities, and unfavourable government policy.

2.2.5.1 Unexpected location difficulty and adverse weather or acts of god

Unexpected location difficulty includes unexpected ground conditions (Dissanayaka & Kumaraswamy 1999; Frimpong et al. 2003; Toor & Ogunlana 2008), obstruction due to underground utilities (Dissanayaka & Kumaraswamy

1999), and adverse weather or acts of god (Al-Momani 2000; Elinwa & Joshua 2001; Frimpong et al. 2003; Sweis et al. 2008; Toor & Ogunlana 2008). Bad weather and unforeseen ground condition are among factors that cause schedule delay (Zhi 1995). For example, limestone areas are characterized by some of the most difficult ground conditions in Malaysia, namely: weak soils overlying limestone bedrock with karstic features such as pinnacles, solution channels, cavities and overhangs, posing difficulties both during design and construction of foundations (Chan & Hong 1986).

2.2.5.2 Negative impact of project towards society or environment

Negative impact of project towards society or environment includes site pollution and noise (Toor & Ogunlana 2008) that negatively impact water resources, forest, wildlife and nearby residents (Awakul & Ogunlana 2002). As in a case in Thailand this resulted in conflicts and non-cooperation with local residents and the need to pay compensation (Awakul & Ogunlana 2002). These could be linked back to inadequate project feasibility studies such as the environmental impact assessment (EIA), and public consultation sessions (Awakul & Ogunlana 2002).

2.2.5.3 Unexpected bad economic conditions

Unexpected bad economic conditions (Al-Momani 2000; Toor & Ogunlana 2008) can affect a project in many ways such as 1) escalation of material prices (Dissanayaka & Kumaraswamy 1999; Frimpong et al. 2003;

Sweis et al. 2008; Toor & Ogunlana 2008), 2) increase in the cost of financing due to higher interest rate (Toor & Ogunlana 2008), and 3) lower returns of investment once the project is completed. The bad economic and financial conditions may arise from a local economy crisis (such as sharply decreasing GNP), significant under-development (such as an incompatibly low GNP per capita), interest rate fluctuations, rising inflation, foreign currency exchange rate fluctuations, and rising tax rates (Zhi 1995). For example, the construction of the Second Penang Bridge was delayed partly due to increased prices (NST Online 2008). If the situation becomes bad, project may become unprofitable, leading to abandonment.

2.2.5.4 Lack of cooperation from local authorities and unfavourable government policy

Other factors include lack of cooperation from local authorities (Toor & Ogunlana 2008), and unfavourable government policy (Elinwa & Joshua 2001) such as difficulties in obtaining work permits (Sweis et al. 2008). The lack of cooperation from local authorities and unfavourable government policy could be linked with the political environment. The most distressing political risks are war, revolution, civil disorder, and inconsistency of government policies (Zhi 1995). In another example, a news article (NST Online 2008) shows contradicting statements of government officials from different political parties on the delay of the Second Penang Bridge, which seems to imply that the delay was partly due to political reasons.

2.2.6 Other relevant factors

This category covers factors such as cultural clash among parties involved in project (Chan & Tse 2003), litigation (Elinwa & Joshua 2001), and fraudulent practices and briberies (Toor & Ogunlana 2008). Cultural clash normally happens in large or complex projects where participants come from different cultural backgrounds. Litigation usually involves solving disputes through lengthy court proceedings, when participants fail to use alternative dispute resolution methods such as arbitration, mediation, negotiation, etc. However, the list is not exhaustive pending the result of the study.

As a result of the literature review above, all the negative factors affecting the success of projects reviewed are summarized into a list of forty one factors, grouped as depicted in Table 2.5 below.

Table 2.5 Categories of negative factors that may adversely affect the success of projects

Categories	Negative factors
Project characteristic related factors	Difficulty of design and construction
Procurement related factors	Inappropriate risk allocation among project team members Inappropriate pricing/incentives of services rendered by contractors or consultants Faulty tender process Ambiguities or mistakes in scope of work, specifications or drawings Inadequate project feasibility studies Lack of appropriate dispute resolution method Poor contract administration Site acquisition problems Unclear lines of responsibility and authority Inappropriate contract arrangements (traditional design-bid-build/design & build/management contracting/etc.) Inappropriate mode of financing project
Project management factors	Inappropriate project planning and scheduling Project control problems Bureaucracy and red tape within the project Poor quality control Problems of communication and coordination Poor safety management on site
Project participants related factors	Financial difficulties faced by the contractor Financial difficulties faced by the owner Delays in interim payments Problems related to change orders/variation orders Involvement of large number of participants of project Unavailability of materials and equipment Incompetent contractors or subcontractors Incompetent consultants Unskilled/incompetent site workers Shortage of site workers Lack of motivation of site workers Poor relationship among project team members Inexperienced client/owner Relationship between contractor and labour (industrial relation)
External factors	Adverse weather or acts of God Unexpected location difficulty Negative impact of project towards society or environment Lack of cooperation from local authorities Unexpected bad economic conditions Unfavourable government policy
Other factors	Cultural clash among parties involved in project Litigation Fraudulent practices and briberies

2.3 Summary

The causes of abandoned construction projects identified from existing literature mainly focus on issues concerning mismanagement, unfavourable government policies, inefficient public delivery system, and unfavourable economic conditions. It is found that the relevant literature available is mainly news articles which lacks credibility and focuses mainly on abandoned housing

projects. A more detailed research into abandoned construction projects in Malaysia is therefore required.

A list of 41 negative factors has been produced as a result of an extensive literature review on the factors affecting the success of projects. These potential causes of abandoned construction projects will be used as a basis for an industry wide questionnaire survey as well as semi structured interviews to gain industrial opinions on the causes of the problems as well as suggestions on how to solve the problems.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter describes the methods used in this research to accomplish the aim and objectives. It reviews existing literature on the meaning and background philosophy of research and research methodology. It also reviews the quantitative, qualitative, and triangulation methods, with discussions on the selection of a suitable method for this research. This is followed by discussions on the methods used in this research, i.e. literature review, questionnaire survey, and semi-structured interviews. Then, the techniques used for analysis of data are also presented.

3.1 What is research?

There are many definitions of what research is. Research can be defined as a systematic way of discovering new facts, or confirming existing facts, or denying previous research findings (Ahmed et al. 2006); a useful tool to obtain answers to questions (Mitchell & Jolley 2007); the creation of knowledge where it does not already exist (Beins 2009); a process through which new knowledge is discovered (Salkind 2009).

It can also be defined as the methodical search for knowledge by the discovery of facts and insights, and the demonstration of their relevance to existing knowledge (Richardson et al. 2005). In addition, a research has to have

specific aim or objective, i.e. to answer specific questions, solve a particular problem or test a hypothesis, clearly stated at the outset of the research (Naoum 2007). All in all, a research can be summarised as a systematic search for a specific new knowledge that is of relative importance.

3.2 Research methodology

In Oxford Dictionaries (Oxford Dictionaries 2010a), a methodology is "a system of methods used in a particular area of study or activity". Different authors of research methodology reference books use different terms, such as research strategy (Naoum 2007), research methods (Fellows & Liu 2008), and research design/method (Creswell 2009). Naoum (2007) defines research strategy as the way in which the research objectives can be questioned. According to Fellows and Liu (2008) research methods concern the techniques/approaches on collection and analysis of data. Creswell (2009) defines research designs as plans and the procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis. However, for the purpose of this research, the term 'research methodology' is preferred. Naoum (2007), Fellows and Liu (2008) and Creswell (2009) further divide research methodology broadly into quantitative and qualitative methods. In addition, Fellows and Liu (2008) and Creswell (2009) discuss an additional third method, called triangulated studies / mixed methods, which is basically a mixture of the quantitative and the qualitative methods. The quantitative, qualitative, and triangulated methods will be discussed in detail in the following sections.

3.2.1 Quantitative method

The quantitative method is "objective" in nature (Naoum 2007) and it is a means for testing objective theories by examining the relationship among variables (Creswell 2009). Quantitative approaches tend to relate to positivism and seek to gather factual data, addressing questions such as what, how much, and how many (Fellows & Liu 2008). According to Richardson et al. (2005) quantitative research involves the measurement of tangible variables and their interrelationships. Therefore, the data obtained using the quantitative method is quantified data, measurable using scientific techniques (Fellows & Liu 2008) and instruments (Creswell 2009). Examples of the data and results of the quantitative approaches are such as, compressive strength of a concrete cube, number of firms in an industry, market price of an item, content of an Architect's Instruction (Fellows & Liu 2008). Data from the quantitative method are normally analysed using statistical procedures (Creswell 2009). Analyses of the data yield quantified results and conclusions derived from evaluation of the results in the light of the theory and literature (Fellows & Liu 2008).

The quantitative method is also deductive in nature (Creswell 2009), as opposed to the inductive nature of the qualitative method. According to Fellows and Liu (2008), quantitative approaches adopt 'scientific method' in which initial study of the theory and literature yields precise aims and objectives with propositions and hypotheses to be tested. The final written report has a set structure consisting of introduction, literature and theory,

methods, results, and discussion (Creswell 2009), and this may be due to the objective and deductive nature of quantitative research.

The strategies of inquiry associated with quantitative research are survey research and experimental research (Creswell 2009). According to Salkind (2009), experimental method tests for the presence of a distinct cause and effect by controlling the potential sources of differences. However, controlling for the sources of differences for an abandoned construction project is not possible given the multitude of factors influencing the success of projects and it would be too costly and too time consuming to conduct even a single experiment.

According to Creswell (2009) survey research provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. It includes questionnaires and structured interviews. In a structured interview, questions are presented in the same order and with the same wording to all interviewees, and the questions are dominated by ‘closed’ questions as oppose to ‘open’ questions (Naoum 2007). Questionnaire is seen as more suitable than structured interviews because structured interviews are more costly and time consuming. Therefore it is not preferred due to resource constraint.

3.2.2 Qualitative method

Many authors describe the qualitative method as exploratory in nature (Creswell 2009; Fellows & Liu 2008; Naoum 2007; Richardson et al. 2005). Specifically, Creswell (2009) describe the process of qualitative research as involving emerging questions and procedures. Fellows and Liu (2008) explains that qualitative studies seek to go deep and to gain insights. Therefore, the results of qualitative studies tend to be detailed and hence rich in content and scope (Fellows & Liu 2008), and complex (Creswell 2009).

The qualitative method is also inductive in nature. According to Fellows and Liu (2008), the exploration of the subject is undertaken without prior formulations, the object is to gain understanding and collect information and data such that theories will emerge. Creswell (2009) states that the data analysis process is inductively building from particulars to general themes.

According to Richardson et al. (2005), the subjects studied in a qualitative research are intangible variables and phenomena (often behaviour). The subjects studied are described as complex situation, and social or human problem (Creswell 2009). Fellows and Liu (2008) state the subjects studied as the reason things happen as they do; events, processes and structures; aspects of people's social world; people's assumptions, prejudices, etc., and the impact of these on behaviour and, thence, (organisational/project) performance.

The participant giving information on the subject studied may be an individual or a group (Creswell 2009; Fellows & Liu 2008). Different authors give various descriptions of the information given by the participant, i.e. verbal description or explanation (Richardson et al. 2005); meanings, experiences (often verbally described), and description (Naoum 2007); meaning the individuals or groups ascribe to a social or human problem (Creswell 2009); meaning which people attribute to events, processes and structures, people's perceptions of the world, people's assumptions and prejudices, and briefs, understandings, opinions, views etc. of people (Fellows & Liu 2008).

Analysis of qualitative data involves the researcher making interpretations of the meaning of the data (Creswell 2009). Also, analyses of qualitative data requires a lot of filtering, sorting and other 'manipulations' to make them suitable for analytic techniques (Fellows & Liu 2008). For example, transcribing interviews and analysing the content of conversations.

Qualitative method is "subjective" in nature (Naoum 2007). Fellows and Liu (2008) state that the objectivity of qualitative data is often questioned, especially by people with a background in the scientific, quantitative, positivist tradition. Fellows and Liu (2008) also added that a variety of external, environmental variables are likely to impact on the data and results and the researchers are likely to be intimately involved in all stages of the work in a more active way than usually is acceptable in quantitative studies. The final written report of qualitative research has a flexible structure (Creswell 2009), and this may be the result of the subjectivity of qualitative research.

Qualitative methods include direct and participant observation, videotaping of subjects, and document analysis (Richardson et al. 2005), historical methods (Salkind 2009), grounded theory, phenomenological research, and narrative research (Creswell 2009), case studies (Creswell 2009; Richardson et al. 2005; Salkind 2009), interviews (Richardson et al. 2005; Salkind 2009), and ethnography (Creswell 2009; Salkind 2009).

Interviews can be divided into structured, semi-structured and unstructured interviews (Naoum 2007), of which semi-structured and unstructured interviews conforms with the qualitative method in that subjectivity is allowed during questioning in order to gain emerging details from the interviewee. In a semi-structured interview, questions are not asked in a specific order and no schedule is used. The questions consist of a mixture of 'closed' and 'open' questions. In an unstructured interview, there is no set order or wording of questions, no schedule and the interviewer is not looking for the same information from each interviewee. Questions asked are mainly 'open' questions.

Semi-structured and unstructured interviews may be able to yield rich and detailed results. Unstructured interview is normally conducted at the beginning of any research when the researcher knows little about his/her subject area, whereas semi-structured interviews are conducted when the researcher has a number of specific topics around which to build the interview (Naoum 2007).

Historical methods primarily involve the analysis of written documents and the culling of records (Salkind 2009). However, the abandonment of construction projects is an on-going problem. Therefore, the historical methods are unsuitable.

Ethnography is a strategy of inquiry in which the researcher studies an intact cultural group in a natural setting over a prolonged period of time by collecting, primarily, observational and interview data (Creswell 2009). Grounded theory is a strategy of inquiry in which the researcher derives a general, abstract theory of a process, action, or interaction grounded in the views of participants (Creswell 2009). However, ethnography is not suitable for this research as abandoned projects are passed events and cannot be observed in its natural setting while it occurs. Grounded theory may be similar to interviews in that general understanding of a problem is derived from analysing the qualitative data from interviewees.

According to Creswell (2009), phenomenological research is a strategy of inquiry in which the researcher identifies the essence of human experiences about a phenomenon as described by participants; and narrative research is a strategy of inquiry in which the researcher studies the lives of individuals and asks one or more individuals to provide stories about their lives. Phenomenological research is not suitable for this research because the causes of abandoned construction projects are not the essence of human experiences. Narrative research is also not suitable because this research is not about the lives of individuals.

Other methods, like direct and participant observation, and videotaping of subjects are not suitable because an abandoned construction project is a past event and cannot be directly observed or videotaped.

3.2.3 Triangulated studies / mixed methods

Triangulation studies / mixed methods are the use of both quantitative and qualitative approaches together to study a topic (Creswell 2009; Fellows & Liu 2008). The overall strength of a mixed method study is greater than either qualitative or quantitative research (Creswell 2009). Fellows and Liu (2008) state that triangulation may be employed to reduce or eliminate disadvantages of each individual approach whilst gaining the advantages of each, and of the combination – a multi-dimensional view of the subject, gained through synergy. Triangulation may be used for entire studies (such as by investigating a topic from several, alternative paradigms or/and research methodologies) or for individual part(s) of a study (such as collecting quality performance data from archival records of defects, questionnaires administered to project participants, and results of participant observation) (Fellows & Liu 2008).

For the purpose of this research which is rather unexplored, and given enough resources to complete both the questionnaire survey and semi-structured interviews, the triangulation method is chosen because it gives the details and depth of information via semi-structured interviews, and the ability to generalise the findings of the research to the whole construction industry via questionnaire survey. The questionnaire survey will be conducted first, and

then followed by the semi-structured interviews. In this way the semi-structured interviews can serve to answer or complement what specific gaps or questions raised by the questionnaire survey in detail apart from the basic questions of this research which are to identify the causes of abandoned construction projects and the solutions to the problem.

3.3 Literature Review

The literature review stage is mainly carried out at the beginning stages of the research but it continues throughout as the research progresses. Existing literature on the issues and causes of abandoned construction projects has been reviewed. The sources of information are mainly news articles. Apparently there is a lack of research in this area. Therefore, existing literature on potential causes of abandoned construction projects has also been reviewed by reviewing factors that could negatively affect the success of a project. It is believed that some of the factors that affect the success of a project, if overlooked, may lead to the abandonment of construction projects. These potential causes will be used as a basis for an industry wide questionnaire survey as well as semi structured interviews to gain industrial opinions on the causes of the problems as well as suggestions on how to solve the problems.

3.4 Questionnaire Survey

After the potential causes of abandoned construction projects have been identified through literature review, it is followed by the questionnaire survey.

3.4.1 Questionnaire design

The questionnaire consists of 4 pages. The first page contains questions related to the respondent, i.e. whether the respondent has been involved in an abandoned construction project, the role of the respondent in the project, how many years of experience the respondent has in the project, the type of the project, and how the project was funded.

The second and third page contains the 41 potential causes of abandoned construction projects identified through literature review. The respondents are asked to tick in the appropriate columns to indicate how much they agree that the factors are causes of abandoned construction projects on a five point Likert scale, i.e. strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree.

The fourth page consists of an open ended question on how do the respondent think the problems of abandoned construction projects can be solved, a thank you note, a section for the respondents to fill out their contact details, and a section containing the researcher's contact details. The questionnaire is included in APPENDIX B.

3.4.2 Sampling

According to Naoum (2007) the term 'sample' means a specimen or part of a whole (population) which is drawn to show what the rest is like.

Fellows and Liu (2008) explain that the objective of sampling is to provide a practical means of enabling the data collection and processing components of research to be carried out whilst ensuring that the sample provides a good representation of the population.

The first task in sampling is to define the population (Fellows & Liu 2008; Naoum 2007). The results of this research are aimed to be representative of the whole construction industry in Malaysia. Therefore the population should be all construction related people who has knowledge about the abandonment of construction projects.

Fellows and Liu (2008) classify the means of sampling into random sampling, judgemental sampling, and non-random sampling. Non-random sampling is further divided into systematic sampling, stratified sampling, cluster sampling, convenience sampling, and snowball sampling. Random sampling is carried out using random numbers, either from tables or from computer programs. Judgemental sampling is based on the judgement of the researcher which items of the population should form the sample. Systematic sampling selects a member of the population at a particular interval to form the sample, starting from a random point of the population. Stratified sampling is used when the population occurs in 'distinct' groups or strata. The number of samples coming from different stratum is proportioned according to the relative importance of each stratum, while the sampling within each stratum is done randomly. Cluster sampling is appropriate where a population is divided into groups which inter-group differences are small whilst intra-group differences

are large. The clusters are selected randomly and the total members of the clusters provide the total sample. Convenience sampling may be used where the nature of the research question(s) and the population do not indicate any particular form of sample and so, the researcher collects data from a sample which can be accessed readily (it is convenient). Snowball sampling is used when data are difficult to access, so the researcher starts with a small number of sources (respondents), and progressively building a sufficient sample by asking the sources to identify further sources.

It is anticipated that the response rate will be low due to the nature of this research. Therefore convenience sampling is opted by sending the questionnaires to the contacts which are readily available / accessible. The contacts are obtained from the websites of Malaysia Yellow Pages (Anon n.d.) and the Construction Industry Development Board of Malaysia (CIDB) (CIDB Malaysia 2010). The targeted respondents are from different areas of the construction industry, i.e. clients/developers, consultants, and contractors to ensure a comprehensive view will be obtained. A total of 2500 questionnaires were sent out by post with a response rate of 8.9%. Additionally, the researcher also sent out questionnaires to three personal contacts of which two were returned. A detailed breakdown of the respondents is given in the next chapter on analysis of data. Generally, the 225 samples returned are sufficient. This is evident in factor analysis, whereby the 225 samples yield 103 samples from respondents with experience in abandoned projects which are used in the analysis. This gives a Kaiser-Meyer-Olkin measure of sampling adequacy value of 0.890 which falls in the ‘great’ category (see section 4.3.1 in page 77).

3.5 Semi-structured Interview

The semi-structured interviews were carried out after the questionnaire survey was conducted. The interviewees were some of the questionnaire respondents who had indicated that they have been involved in an abandoned construction project, and individual professionals in the industry who are known to be well experienced. The interviewees include architects, developers, property consultants, the honorary secretary general of the National House Buyers Association etc. to ensure a comprehensive view was obtained.

The interviewees were mainly asked to give 1) the causes of abandonment of construction projects, and 2) any suggestions to help solve/manage the problems of abandonment of construction projects. During the interviews, some probing questions were asked in order to get more details from the interviewees, such as asking the interviewee to elaborate on some vague points or to give examples. Some interviewees were also asked to suggest people whom they know are well versed in the subject matter to be interviewed.

The interviewees were sent letters or emails in advance requesting for an interview. The letters and emails contain an introduction of the researcher, the title of research, the request and purpose of the interview, the main questions to be asked, an assurance that any specific identification of any particular project, organisation or person which is sensitive will be kept

confidential, and that the researcher can be available at any place and time convenient to the interviewee.

3.6 Analysis of Data

Basic descriptive methods, ranking of potential causes with Spearman's ranking correlation coefficient, and factor analysis with Cronbach's α reliability analysis were used to analyse the data from questionnaire survey. Basic descriptive methods include frequency distribution and mean. The Spearman correlation is to measure the similarity in ranking a list of items between different groups of respondents (Field 2005; Naoum 2007), i.e. the ranking of the 41 potential causes of abandoned construction projects by the different demographic groups. Factor analysis is a technique for identifying groups or clusters of variables (Field 2005), i.e. to group the 41 potential causes into groups of correlated causes, each group represents a latent cause. Cronbach's α reliability analysis checks the groups extracted from factor analysis to see how well the variables within each group measure a common construct (Field 2005).

The results of the open ended question and the transcript of the interviews were analysed using the methods for analysing open ended data (Creswell 2009). The data were grouped into themes/categories by means of assigning categories/labels/codes to segments of the data. This is followed by studying the interrelationship between the themes/categories.

3.7 Summary

A literature review on what is research and research methodology with particular emphasis on the quantitative, qualitative and triangulation studies / mixed methods has been presented. The actual methods used for literature review, questionnaire survey and semi-structured interview has also been reported. Also reported are methods for analysis of quantitative and qualitative data. The overall research methodology has been summarised in a flowchart as shown in Figure 3.1 below.

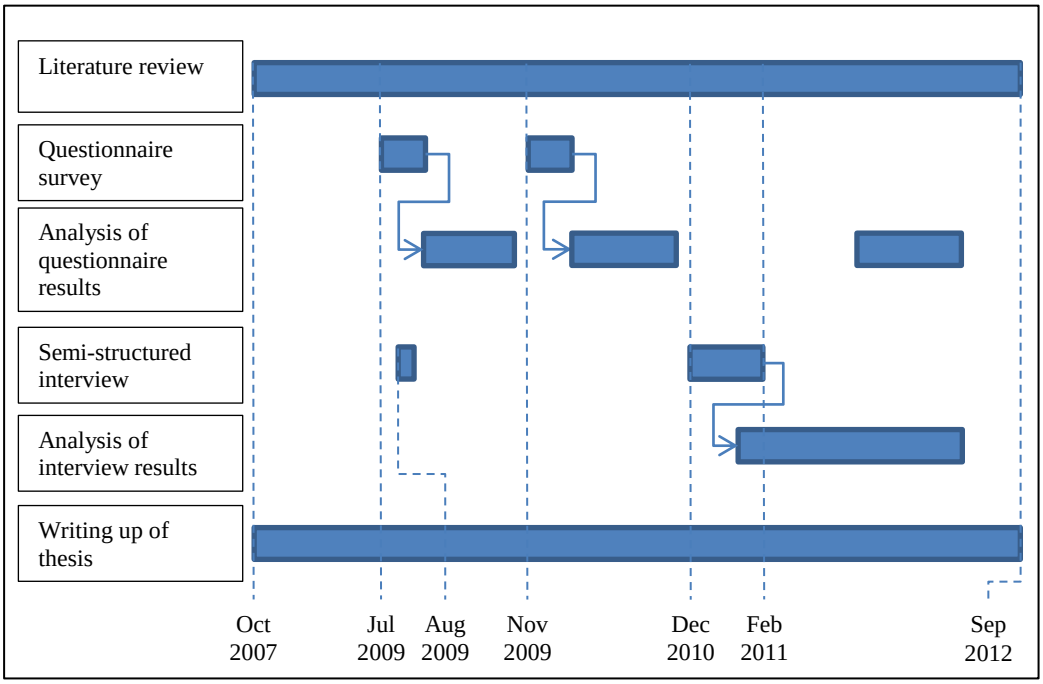

Figure 3.1 Research methodology flowchart

CHAPTER 4

ANALYSIS OF DATA

This chapter covers the analysis of both the quantitative data obtained from the questionnaire survey and the qualitative data obtained from the questionnaire survey as well as the semi-structured interviews. Quantitative analyses cover the general characteristics of questionnaire respondents, ranking of the causes of abandoned construction projects with Spearman's ranking correlation between different groups of respondents, and factor analysis with Cronbach's α reliability analysis. Qualitative analyses cover the results of the open ended question on solving abandonment of construction projects, which include the characteristics of the respondents, the suggested solutions, and also causes of abandoned construction projects voluntarily provided. Qualitative analyses also cover the results of the semi-structured interviews, which include the background of the interviewees, the causes of abandoned construction projects, and suggestions to manage or mitigate abandonment of construction projects.

4.1 General Characteristics of Questionnaire Respondents

A total of 2500 questionnaires were sent out by post in two batches whereas three questionnaires were delivered personally (see Table 4.1). The first batch of 1000 questionnaires was sent out on 28th of July 2009, and the second batch of 1500 questionnaires was sent out on 11th of November 2009.

The total responses received for the first batch, second batch, and questionnaires delivered personally are 99, 124, and 2 respectively. The response rate for the postal questionnaires is 8.9%, while the response rate for the questionnaires delivered personally is 66.7%. Overall, there are 2503 questionnaires issued with 225 responses, giving an overall response rate of 9.0%. The following sections will describe the breakdown of the 225 questionnaire responses in terms of 1) the experience of respondents in abandoned construction projects, 2) the roles of respondents in the projects, 3) the types of the projects, and 4) how the projects were funded.

Table 4.1 Response rates of questionnaire survey

	Total sent	**Total responded**	**Response rate**
First batch sent on 28th of July 2009	1000	99	9.9%
Second batch sent on 11th of November 2009	1500	124	8.3%
Total postal questionnaire sent out	2500	223	8.9%
Questionnaire delivered personally	3	2	66.7%
Overall questionnaire issued	2503	225	9.0%

4.1.1 Experience of respondents in abandoned construction projects

The experience of the 225 respondents in abandoned construction projects are summarised in Table 4.2. The proportions of respondents who have experience in abandoned projects, almost abandoned projects, no

experience, and those who have not provided information are 32.9%, 12.9%, 52.9%, and 1.3% respectively.

Table 4.2 Experience of respondents in abandoned construction projects

Experience of respondents	Number of respondents	Proportion (%)
1) Abandoned project	74	32.9
2) Almost abandoned project	29	12.9
3) No experience	119	52.9
4) Not provided	3	1.3
Total	225	100.0

4.1.2 Roles of respondents in the projects

The roles of the 225 respondents in the projects are summarised in Table 4.3. The proportions of clients/owner, consultants, contractor/supplier, government officials, and others are 28.9%, 37.8%, 23.1%, 0.9%, and 9.3% respectively. The others group consists of one who bought over an abandoned project and revive it, one who is involved in project financing, one who is involved in project management, one house buyer, one estate agent, one who chose ‘others’ but did not provide additional details, two who are client/owner and consultant, four who are client/owner and contractor/supplier, one who is consultant and contractor/supplier, and eight who did not provide any information.

Table 4.3 Roles of respondents in the projects

Roles of respondents	Number of respondents	Proportion (%)
1) Client / owner	65	28.9
2) Consultant	85	37.8
3) Contractor / supplier	52	23.1
4) Government official	2	0.9
5) Others	21	9.3
Total	225	100.0

4.1.3 Types of the projects

The types of the projects of the 225 respondents are summarised in Table 4.4. The proportions of types of projects, i.e. residential, non-residential, civil work, special trades and others are 44.4%, 16.0%, 6.7%, 3.1%, and 29.8% respectively. The others groups consists of two mixed developments, 29 which comprise residential and non-residential, 10 which comprise residential, non-residential and civil work, four which comprise residential, non-residential, civil work and special trades, one which comprises residential, non-residential and special trades, nine which comprise residential and civil work, two which comprise non-residential, civil work and special trades, one which comprises civil work and special trades, and nine which information were not provided.

Table 4.4 Types of the projects

Types of the projects	Number of respondents	Proportion (%)
1) Residential	100	44.4
2) Non-residential	36	16.0
3) Civil work	15	6.7
4) Special trades	7	3.1
5) Others	67	29.8
Total	225	100.0

4.1.4 How the projects were funded

How the projects of the 225 respondents were funded are summarised in Table 4.5. The proportions of projects which were funded privately, publicly, jointly funded using private and public funds, and those which information are not provided are 71.6%, 7.6%, 16.4%, and 4.4% respectively.

Table 4.5 How the projects were funded

How the projects were funded	Number of respondents	Proportion (%)
1) Privately	161	71.6
2) Publicly	17	7.6
3) Jointly funded using private and public funds	37	16.4
4) Not provided	10	4.4
Total	225	100.0

4.2 Ranking of Causes of Abandoned Construction Projects

The ranking of the causes of abandoned construction projects shows the relative importance of each of the 41 potential causes identified from the literature, whereas Spearman's ranking correlations examine the general similarities of rankings of the causes of abandoned construction projects between different groups of respondents. These different groups of respondents are within five broader categories in terms of 1) the experience of respondents in abandoned construction projects, 2) the roles of respondents in the projects,

3) the types of the projects, and 4) how the projects were funded. The associations among rankings of different groups of respondents are verified at the 5% significance level.

4.2.1 Ranking

The causes of abandoned construction projects ranked by 225 respondents are depicted in Table 4.6. The causes ranked 1 to 5 seem to focus on financial issues, i.e. financial difficulties faced by the owner, financial difficulties faced by the contractor, unexpected bad economic conditions, inappropriate mode of financing project, and delays in interim payments. This is followed by causes ranked 6 and 7, i.e. inadequate project feasibility studies and incompetent contractors or subcontractors respectively. Subsequently, causes ranked 8 to 11 appear to focus on project management and administration problems, i.e. project control problems, inappropriate project planning and scheduling, bureaucracy and red tape within the project, and poor contract administration. Then this is followed by the cause ranked 12, i.e. inexperienced client/owner. Causes ranked 13 and 19 seem related to ineffective authorities, i.e. unfavourable government policy, and lack of cooperation from local authorities. Causes ranked 14, 15, 17, 18 and 20 appear to focus on legal and contractual matters, i.e. fraudulent practices and briberies, litigation, lack of appropriate dispute resolution method, faulty tender process, and inappropriate contract arrangements (traditional design-bid-build/design and build/management contracting/etc.). Cause ranked 16 is inappropriate pricing/incentives of services rendered by contractors or consultants.

Table 4.6 Causes of abandoned construction projects ranked by 225 respondents

Causes	Mean	Ranks
Financial difficulties faced by the owner	4.311	1
Financial difficulties faced by the contractor	4.004	2
Unexpected bad economic conditions	3.982	3
Inappropriate mode of financing project	3.778	4
Delays in interim payments	3.773	5
Inadequate project feasibility studies	3.680	6
Incompetent contractors or subcontractors	3.484	7
Project control problems	3.467	8
Inappropriate project planning and scheduling	3.431	9
Bureaucracy and red tape within the project	3.427	10
Poor contract administration	3.404	11
Inexperienced client/owner	3.373	12
Unfavorable government policy	3.338	13
Fraudulent practices and briberies	3.200	14
Litigation	3.196	15
Inappropriate pricing/incentives of services rendered by contractors or consultants	3.191	16
Lack of appropriate dispute resolution method	3.164	17
Faulty tender process	3.138	18
Lack of cooperation from local authorities	3.133	19
Inappropriate contract arrangements (traditional design-bid-build/design & build/management contracting/etc.)	3.053	20
Unclear lines of responsibility and authority	3.027	21
Problems of communication and coordination	2.982	22
Incompetent consultants	2.960	23
Poor quality control	2.956	24
Site acquisition problems	2.947	25
Negative impact of project towards society or environment	2.929	26
Inappropriate risk allocation among project team members	2.916	27
Shortage of site workers	2.880	28
Poor relationship among project team members	2.871	29
Unskilled/incompetent site workers	2.862	30
Ambiguities or mistakes in scope of work, specifications or drawings	2.822	31
Problems related to change orders/variation orders	2.809	32
Involvement of large number of participants of project	2.689	33
Lack of motivation of site workers	2.676	34
Relationship between contractor and labour (industrial relation)	2.649	35
Unavailability of materials and equipments	2.636	36.5
Poor safety management on site	2.636	36.5
Cultural clash among parties involved in project	2.609	38
Unexpected location difficulty	2.573	39
Adverse weather or acts of God	2.471	40
Difficulty of design and construction	2.120	41

4.2.2 Spearman's ranking correlation

The results of Spearman's ranking correlations of different experience of respondents in abandoned construction projects are shown in Table 4.7. The results show that all correlations are significant at the 1% significance level. The Spearman's correlations between experience in abandoned project and almost abandoned project, abandoned project and no experience, and almost abandoned and no experience are 0.862, 0.944 and 0.859 respectively. The Spearman's correlations between those who have not provided information and those with experience in abandoned project, almost abandoned project, and no experience are 0.659, 0.619 and 0.632 respectively.

It seems that Spearman's correlations are rather high among respondents who have experience in abandoned projects, almost abandoned projects, and those who have no experience with a range between 0.859 and 0.944. The Spearman's correlations involving those who have not provided information seems to be somewhat lower with a range between 0.619 and 0.659. However, it should be noted that those who have not provided information consist of only three respondents with an overall proportion of 1.3%. Therefore, it can be concluded that the rankings of the causes of abandoned construction projects among different experience of respondents in abandoned construction projects are generally similar.

Table 4.7 Spearman's ranking correlations of different experience of respondents in abandoned construction projects (N=41)

		Abandoned project	Almost abandoned project	No experience	Not provided
Abandoned project	Correlation Coefficient	1.000	.862**	.944**	.659**
	Sig. (1-tailed)	.	.000	.000	.000
Almost abandoned project	Correlation Coefficient	.862**	1.000	.859**	.619**
	Sig. (1-tailed)	.000	.	.000	.000
No experience	Correlation Coefficient	.944**	.859**	1.000	.632**
	Sig. (1-tailed)	.000	.000	.	.000
Not provided	Correlation Coefficient	.659**	.619**	.632**	1.000
	Sig. (1-tailed)	.000	.000	.000	.
**. Correlation is significant at the 0.01 level (1-tailed).					

The results of Spearman's ranking correlations of different roles of respondents in the projects are shown in Table 4.8. The results show that all correlations are significant at the 1% significance level except for the correlation between consultant and government official which is significant at the 5% significance level. The Spearman's correlations between client/owner and consultant, client/owner and contractor/supplier, client/owner and others, consultant and contractor/supplier, consultant and others, and contractor/supplier and others are 0.904, 0.936, 0.930, 0.907, 0.896, and 0.943 respectively. The Spearman's correlations between government official and client/owner, consultant, contractor/supplier, and others are 0.367, 0.361, 0.393, and 0.447 respectively.

It seems that Spearman's correlations are rather high among client/owner, consultant, contractor/supplier, and others with a range between 0.896 and 0.943. The Spearman's correlations involving government official seems to be somewhat lower with a range between 0.361 and 0.447. However,

it should be noted that the government official group consists of only two respondents with an overall proportion of 0.9%. Therefore, it can be concluded that the rankings of the causes of abandoned construction projects among different roles of respondents in the projects are generally similar.

Table 4.8 Spearman's ranking correlations of different roles of respondents in the projects (N=41)

		Client / owner	Consultant	Contractor / supplier	Governme-nt official	Others
Client / owner	Correlation Coefficient	1.000	.904**	.936**	.367**	.930**
	Sig. (1-tailed)	.	.000	.000	.009	.000
Consultant	Correlation Coefficient	.904**	1.000	.907**	.361*	.896**
	Sig. (1-tailed)	.000	.	.000	.010	.000
Contractor / supplier	Correlation Coefficient	.936**	.907**	1.000	.393**	.943**
	Sig. (1-tailed)	.000	.000	.	.005	.000
Government official	Correlation Coefficient	.367**	.361*	.393**	1.000	.447**
	Sig. (1-tailed)	.009	.010	.005	.	.002
Others	Correlation Coefficient	.930**	.896**	.943**	.447**	1.000
	Sig. (1-tailed)	.000	.000	.000	.002	.
**. Correlation is significant at the 0.01 level (1-tailed).						
*. Correlation is significant at the 0.05 level (1-tailed).						

The results of Spearman's ranking correlations of different types of the projects are shown in Table 4.9. The results show that all correlations are significant at the 1% significance level. The Spearman's correlations between residential projects and non-residential projects, residential projects and civil work, residential projects and special trades, and residential projects and others are 0.941, 0.772, 0.797, and 0.921 respectively. The Spearman's correlations between non-residential projects and civil work, non-residential projects and special trades, and non-residential projects and others are 0.730, 0.770 and 0.935 respectively. The Spearman's correlations between civil work and

special trades, civil work and others, and special trades and others are 0.540, 0.755 and 0.695 respectively.

It seems that Spearman's correlations are rather high among different types of the projects and others with a range between 0.730 and 0.941, except for the correlations between civil work and special trades, and special trades and others which are somewhat lower with 0.540 and 0.695 respectively. However, it should be noted that special trades consist of only seven respondents with an overall proportion of 3.1%. Therefore it can be concluded that the rankings of the causes of abandoned construction projects among different types of the projects are generally similar.

Table 4.9 Spearman's ranking correlations of different types of the projects (N=41)

		Residential	Non residential	Civil work	Special trades	Others
Residential	Correlation Coefficient	1.000	.941**	.772**	.797**	.921**
	Sig. (1-tailed)	.	.000	.000	.000	.000
Non residential	Correlation Coefficient	.941**	1.000	.730**	.770**	.935**
	Sig. (1-tailed)	.000	.	.000	.000	.000
Civil work	Correlation Coefficient	.772**	.730**	1.000	.540**	.755**
	Sig. (1-tailed)	.000	.000	.	.000	.000
Special trades	Correlation Coefficient	.797**	.770**	.540**	1.000	.695**
	Sig. (1-tailed)	.000	.000	.000	.	.000
Others	Correlation Coefficient	.921**	.935**	.755**	.695**	1.000
	Sig. (1-tailed)	.000	.000	.000	.000	.
**. Correlation is significant at the 0.01 level (1-tailed).						

The results of Spearman's ranking correlations of different means of funding the projects are shown in Table 4.10. The results show that all correlations are significant at the 1% significance level. The Spearman's

correlations between the groups privately and publicly, privately and jointly funded, privately and those which information are not provided, publicly and jointly funded, publicly and those which information are not provided, and jointly funded and those which information are not provided are 0.752, 0.938, 0.888, 0.672, 0.667, and 0.854 respectively.

It seems that Spearman's correlations are rather high among different means of funding the projects with a range between 0.752 and 0.938, except for the correlations between the groups publicly and jointly funded, and publicly and those which information are not provided which are somewhat lower with 0.672 and 0.667 respectively. However, it should be noted that publicly funded projects consist of only 17 respondents with an overall proportion of 7.6%. Therefore it can be concluded that the rankings of the causes of abandoned construction projects among different means of funding the projects are generally similar.

Table 4.10 Spearman's ranking correlations of different means of funding the projects (N=41)

		Privately	Publicly	Jointly funded using private and public funds	Not provided
Privately	Correlation Coefficient	1.000	.752**	.938**	.888**
	Sig. (1-tailed)	.	.000	.000	.000
Publicly	Correlation Coefficient	.752**	1.000	.672**	.667**
	Sig. (1-tailed)	.000	.	.000	.000
Jointly funded using private and public funds	Correlation Coefficient	.938**	.672**	1.000	.854**
	Sig. (1-tailed)	.000	.000	.	.000
Not provided	Correlation Coefficient	.888**	.667**	.854**	1.000
	Sig. (1-tailed)	.000	.000	.000	.
**. Correlation is significant at the 0.01 level (1-tailed).					

4.3 Factor Analysis

Factor analysis is used to identify the underlying factors of a given list of measurable variables. In this research the measurable variables are the list of potential causes of abandoned construction projects used in the questionnaire survey. Hence, the underlying factors found are underlying causes of abandoned construction projects. By reducing the larger number of potential causes to a few underlying causes, simplification is achieved. The factor analysis was carried out on 103 samples of respondents who have experience in abandoned or almost abandoned projects.

4.3.1 Analysis considerations

According to Stevens (2009) two basic approaches of factor analysis are 1) principal components analysis and 2) factor analysis. Both methods often yield similar results, but principal components analysis is preferred for its simplicity (Stevens 2009). Therefore, principal components analysis is used for this research.

Before factor analysis is carried out, the data must satisfy a few criteria as recommended by Field (2005). For sampling adequacy, the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) for this research, 0.890 is great ($0.5 < KMO < 0.7$ is mediocre, $0.7 < KMO < 0.8$ is good, $0.8 < KMO < 0.9$ is great, $KMO > 0.9$ is superb). A more detailed measure of sampling adequacy is by checking the diagonal elements of the anti-image correlation matrix, which

shows sampling adequacy for each of the 41 variables (See APPENDIX C). A check through the anti-image correlation matrix shows adequate sample size for each of the 41 variables, with all diagonal elements of the anti-image correlation matrix above the minimum requirement of 0.5. The data collected also passes Bartlett's test of sphericity at a significant level of 0.000, which tests whether there are adequate correlations between the variables. The correlation matrix was analysed as a recommended default for factor extraction. Seven underlying factors with eigenvalues greater than 1 were retained according to Kaiser's criterion (See Table 4.11 below). The seven extracted factors explain 66.684% of the total variance. These underlying factors must be rotated so that each variable's loadings are maximized on one of the extracted factors while they are minimized on all other factors. Orthogonal rotation ensures that all factors extracted remain uncorrelated, while oblique rotation allows the factors extracted to be correlated. The orthogonal rotation is chosen for its simplicity, of which varimax is the recommended default.

The residual matrix is also checked to ascertain the fit of the factor model. The residual matrix contains the differences between the correlations of the variables based on the observed data and the correlations based on the factor model, the smaller the residuals the better. There are 197 (24.0%) non redundant residuals with absolute values greater than 0.05. According to Field (2005), this should not be a cause for concern.

Stevens (2009) gives recommendations for the statistical significance of factor loading according to sample size. Basically, the larger the sample size, the smaller the factor loading that can be considered significant. With a sample size of 103, the minimum factor loading that can be considered significant is 0.505 as a result of interpolation from a series of sample sizes and their corresponding significant factor loadings (See APPENDIX D). Apart from the statistical significance of factor loadings, Stevens (2009) also recommended interpreting only factor loadings greater than 0.4 for substantial importance of a variable to a factor. Therefore, in order to satisfy both criteria, this research will only interpret factor loadings greater than 0.505. As a result of this, only 29 out of the total 41 variables are involved in the interpretation of extracted factors. The results are depicted in Table 4.11 below.

Table 4.11 Underlying factors extracted

No.	Underlying factors	Eigenvalue	Percentage of variance	Variables	Factor loadings
1	Site worker and related problem with contractor	5.644	13.766	Lack of motivation of site workers	0.844
				Shortage of site workers	0.833
				Unskilled/incompetent site workers	0.797
				Incompetent contractors or subcontractors	0.614
				Poor quality control	0.556
				Relationship between contractor and labour (industrial relation)	0.525
2	Project teamwork and ethical issues	5.051	12.320	Cultural clash among parties involved in project	0.641
				Litigation	0.638
				Lack of cooperation from local authorities	0.598
				Unfavourable government policy	0.591
				Fraudulent practices and briberies	0.539
				Inappropriate mode of financing project	0.537
				Unclear lines of responsibility and authority	0.508
3	Design, sourcing of resources and acts of God	4.554	11.107	Difficulty of design and construction	0.727
				Adverse weather or acts of God	0.699
				Unavailability of materials and equipment	0.672
				Unexpected location difficulty	0.602
				Ambiguities or mistakes in scope of work, specifications or drawings	0.534
4	Project planning, monitoring and controlling	4.290	10.464	Inappropriate project planning and scheduling	0.749
				Project control problems	0.729
				Poor contract administration	0.680
5	Contract administration	3.650	8.902	Faulty tender process	0.771
				Inappropriate pricing/incentives of services rendered by contractors or consultants	0.730
				Lack of appropriate dispute resolution method	0.554
				Ambiguities or mistakes in scope of work, specifications or drawings	0.527
6	Financial management	2.591	6.319	Financial difficulties faced by the owner	0.732
				Unexpected bad economic conditions	0.650
				Delays in interim payments	0.643
				Inadequate project feasibility studies	0.543
7	Inexperienced client/owner	1.560	3.805	Inexperienced client/owner	0.699
		Total	**66.684**		

4.3.2 Underlying factors extracted

The seven underlying factors extracted are 1) site worker and related problem with contractor, 2) project teamwork and ethical issues, 3) design, sourcing of resources and acts of God, 4) project planning, monitoring and controlling, 5) contract administration, 6) financial management, and 7) inexperienced client/owner (see Table 4.11 above).

Site worker and related problem with contractor consist of 1) lack of motivation of site workers, 2) shortage of site workers, 3) unskilled/incompetent site workers, 4) incompetent contractors or subcontractors, 5) poor quality control, and 6) relationship between contractor and labour (industrial relation). The first three variables describe site worker problems, while the fourth variable describes the contractor as incompetent. The sixth variable suggests that site worker and contractor problems are two interrelated problems. The fifth variable may be the result of site worker and contractor problems.

Project teamwork and ethical issues are made up of 1) cultural clash among parties involved in project, 2) litigation, 3) lack of cooperation from local authorities, 4) unfavourable government policy, 5) fraudulent practices and briberies, 6) inappropriate mode of financing project, and 7) unclear lines of responsibility and authority. The third and fourth variables show that project teamwork includes the authorities. However, the sixth variable does not apparently seem to be related to project teamwork and ethical issues. Project teamwork and ethical issues seem to be related to contract administration in terms of the lack of appropriate dispute resolution method.

Design, sourcing of resources and acts of God include 1) difficulty of design and construction, 2) adverse weather or acts of God, 3) unavailability of materials and equipment, 4) unexpected location difficulty, and 5) ambiguity or mistakes in scope of work, specifications or drawings. The first and fifth variables seem to be related to design and specifications, whereas the second,

third and fourth variables seem to be related to external causes. The fifth variable suggests that the factor is also related to contractual matters.

Project planning, monitoring and controlling include 1) inappropriate project planning and scheduling, 2) project control problems, and 3) poor contract administration. Poor contract administration covers many aspects of project management, and in this case the factor should be related to the planning and controlling aspect of contract administration. Contract administration is also a factor itself as in the following factor.

Contract administration consists of 1) faulty tender process, 2) inappropriate pricing/incentives of services rendered by contractors or consultants, 3) lack of appropriate dispute resolution method, and 4) ambiguities or mistakes in scope of work, specifications or drawings. Contract administration seems to be related to project teamwork and ethical issues via the third variable concerning disputes. Besides, contract administration also seems to be related to the factor design, sourcing of resources and acts of God via the fourth variable.

Financial management includes 1) financial difficulties faced by the owner, 2) unexpected bad economic conditions, 3) delays in interim payments, and 4) inadequate project feasibility studies. Cash flow problems seem to be resulted from the second and fourth variables, thus causing financial difficulties faced by the owner, and eventually delays in interim payments.

Inexperienced client/owner is made up of only one variable which is inexperienced client/owner.

4.3.3 Cronbach's α reliability analysis

Cronbach's α reliability analysis checks whether the variables associated with an underlying factor extracted from factor analysis are consistent and reliable measures of the underlying factor (Field 2005). Field (2005) specifies the procedures and criteria involved in this analysis. The results of the analysis are presented in Table 4.12. Underlying factor number seven, inexperienced client/owner is excluded from the analysis because it consists of only one variable. All corrected item-total correlations appear to be more than the minimum value of 0.3. A reliable variable should correlate with the total score of all variables associated with the same underlying factor. All Cronbach's α's if item deleted appear to be not more than the overall Cronbach's α of their corresponding underlying factor. This means that exclusion of any variable will not improve the overall reliability of its corresponding underlying factor. Finally, all except underlying factor number six's Cronbach's α appear to be above the recommended value of 0.8. The Cronbach's α for underlying factor number six, financial management is 0.621. This value is well below the value of other underlying factors. Kline (as cited in Field 2005) explains that values well below 0.7 can be realistically expected of psychological constructs which are diverse in nature. Therefore, it should be noted that the variables describing financial management may also be diverse

in nature; they may also be measuring other aspects of abandonment of construction projects apart from financial management.

Table 4.12 Cronbach's α's on the underlying factors extracted from factor analysis

No.	Underlying factors	Cronbach's α	Variables	Corrected item-total correlation	Cronbach's α if item deleted
1	Site worker and related problem with contractor	0.903	Lack of motivation of site workers	0.719	0.888
			Shortage of site workers	0.772	0.880
			Unskilled/incompetent site workers	0.859	0.866
			Incompetent contractors or subcontractors	0.683	0.894
			Poor quality control	0.709	0.890
			Relationship between contractor and labour (industrial relation)	0.671	0.895
2	Project teamwork and ethical issues	0.866	Cultural clash among parties involved in project	0.633	0.849
			Litigation	0.616	0.850
			Lack of cooperation from local authorities	0.706	0.837
			Unfavourable government policy	0.674	0.841
			Fraudulent practices and briberies	0.595	0.853
			Inappropriate mode of financing project	0.523	0.862
			Unclear lines of responsibility and authority	0.727	0.834
3	Design, sourcing of resources and acts of God	0.807	Difficulty of design and construction	0.504	0.795
			Adverse weather or acts of God	0.654	0.750
			Unavailability of materials and equipment	0.555	0.782
			Unexpected location difficulty	0.623	0.760
			Ambiguities or mistakes in scope of work, specifications or drawings	0.629	0.758
4	Project planning, monitoring and controlling	0.820	Inappropriate project planning and scheduling	0.698	0.733
			Project control problems	0.714	0.714
			Poor contract administration	0.627	0.815
5	Contract administration	0.813	Faulty tender process	0.632	0.765
			Inappropriate pricing/incentives of services rendered by contractors or consultants	0.587	0.788
			Lack of appropriate dispute resolution method	0.644	0.759
			Ambiguities or mistakes in scope of work, specifications or drawings	0.668	0.748
6	Financial management	0.621	Financial difficulties faced by the owner	0.525	0.462
			Unexpected bad economic conditions	0.387	0.561
			Delays in interim payments	0.387	0.565
			Inadequate project feasibility studies	0.320	0.610
7	Inexperienced client/owner	Non applicable	Inexperienced client/owner	Non applicable	Non applicable

4.4 Results of Open Ended Question on Solving Abandonment of Construction Projects

Among the questions in the questionnaire sent out is an open ended question on how to solve the problems of abandoned construction projects. One

hundred and twenty three responses have been received for this question, of which 69 respondents have experience in abandoned or almost abandoned projects, 51 respondents have no experience, and 3 respondents have not provided information.

The respondents have provided answers that can be classified into three categories i.e. 1) general answers, 2) answers specific to resolving already abandoned projects, and 3) causes of abandoned construction projects. The detailed breakdown of number of responses for each of these categories is shown in Table 4.13 below. A chart representing a breakdown of the categories/themes that have emerged from the results is depicted in Figure 4.1 below.

Table 4.13 Experience of respondents and type of answers provided

Experience of respondents	**Total responded to the open ended question**	**Types of answers**		
		General	**Specific to resolving already abandoned projects**	**Causes of abandoned construction projects**
1) Abandoned or almost abandoned project	69	52	18	9
2) No experience	51	43	8	3
3) Not provided	3	None	3	None
Total	123	95	29	12

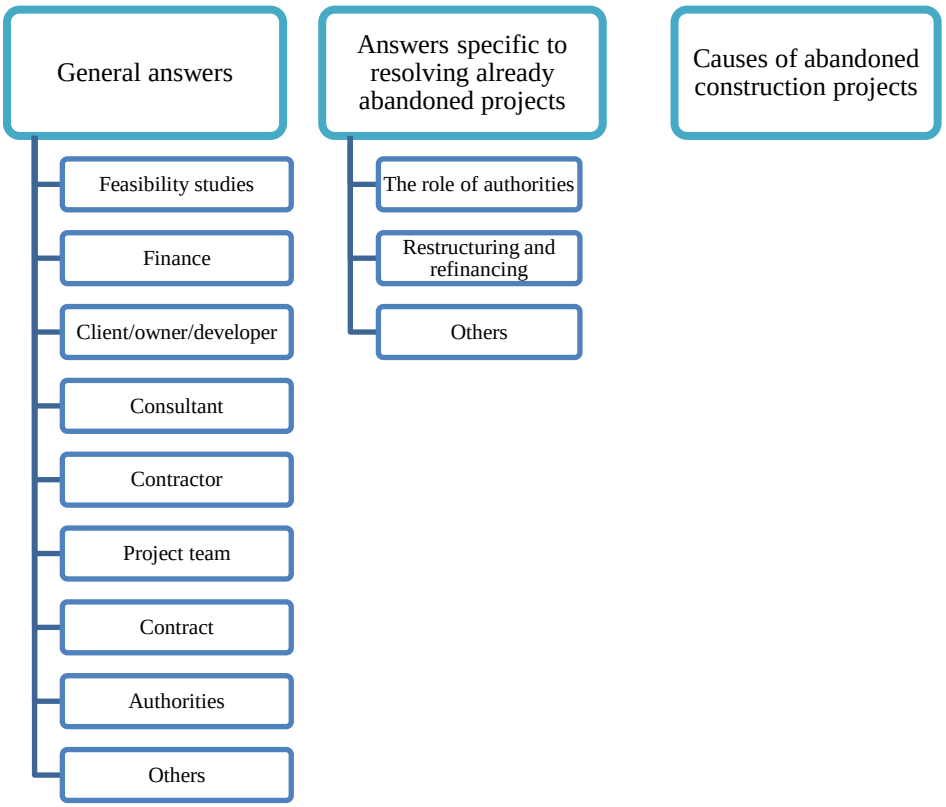

Figure 4.1 Results of open ended question on solving abandonment of construction projects

4.4.1 General answers

General answers are suggestions applicable both for the prevention and during the revival of abandoned projects. The answers can be broadly grouped into themes such as those concerning feasibility studies, finance, client/owner/developer, consultant, contractor, project team, contract, authorities, and others.

4.4.1.1 Feasibility studies

It is suggested that project feasibility studies must be carried out properly. They include economic and technical feasibilities. For economic

feasibilities, there must be good cash flow projection. Economic feasibilities involve market survey on the pricing and type of products to suit market demands before launching a particular project. The developer should avoid inferior locality/land, which is crucial in resolving an already abandoned project. In conducting economic feasibility studies, allowance should be given for less favourable economic conditions. For resolving an already abandoned project, the cost worthiness should include the expenditure to settle disputes with parties concerned.

For technical feasibilities, there must be adequate geological survey of the development site. Also, the project must be receptive to changes due to site condition.

4.4.1.2 Finance

It is recommended that there must be proper financing of project both at the owner/client and contractor level. Construction companies must be financially strong and not rely too much on bank financing, such as bridging loan at the initial stage. There must be appropriate proportion of bridging and end financing. Over leveraging should be avoided.

Financial institution should be more careful in approving loans. Financial institution should help to resolve funding issues arising from unexpected circumstances. Financial institutions should be more vigilant in

monitoring their financed project by engaging chartered surveyors to conduct audit for them.

There must be no delays in interim claims as well as interim payments. Interim payments not only include the client/owner paying the main contractor, but also contractors paying their subcontractors and suppliers, workers, and payments to all services rendered. It is also recommended that consultants should be paid reasonable fees and non-payment to consultants should be prevented.

4.4.1.3 Client/owner/developer

The client/owner must be competent and have experience. In particular the housing developer must be familiar with housing development. Besides it is also suggested that the developer must be trustful, sincere, responsible, and fully abide by all the guidelines spelt out in the Housing Development Act (HDA). In dealings with the consultants, clients without technical knowledge should refrain from giving unreasonable recommendations and ideas. Instead clients should pay more attention to advice given by consultants. Client/developer must focus on the project and be decisive, and must not keep on postponing decisions on the design and finishing. The need statement must be made clear to the consultants prior to designing.

4.4.1.4 Consultant

The consultants must be competent and committed, particularly the architect. The consultants should be honest with the client on whether a project is technically feasible, i.e. on the technical difficulties and risks. The consultants must ensure that all requirements for statutory approvals and achieving Certificate of Fitness (CF) are in place. Statutory requirements include the Uniform Building Bylaws (UBBL) requirements. Besides, the consultants should conduct more site visits in addition to the visits during site meetings.

4.4.1.5 Contractor

The contractor must be competent, have good track record, financially sound and know how to control their finance during construction. Contractors should make sure that materials and labour are sufficient for the project to finish on time. This includes both skilled and unskilled labour. Besides, contractors must possess equipment to carry out their work. In addition, there must be adequate technical knowledge among the subcontractors and site workers such as the ability to read and understand technical drawings. Contractors must also be honest and not cut corners. The contractor must also properly select good client/owner to work for.

4.4.1.6 Project team

The project team must be competent and motivated. A competent project team includes a strong and experienced management team. Good project management includes proper project planning, scheduling, monitoring, coordination and control. Project coordination involves coordination of all parties such as the owner, contractors, site workers, consultants and authorities. Therefore, an experienced site coordinator is very important. Project control includes tight financial control, cost control, quality control, and schedule control. Tight financial control involves strict monitoring of the project cash flow. There must also be safety awareness and good site management. Besides, the project management team must be technically sound as well as good at managing the sale of their products.

Good leadership within the project team is also recommended. All parties involved must be cooperative and should play win-win and work shoulder to shoulder. For example, the developer must be in good cooperation with the main contractor. All parties involved must adhere to proper rules and regulations, such as those of the local authority.

4.4.1.7 Contract

There must be good contract administration. Transparent contract administration is suggested. The contract must be clear and determined in terms of the scope of work so as to prevent variations. In other words, contract

documents and drawings must be comprehensive. Besides, there must be proper tender and evaluation processes. There must be reasonable tender prices and tender must not be awarded to the lowest bidder. For public projects, the tendering process must be transparent, such as in an open tender. All in all, just and fair deals are emphasised. With regard to purchasers, it is also suggested that the sales and purchase agreement must be more protective of the purchaser's interest.

4.4.1.8 Authorities

First of all, there must be political will both at preventing and resolving abandoned projects. There must be cooperation from the authorities instead of corruption. There must be more government involvement through legislation. In particular, there must be more legislation to protect purchasers. For this, the government can implement the Build Then Sell concept of housing development.

There must also be proper enforcement by the authorities. The authorities should make sure that developers are competent and financially sound. This could be achieved through more stringent issuance of license to developers. The authorities must strictly enforce to blacklist developers or any parties who are responsible for the abandonment of projects. The government should prosecute those who intentionally abandon projects for personal gains.

The authorities should also scrutinise development proposals for viability before approval. To prevent abandonment of projects, there must be better project monitoring by the authorities. One suggestion is to have a special independent commission comprising human resource advisor, legal advisor and financial advisor to monitor the projects.

The government should also control the price of building materials. The government should regulate the supply of foreign workers to ensure there is no shortage of skilled construction workforce.

4.4.1.9 Others

There must be political and economic stability in a country to prevent abandonment of projects. Good economic conditions include adequate demand and adequate supply of material and labours. Bribery, corrupt and fraudulent practices must be avoided. Projects must not be awarded to corrupt politicians. In a broader sense, avoid appointing companies parachuted by third party as this "middle man" policy will affect payment.

Also, there must be efficient dispute resolution, such as a quick arbitration process. Any financial dispute must be overcome to ensure smooth progress of the project. In resolving an abandoned project, the arbitration process must aim for a win-win situation for all parties concerned.

4.4.2 Answers specific to resolving already abandoned projects

Answers specific to resolving already abandoned projects can largely be grouped into those involving the role of the authorities, those involving restructuring and refinancing, and others comprised of general and specific suggestions.

4.4.2.1 The role of authorities

It is suggested that the government should take over abandoned projects or take the lead to solve the problems. It is pointed out that all parties involved in an abandoned project must provide a clear history of the project. One suggestion for this is for the government to engage liquidator / legal team to assess each project and identify the original consultant team responsible for the design and supervision of work. The consultant team is to submit a report on the status of the project inclusive of scope of remaining work with cost estimate. Then, the project should be retendered to good contractors.

The government should provide financial assistance to revive abandoned projects. The government should also provide incentives and benefits to the company reviving the project. Local authorities should assist by extending any expired building plans and waive any fees incurred. Authorities may also need to waive certain other requirements to assist. Also, the government should advertise the abandoned projects via internet, newspapers, etc. so that interested parties can know and get involved.

4.4.2.2 Restructuring and refinancing

It is urged that the project team should be restructured. This may involve seizure/divesting. The original developer should sell off the project to a more competent and financially strong developer. Alternatively, the developer could joint venture with other developer to revive the project. Another suggestion is to invite new investors to refinance the project. The developer must not be too greedy when forming a joint venture with an investor to revive the project. If the project is to be tendered out it should be at a big discount. It is also recommended that banks should take over an abandoned project. However, one respondent cautioned that re-tendering of the project must be avoided because it will incur more cost.

An abandoned project should be adequately funded in order to be revived. The developer should seek financial assistance. The developer can apply for the working loan from a special government fund for abandoned housing projects (Tabung Projek Perumahan Terbengkalai Bank Negara Malaysia). An abandoned project should also be refinanced and financial institutions should allow for this. The interest charges from bank loans should be capped.

4.4.2.3 Others

There must be a steering committee formed to handle an already abandoned project. A public accounting firm can be appointed to act as project

manager for the purpose of the rehabilitation work, assisted by the other related parties of a project. There must be renegotiation with house/retail buyers to seek new solutions. Purchasers may have to foot out extra money to complete a project. Any legal issues should be resolved. In resolving an already abandoned project, the development mix of the project can be changed to better suit the prevailing market demands. Building use can also be changed.

4.4.3 Causes of abandoned construction projects

Among the causes of abandoned construction projects suggested are financial difficulties faced by the client/owner and contractor. This may be related to mismatch of funding versus cash flow for housing project. One respondent suggested poor cash flow planning by contractor in the private sector. Non-payment by contractor to sub trades and suppliers result in delay, shoddy works and defaults. Financial difficulties may also be related to other causes suggested like economic crisis, sudden rise in the price of materials such as during 2008 when there were intense constructions in China in preparation for the Olympics, and poor market feasibility for institutional and public projects. It is also pointed out that the authorities are not strict enough in approving construction projects to ensure that the projects are financially sound.

Also highlighted is fraud by developer of housing project and abuse of government incentives for small contractors. Weaker contractors will default and cause projects to be abandoned. Related to fraud, abandoned government

projects are also the result of excessive layers of subcontracting, lack of transparency and incompetency of contractor. The scenario could be the subcontracting of the main works, i.e. the main contractor does not do the main works of the contract, and the payment given to main contractor does not go to the work contractor. One respondent gave an example whereby a state government project was awarded to a main contractor that wholly sub-let the project with a lower price to another contractor which was inexperienced. This resulted in the project being abandoned.

Others mentioned include mismanagement and inefficient management team. Particularly, unrealistic expectation of client is given. Another related cause given is undecided client which results in change of scope and subsequently variations, and abandonment. Two examples of abandoned public project are also given. Mega project like the "scenic bridge" (The Star Online 2006) is abandoned due to international politics, and the Broga incinerator plant is abandoned due to public perception and opinion.

4.5 Results of Semi-structured Interviews

A series of ten semi-structured interviews were conducted to obtain detailed opinions from experienced players in the construction industry concerning the causes of abandoned construction projects and how to solve the problems. The backgrounds of the interviewees are summarised in Table 4.14 below. The diverse backgrounds of the interviewees, i.e. architects, developers, property consultants, the honorary secretary general of the National House

Buyers Association etc. ensured a comprehensive view was obtained. New information discovered from the interviewees declined substantially after the eighth interviewee, indicating saturation of information. A chart representing a breakdown of the categories/themes that have emerged from the results is presented in Figure 4.2 below.

Table 4.14 Backgrounds of interviewees

Interviewee	Background
1	Director of a development company
2	Architect
3	Deputy managing director of an international property consultants and chartered surveyors company
4	Architect
5	Architect
6	Property development and corporate finance consultant
7	Project manager of a development company
8	General manager of a development company
9	Honorary secretary general of the National House Buyers Association
10	Former corporate director of a construction company

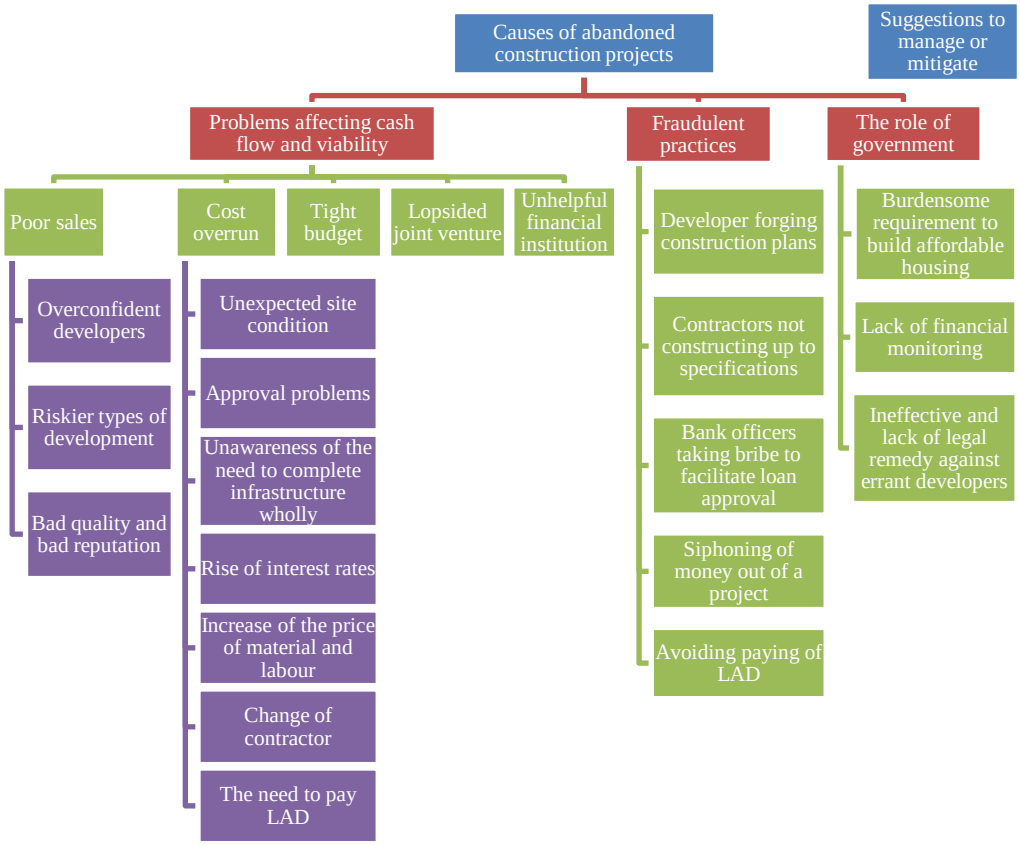

Figure 4.2 Results of semi-structured interviews

4.5.1 Causes of abandoned construction projects

The causes of abandoned construction projects given by the interviewees are classified into three main sections, i.e. 1) problems affecting cash flow and viability, 2) fraudulent practices, and 3) the role of government.

4.5.1.1 Problems affecting cash flow and viability in abandonment of construction projects

Problems affecting cash flow and viability in abandonment of construction projects suggested by interviewees can be categorised into five

groups, i.e. 1) poor sales, 2) cost overrun, 3) tight budget, 4) lopsided joint venture, and 5) unhelpful financial institution.

a Poor sales

Poor sales often lead to cash flow problems and eventually abandonment of construction projects. Developers need about 50 to 70% of sales to breakeven. Banks only release loan on condition that certain percentage of sales is made, e.g. 65% of sales. Developers may have built the foundation, car park, and some part of the superstructure even though the bank has not released the loan. Poor sales can be affected by overconfident developers, certain types of development which are riskier, and bad quality and bad reputation.

i Overconfident developers

Overconfident developers are often inexperienced developers who result in overestimation of sales and overpricing of products of development projects. Developers do not consider whether the location is good, i.e. there are enough population and good transportation which are important for good sales. However, one interviewee pointed out that there will inevitably be units which are hard to sell initially, e.g. units facing junction, units near sewage treatment plant, units too near a slope, units too near the main road, units too near a cemetery and units with access road that is too narrow. These internal bad units are inevitable even in good locations.

Another interviewee gave an example where the developer was overconfident. The project consisted of eight blocks of low cost flats, 840 units in total, of which 524 were sold. The project was abandoned because all the eight blocks were open for sales at once. The houses sold were scattered across the eight blocks. This affected the payment because the developer could not have concentrated cash flow on the blocks being built. For example, when the contractor was constructing the first block, because the houses sold were scattered across all eight blocks, the houses sold in the first block was not enough to pay the contractor. Instead the developer should have anticipated a stage by stage sale of the houses.

ii Riskier types of development

High rise residential, high rise strata unit office building and low cost residential projects are inherently riskier in terms of poor sales. For high rise residential and high rise strata unit office building projects, the risk is higher because the sale is top down, whereby the upper floor units are preferred by buyers, but the payment is based on the sequence of construction which is bottom up. The developer might be able to build until the car park, but not the bottom units if the developer is financially weak. Furthermore, high rise buildings are riskier because, unlike landed properties which can be completed unit by unit based on units sold, high rise buildings must be completed wholly in order to be certified fit for occupation.

Low cost houses are riskier in terms of sales because there is lack of financially qualified buyers within the group of people which the low cost houses are reserved for by the government. One interviewee gave an example where a project was built on squatters land. The squatters were given priority to buy the low cost houses, but they could not afford them. Even when the low cost houses were open to other buyers, there was a lack of financially qualified buyers who are within the group eligible for low cost houses.

iii Bad quality and bad reputation

When the quality of construction is poor or the developer has bad reputation, then the project will inevitably be subjected to the risk of poor sales.

b Cost overrun

Cost overrun problems can be due to 1) unexpected site condition, 2) approval problems, 3) unawareness of the need to complete infrastructure wholly, 4) rise of interest rates, 5) increase of the price of material and labour, 6) change of contractor, and 7) the need to pay LAD.

i Unexpected site condition

Hilly area, ex-mining land and squatter land are examples of development sites that are prone to the problems of unexpected site conditions.

Problems associated with unexpected site conditions reported by interviewees include weak soil condition hence the need to increase reinforcement such as piling, the land is too hilly therefore it needs a lot of cutting and filling, and because it is hilly it is more prone to slope failure, and another case where the land is too low and it needs to be filled up. Concerning squatters, a developer overlooked the costs of paying compensations and building temporary settlements for the squatters. Unexpected site conditions reported also include infrastructure problem whereby the developer overlooked the need to tap water from a farther source which is costlier. Another unexpected site condition mentioned is flooding.

ii Approval problems

Approval problems can be related to land matters, i.e. conversion, amalgamation and subdivision, approval of building plans, and constructing not according to regulations. Approval problems can be due to developers' unawareness of certain regulations, such as amendments or new requirements by local authorities and service providers, e.g. providers of water and electricity, and incomplete/insufficient design by the consultant. Incomplete/insufficient design by the consultant may be due to too low a fee paid or too little time given to the consultant. Approval problems result in cost overrun and delays, and eventually abandonment of projects.

iii Unawareness of the need to complete infrastructure wholly

An interviewee brought up a point where an inexperienced developer of a big commercial project was unaware and did not foresee the need to complete infrastructure works wholly, e.g. septic tank and retention pond, when the sales of the development is only partial and not enough for the purpose. Therefore the project was abandoned.

iv Rise of interest rates

When interest rate rises, there will be increase of the cost of capital which will contribute towards cost overrun and abandonment of construction projects. This is especially affecting developers who practice high leveraging.

v Increase of the price of material and labour

The increase of the price of material and labour could lead to cost overrun. An example given is when a genuine developer was met with the economic downturn due to the 2008 oil price hike. As a result, the price of steel bar went from about RM 2 thousand per ton to about RM 4 thousand per ton. The problem was exacerbated by the developer's own tight budget, therefore the project was abandoned.

vi Change of contractor

Change of contractor happens when a contractor abandons a project and a new contractor has to be called in. The new contractor takes many months to restart. New contractor have to quote a higher price, about 20% to 40% higher because they need to solve someone else's problems, i.e. there might be defects which they need to rectify.

Abandonment by contractors can be caused by cash flow problems of contractors as a result of underpricing. Underpricing by contractors can be due to high competition among contractors and demand by developer for a low price. Cash flow problems of contractors can also be due to substantial increase of the price of labour and material, e.g. steel, cement and plywood, and the developer does not allow increase of the price of contract for the contractors. Another cause of cash flow problems of contractors can be delays in interim payments, e.g. when the developer siphons money into another project, thus affecting the payment to the contractor.

Apart from cash flow problems of contractors, abandonment by contractors can also be due to substandard workmanship and material, and fraudulent contractor as one interviewee pointed out. The contractor may be used to bribing consultants in return for leniency. But, when it so happen that the consultant is strict, the contractor abandons the project.

vii The need to pay LAD

LAD (liquidated and ascertained damages) is a contractual penalty for delay for a project which exceeds the contractual completion dateline. LAD is an increase of cost which can cause cost overrun and affect viability of a project and ultimately abandonment. Causes of delays mentioned by interviewees are mainly approval problems, unexpected site conditions, change of contractor, and financial problems.

c Tight budget

A tight budget puts a project at a higher risk to suffer from cash flow problems and to become not viable and hence abandonment. Interviewees reported four aspects that make a project's budget tight, i.e. 1) the developer is financially weak and does not have sufficient fund, 2) the land of the development is bought by the developer getting a loan from the bank hence the need to continuously service the interest charges, 3) the development products are sold too cheaply, and 4) the developer siphons the project's money elsewhere. During a recession, the developer who bought the development land by loan has no choice but to proceed with a low profit margin because any delays can cause cost overrun due to the continuous interest charges. Low profit margin may be in the way of cheap pricing of the development products or higher material costs. Cheap pricing of the development products may also be due to high buyers' bargaining power / highly competitive market. Siphoning of money happens when money intended for the project, e.g. money

from house buyer's 10% down payment or even the developer's own money intended for the project is used to buy other land, buy shares, or channelled to another project.

d Lopsided joint venture

One interviewee provided an example where the developer and the land owner were engaged in a joint venture, whereby the developer was allowed to charge the land to the bank to borrow money. The developer promised the land owner too high a percentage of the completed units as return, maybe 30% when normally it was only about 20%. After some time, the project became not viable, and the developer decided not to continue. The joint venture is lopsided. The interviewee said that the landowner might be too greedy for bigger return to allow the developer to charge the land, which is very risky. The interviewee pointed out that good developers never use owner's land for financing and they should have their own source of financing.

e Unhelpful financial institution

Interviewees stated a few scenarios that financial institutions are unhelpful when construction companies are facing cash flow problems. One of them is that there is too much criteria for disbursement of money from the bank. One interviewee pointed out that the approval of bridging loan at 50% to 60% of units sold is unhelpful because at this percentage of sale, it is already almost enough to cover for the cost of construction. Another interviewee

pointed out that a bank would only release a loan if there are 65% of units sold which is unhelpful. One interviewee gave another scenario when a bank is unhelpful, i.e. when a construction company has borrowed money from a bank, and a rise of interest rate is coupled with a tight repayment schedule, such as when the bank does not allow restructuring of the repayment schedule, cash flow problem will arise.

One of the interviewees also pointed out a situation where the bank withdrew the loan facility to a development causing it to be abandoned. The development was bought over from another developer. Due to a financial crisis, the original loan provider bank was affected. Therefore the bank withdrew the loan facility to the development, claiming that there was a change of management in the development. The new developer was forced to abandon the project because he did not have extra money.

4.5.1.2 Fraudulent practices in abandonment of construction projects

Fraudulent practices in abandonment of construction projects involve developers, contractors and bank officers. Fraudulent practices in abandonment of construction projects are related to developer forging construction plans, contractors not constructing up to specifications, bank officers taking bribe to facilitate loan approval, siphoning of money out of a project, and avoiding paying of LAD when a project is late.

a Developer forging construction plans

According to one interviewee, there was a man who had layout plan approved and land titles subdivided. He proceeded to sell houses with forged plans by way of forged signatures. He did not get infrastructure plan approvals. When he was selling, problem arises due to no water and electricity, because these utilities need infrastructure plans. When he was applying for infrastructure plans approval, MPKJ (the town council of Kajang) found out that there was actually no building plan approval. Thus MPKJ issued a stop work order, and the project was abandoned. The architect of this project was based in Kelantan, while the consultant engineer was based in Johor. It was not known whether he intended to cheat or not. He managed to sell some units. He was not an experienced developer, judging from the layout plan. He might be trying to save money, judging from his unwillingness to pay various fees incurred from dealings with the authorities.

b Contractors not constructing up to specifications

One interviewee gave a scenario of a contractor not constructing up to specifications. The contractor's workmanship and material are substandard. The contractor may be used to taking consultants to nightclub, and have leniency from the consultant in return. When it so happen that the consultant is strict, the contractor abandon the project. Then new contractor has to be called in, but with a higher price and delayed time.

c Bank officers taking bribe to facilitate loan approval

An example of an actual case was told by one interviewee whereby the bank officers have to be given bribe of 20K-30K to get a 1 million loan.

d Siphoning of money out of a project

The siphoning of money out of a project is the transferring of money intended for a project for use in another project which may be short of cash, or for investing in buying land or shares. The money siphoned out may also be channelled to the developers themselves, which is often the case with public listed company.

The siphoning of money may be due to the lack of control by the government as in commercial projects. Even though there is control by the government for housing projects in the form of HDA accounts, some developers are able to withdraw money fraudulently from the HDA accounts before the money is siphoned out. For example, a developer may only have completed 30% of the construction, but have already withdrawn 70% of the money from the HDA account. They may do this by conspiring with the contractors and consultants. This may be due to the not stringent enough procedures to withdraw money from the HDA accounts.

After money is siphoned out of projects, developers may become unable to pay their contractors. Therefore construction activities cannot be

continued, and the projects are abandoned. It is hard for house buyers to sue the developers because the misappropriations are often hidden under legal ways.

e Avoiding the payment of LAD

This happens when a project is delayed, the developer has to pay LAD (liquidated and ascertained damages) if they complete the project, and the developer is not afraid of being sued for abandoning the project. So there are projects which are 90% completed, but have been abandoned because the developers wanted to collect as much profit as possible but did not want to finish the projects so as to avoid being sued for LAD.

4.5.1.3 The role of government in abandonment of construction projects

The role of government in abandonment of construction projects is related to the burdensome requirement to build affordable housing for housing projects, the lack of financial monitoring, and the ineffective and lack of legal remedy against errant developers.

a Burdensome requirement to build affordable housing

According to one interviewee, the government requirement to build affordable housing is at the developers' expense especially at prime locations, where the land prices are more expensive while the price of affordable housing remains the same as in other less expensive lands. For example, although the

land price in Semenyih, Kajang and Cheras are different, the price of low cost house is RM42 thousand, the same for all locations. Furthermore, RM42 thousand is an old price that has not been changed for ten years. This has partly contributed to the abandonment of housing projects. Another related contributor to the problem is the requirement to sell low cost houses to a certain lower income category, i.e. most house buyers of this category have very poor credit rating which the banks are reluctant to lend money. The interviewee also hinted about developers resorting to circumvent the problem by selling the low cost houses to non-deserving buyers, i.e. buyers whose financial ability is higher than the intended group.

Another interviewee also pointed out that the government is too slow in selecting the eligible buyers for the low cost houses. This has affected the cash flow of one developer, including the developer's payment to the contractor. Because the payment was not good, the contractor stopped work, and in turn caused the existing house buyers to instruct the bank to stop paying the developer. Therefore, the project was abandoned.

b Lack of financial monitoring

There is a lack of financial monitoring similar to those in the Housing Development Act 1966 (HDA 1966) for commercial projects. For example, without the like of an HDA account for commercial projects, whereby fund is designated for a certain project, money can be siphoned between projects. Developer can siphon money from one project to another that is lacked of

sales, thereby putting the project that money has been transferred out at risk of being abandoned. Also, without proper financial monitoring like those in the HDA 1966, the government cannot ensure that adequate money is allocated for a project. For instance, an interviewee pointed out that a big commercial project was abandoned because the sales is only partial and the developer did not allocate enough money to wholly complete infrastructure works like septic tank and retention pond. The developer did not foresee that infrastructure works must be wholly completed even if sales is only partial.

Even though there is HDA 1966 to monitor the finance of housing projects, three interviewees indicated that the releasing of money from HDA account to the developers is not tight/proper enough. Some developers are able to drawdown the money via unscrupulous ways, such as by conspiring with the contractor or consultant. Some developers spend the extra money on something else while some siphon the money out for themselves.

c Ineffective and lack of legal remedy against errant developers

Part of the reason developers choose to abandon construction projects is because they know house buyers who would sue them would face an uphill task due to the infamous long, tedious and costly legal process in Malaysia. Furthermore, these developers are normally protected behind limited liability companies, whether privately owned or public listed. Besides, any misappropriation of funds would normally be hidden under legal ways that is hard to take action against. For abandoned housing projects, the Ministry of

Housing and Local Government (MHLG) does blacklist errant developers. This is a deterrent for big developers, but less so for small time one project developers. This may be because blacklisted company directors can still use proxies, e.g. their friends or relatives to conduct businesses on their behalf. However, there is no blacklisting for commercial projects.

4.5.2 Suggestions to manage or mitigate abandonment of construction projects

To solve abandonment of construction projects, the interviewees suggested that there must be a competent team. The developer must be strong and well verse in development. On selecting contractors, it is important for the developer to check the contractor's background to make sure that the contractor is financially strong and does not just undertake a contract with a low price. It is also important to check how much the contractor borrows from bank. The interviewees also stressed the importance of tender interview in selecting a contractor. Besides, it is also a must to have competent consultants, and the consultants must be given sufficient fee and time.

On cash flow matters, the interviewees stressed that a proper market research is important, and there must be enough profit margin and high contingency sum. Apart from that, an interviewee suggested not to rely solely on bridging loans, but to have credit lines through other collaterals, i.e. more ways of borrowing money to complete a project.

Concerning the government's role in solving abandonment of construction projects, one interviewee suggested different pricing scheme of low cost housing for different location instead of the same price for all that does not reflect the differing price of land in different locations. The interviewee also suggested the government take over the role of building low cost housing as in the case of Singapore and her HDB (Housing Development Board) flats.

A few interviewees also recommend that the government enforce the BTS (build then sell scheme) which the developer has to assume the risk of completion instead of the house buyers. One interviewee pointed out that quality is also ensured in the BTS because the developer now is afraid of not being able to sell if the quality is poor. The interviewee stated that the house price would be higher because the cost of financing is now factored in, and especially so at the beginning of the implementation of the BTS due to the lack of competition. However, the interviewee said the lack of competition / monopoly is temporary as smaller developers would eventually merge into bigger ones in several years.

Another suggestion for the government is for the partial issuance of CCC (certificate of completion and compliance) for landed residential projects based on units completed as this will put fewer burdens on the developer. Besides, it is also suggested that the government implement something similar to the HDA (Housing Development Act 1966) to control the development of

commercial projects. Another interviewee recommended white knights to help revive abandoned housing projects.

4.6 Summary

General characteristics of the 225 questionnaire respondents show that 1) almost half has experience in abandoned or almost abandoned projects, 2) there is a fair mix of client/owner, consultant and contractor/supplier but it is slightly dominated by consultant, 3) there is a fair representation of non-residential projects (inclusive of non-residential, civil work, special trades and others) even though it is dominated by residential projects at 44.4%, and 4) the projects are mostly privately funded at 71.6%. A ranking of the causes has been produced, and Spearman's ranking correlations between different groups of respondents show high correlation / high agreement of the ranking among the majority of the respondents. The minority groups which show less correlation / less agreement of the ranking are those who did not indicate their experience in abandoned construction projects, government officials, special trades, and publicly funded projects. Seven underlying factors extracted from factor analysis are 1) site worker and related problem with contractor, 2) project teamwork and ethical issues, 3) design, sourcing of resources and acts of God, 4) project planning, monitoring and controlling, 5) contract administration, 6) financial management, and 7) inexperienced client/owner. Cronbach's α reliability analysis confirms the reliability of the underlying factors extracted. Results of open ended question on solving abandonment of construction projects from 123 respondents yield 1) general answers, 2)

answers specific to resolving already abandoned projects, and 3) the causes of abandoned construction projects; the majority of the answers are related to the former two items. More than 50% of these respondents have experience in abandoned or almost abandoned projects. Results of semi-structured interviews with architects, developers, property consultants, and the honorary secretary general of the National House Buyers Association yield detailed information on 1) the causes of abandoned construction projects and 2) suggestions to manage or mitigate abandonment of construction projects; the majority of the information are related to the former item.

CHAPTER 5

DISCUSSION OF RESULTS

This chapter starts with the discussion on the general adequacy of both the quantitative and qualitative data in complementing the lack of available literature. This is followed by the discussion on the ranking of potential causes of abandoned construction projects. Then, the comparison of causes of abandoned construction projects between results of literature review, open-ended question of questionnaire and semi-structured interviews is presented. Lastly this chapter presents the interpretation of the underlying factors extracted from factor analysis with the results of literature review, open-ended question of questionnaire and semi-structured interviews.

5.1 General Adequacy of Data in Complementing the Lack of Available Literature

Now that the data has been obtained, analysed and presented, first of all it is important to discuss how well the data obtained complement the lack of the available literature. At the onset of this research, literature review on the causes of abandoned construction projects found that the available literature on the subject matter is lacking because they focused mainly on housing projects; the sources of literature consisted of mostly news article, a few unpublished theses and conference papers; the methodologies of the unpublished theses lack the ability to generalise the findings to represent the whole construction industry.

5.1.1 General adequacy of quantitative data

In terms of the general characteristics of the questionnaire respondents, there are 225 useful responses received which turns out to have fair representation of different groups within the construction industry. Almost half of the respondents, 103 have experience in an abandoned or almost abandoned project, while 119 others have no experience. While those who have experience may base their answers on true experience, it is believed that the opinions of those who have no experience are not less important. Those with no experience may be very good in construction so much so that they have successfully avoided abandonment of construction projects they were involved, and their opinions may consist aspects of project management that is important to avoid abandonment of projects. In terms of the roles of respondents in the projects, there is a fair mix of client/owner, consultant and contractor/supplier at 28.9%, 37.8%, and 23.1% respectively, though it is slightly dominated by consultant. This should be an improvement over Khalid's (2010) questionnaire survey that only involved housing developers. In terms of types of projects, it is dominated by residential projects at 44.4%. The percentages of non-residential, civil work, special trades and others are 16.0%, 6.7%, 3.1%, and 29.8% respectively. It should be noted here that the others group comprise a large proportion at 29.8%, and a high percentage of projects within this group are a mix of residential and non-residential projects. Therefore, this also increases the representation of non-residential projects. In terms of funding of project, the majority are privately funded at 71.6%.

5.1.2 General adequacy of qualitative data

The qualitative data in this research also seems to be adequate judging by the respondents of the open-ended question in the questionnaire survey as well as the semi-structured interviews. There are 123 respondents to the open-ended question on suggesting solutions to the problems of abandoned construction projects, of which 69 have experience in abandoned or almost abandoned projects. Even though the question is on suggesting solutions to the problems, twelve of the respondents have provided opinions on the causes of abandoned construction projects, of which nine have experience in abandoned or almost abandoned projects. As for the semi-structured interviews, the ten interviewees comprised architects, developers, property consultants, and the honorary secretary general of the National House Buyers Association. New information discovered from the interviewees declined substantially after the eighth interviewee, indicating saturation of information. Most of the qualitative data obtained applies for both residential and non-residential projects as the questions asked are non-specific, i.e. on construction projects in general. Therefore this also complements the available literature that focused mainly on residential projects.

5.2 Discussion on the Ranking of Potential Causes of Abandoned Construction Projects

From the results of the ranking of the causes of abandoned construction projects, it is found that causes ranked 1, 3, 6, 12, 13, and 19 correspond with the causes found in the literature, i.e. financial difficulties faced by the owner,

unexpected bad economic conditions, inadequate project feasibility studies, inexperienced client/owner, unfavourable government policy, and lack of cooperation from local authorities. Other causes identified, which are closely related to that found in the literature, are those ranked 2, 8, 9, 10, and 11, i.e. financial difficulties faced by the contractor, project control problems, inappropriate project planning and scheduling, bureaucracy and red tape within the project, and poor contract administration. A number of important causes which have not been mentioned in previous research are also identified. These are causes ranked 4, 5, 7, 14, 15, 16, 17, 18, and 20, i.e. inappropriate mode of financing project, delays in interim payments, incompetent contractors or subcontractors, fraudulent practices and briberies, litigation, inappropriate pricing/incentives of services rendered by contractors or consultants, lack of appropriate dispute resolution method, faulty tender process, and inappropriate contract arrangements (traditional design-bid-build/design and build/management contracting/etc.).

As such, a significant proportion of the top 20 causes of abandoned construction projects (i.e. 14 out of 20) either weakly correspond with or are not found in the literature. The ranking of the causes of abandoned construction projects has therefore helped to shed some light onto the causes of abandoned construction projects. However, just as discussed in the earlier chapter on research methodology, the ranking as a quantitative method is good at generalisation but lacking in details provided by the qualitative methods. For example, the ranking taken alone would have raised some questions as to why certain causes are ranked highly by the industry. For instance, cause ranked 2

‘financial difficulties faced by the contractor’ raises the question as to why the client/owner could not replace the contractor once he is found to face financial difficulties, or why the financial difficulties of a contractor can ultimately lead to the abandonment of a project. The answers can be found in section 5.4.1 below on underlying factor number 1 of factor analysis interpreted with the results of literature review, open-ended question of questionnaire and semi-structured interviews. Briefly, it is because replacing a problematic contractor causes further delays and cost overruns. In fact, the top 20 causes are well interpreted by underlying factors number 1, 2, 4, 5, 6 and 7 in section 5.4 below. Therefore, the triangulation method chosen for this research, i.e. the quantitative and qualitative methods complementing each other, seems to be worthwhile.

However, the result does point to the owner as the one to be mainly responsible for the abandonment of construction project as ten of the factors are directly attributed to the owner (i.e. causes 1, 4, 5, 6, 11, 12, 14, 17, 18 and 20); whereas, only five causes may be attributed to the contractor (i.e. causes 2, 7, 8, 9 and 16). The owner has himself to be blamed for his own financial difficulties faced, inappropriate mode for financing the project, delay in honouring interim payments, inadequate feasibility studies, poor contract administration, his own lack of experience (and did not take appropriate measures to address this), lack of control over fraudulent practices and briberies, lack of appropriate dispute resolution method formulated for the project and inappropriate contract arrangement. As for the contractor, he might contribute to the abandonment of construction project due to his financial

difficulties, incompetence, and the poor project control, planning and scheduling. In this regard, however, it appears that if a financially sound cum competent contractor who knows how to manage a project is chosen then logically the abandonment of a project might have nothing to do with the contractor. In fact, it is the authority of the owner as far as the selection of contractor is concerned. It is also possible that if the owner is inexperienced he may lack the knowledge to ensure that the most suitable contractor is selected. Hence, ultimately it can be deduced that fifteen amongst the top twenty causes are either directly or indirectly attributed to the owner. This should hold the owner mainly responsible for the abandonment of his own projects. However, it should also be noted that there may be circumstances not due to an inexperienced owner that an incompetent contractor is selected.

5.3 Comparing Causes of Abandoned Construction Projects between Results of Literature Review, Open-Ended Question of Questionnaire and Semi-Structured Interviews

Qualitative results on the causes of abandoned construction projects have been obtained through three methods, i.e. literature review, open-ended question of questionnaire and semi-structured interviews. The data obtained from the open-ended question of questionnaire was unexpected as the question was on suggestions to solve abandonment of construction projects but twelve of the respondents were voluntary. This section seeks to examine the similarities and differences between the causes of abandoned construction projects obtained through the three methods.

Even though the results are qualitative in nature, a rough idea of the contribution of each method could be obtained by comparing the quantities of text between the results from each method. The literature review yields about 2000 words, the open-ended question of questionnaire yields about 340 words, and the semi-structured interviews yield about 3280 words. However, the contribution from each method is also subject to the degree of similarity or exclusivity, the level of detail, and the validity of the points obtained.

Yet another general but a bit deeper level of comparing the points obtained between the three methods is by looking at the themes that have emerged from each of the methods. The causes of abandoned construction projects from the literature review are categorised into 1) mismanagement, 2) unfavourable government policies, 3) inefficient public delivery system, and 4) unfavourable economic conditions. The causes of abandoned construction projects from the open-ended question of questionnaire are organised into paragraphs according to themes related to 1) financial matters, 2) fraud, and 3) others. The causes of abandoned construction projects from the semi-structured interviews are categorised into 1) problems affecting cash flow and viability, 2) fraudulent practices, and 3) the role of government. The themes that have emerged from the literature review seem to be dominated by issues external to a project, i.e. unfavourable government policies, inefficient public delivery system, and unfavourable economic conditions; whereas, only about a quarter of the issues are internal, i.e. related to mismanagement. On the other hand, the themes that have emerged from the open-ended question of questionnaire as well as the semi-structured interviews show a marked increase of internal

issues, i.e. more than two thirds of the issues are related to financial matters as well as fraud. The reasons for this may be the lack of previous research and that most of the sources of information prior to this research are news articles that could only discuss what is apparent and superficial, and the methods used in this research have been successful in discovering many points which are hidden from the non-professionals.

Beneath the themes that have emerged from the three methods lies detailed information characteristic of the qualitative method. Due to the subjective nature of qualitative results, the results obtained from each method does not exactly equal or differ from the others in terms of the level of detail as well as the points. In terms of the level of detail, the results of the semi-structured interviews are the most detailed, followed by the results of the literature review and the open-ended question of questionnaire. In terms of the points, it is found that there are common points and exclusive points among the results of the three methods. The common points may have higher credibility than the exclusive points as they are the same points discovered from different methods.

5.3.1 Common points

Having common points found from the different methods does to a certain extent lend credibility to the common points. Therefore, this section provides a summary of the common points. Using the themes of the semi-structured interviews as the base themes, the common points are found across

the three main themes, i.e. 1) problems affecting cash flow and viability, 2) fraudulent practices, and 3) the role of government.

In problems affecting cash flow, common points are found related to 1) poor sales, 2) cost overrun, 3) tight budget, and 4) unhelpful financial institution. Common reason for poor sales is overconfident developers due to poor market feasibility. Common reasons for cost overrun include unexpected site condition due to squatters, the rise of interest rates affecting developers practising high leveraging, increase of the price of material, and the need to get a new contractor when a contractor abandons due to delay in interim payments. Common reason for tight budget is inadequate funding. Common reason for unhelpful financial institution is the difficulty of obtaining bridging loan from financial institution when a project fails to meet a certain sales percentage, which according to various sources, ranges from 50 to 80% of sales. Bridging loan is supposed to help a contractor continue with construction when the sales percentage is less than expected, but financial institutions are not keen in taking more risk by imposing a high criterion.

In fraudulent practices, common point is found related to siphoning of money out of a project. Whereas, in the role of government, some of the common points are found related to the lack of control and monitoring by the government in general, while others are specifically related to 1) burdensome requirement to build affordable housing, 2) ineffective and lack of legal remedy against errant developers, and 3) the sell then build system. Common problem of burdensome requirement to build affordable housing is the low

number of purchasers within a certain lower income category that the affordable housing can only be sold to. Common problem of ineffective and lack of legal remedy against errant developers is the inability to prevent errant developers who have been blacklisted to use proxies to start new developments. The sell then build system as a cause from the interviews is implied from a few recommending the opposite system, i.e. the build then sell system.

5.3.2 Exclusive points

The exclusive points are far more detailed than the common points, especially those from the semi-structured interviews. This is because the level of detail of the common points is constrained by the lower level of detail of the results of the literature review and the open-ended question of questionnaire. Therefore, in order to avoid the redundancy of restating most of the results of the qualitative methods, perhaps it is sufficient to state here that the exclusive points are found related to all the three main themes of the results of the semi-structured interviews, i.e. 1) problems affecting cash flow and viability, 2) fraudulent practices, and 3) the role of government.

5.4 Interpreting the Underlying Factors Extracted From Factor Analysis with the Results of Literature Review, Open-Ended Question of Questionnaire and Semi-Structured Interviews

The seven underlying factors extracted are 1) site worker and related problem with contractor, 2) project teamwork and ethical issues, 3) design,

sourcing of resources and acts of God, 4) project planning, monitoring and controlling, 5) contract administration, 6) financial management, and 7) inexperienced client/owner. However it has been found in the process of interpreting the underlying factors with qualitative results that the initial apparent name of the factors number 1 and 3 could be further refined into 'under-pricing of contract and disruption of payments to contractor' and 'uncertainties' respectively. For factor number 1, this results in the shift of the blame from site worker and contractor to the developer. This again justifies the triangulation method chosen for this research. Consequently, five of the factors are directly attributed to the owner, i.e. factors number 1, 4, 5, 6 and 7, while the remainders are partially related to the owner, i.e. factors number 2 and 3.

5.4.1 Under-pricing of contract and disruption of payment to contractor

This factor consists of 1) lack of motivation of site workers, 2) shortage of site workers, 3) unskilled/incompetent site workers, 4) incompetent contractors or subcontractors, 5) poor quality control, and 6) relationship between contractor and labour (industrial relation).

Generally, under-pricing of contract and disruption of payment to contractor are responsible for causing cash flow problem of contractor which leads to the consequences as the variables number 1, 2, 3, 5 and 6. The exception is variable number 4 which is only due to under-pricing of contract.

Under-pricing of contract can be due to high competition among contractors, demand by developer for a low price, and excessive layers of rent-seeking subcontracting for government projects. In general, under-pricing can lead to cash flow problem of contractor. In particular, under-pricing due to excessive layers of rent-seeking subcontracting for government projects could lead to the appointment of incompetent contractor as in variable number 4.

Cash flow problem of contractor can also be due to arbitrarily reduced payments (Home Guru 2011) or delays in interim payments. The disruption of payment to contractor may be due to cash flow problem of developer or fraud, e.g. when a developer siphons money out of a project.

Cash flow problem of contractor can have a knock-on effect to subcontractor, supplier (Home Guru 2011) as well as site worker. Cash flow problem of contractor can result in the lack of proper incentives to site workers, leading to the lack of motivation of site workers (Elinwa & Joshua 2001) as in variable number 1. The same can be said to variable number 2, shortage of site workers, and variable number 3, unskilled/incompetent site workers according to the basic economic principle of price elasticity of supply, whereby the lower the price the contractor is able to pay, the lesser the site workers are available, particularly the skilled/competent site workers. The conditions of variables number 1, 2 and 3 could be worsen by the increase of the price of labour and material and the developer does not allow the increase of the price of contract for the contractor.

In a related matter, the relationship between contractor and labour (industrial relation) as in variable number 6 can be made worse by the proliferation of subcontracting as mentioned earlier and contractor's exploitation of small craft-based subcontractors (Chiang 2008). In general, poor industrial relation, together with cash flow problem of contractor and its consequences as in variables number 1, 2 and 3, can result in delays, poor quality as in variable number 5, and cost overrun of project, affecting viability and ultimately leading to the abandonment of project. For instance, cash flow problem of contractor can result in abandonment by the contractor, leading to delays and cost overrun because a new contractor would take some time to restart and charge a higher price. Poor quality as in variable number 5 could lead to poor sales and cost overrun. Alternatively the contractor may be used to bribing consultants in return for leniency about substandard workmanship and material, but when it so happen that the consultant is strict, the contractor abandons the project. Any delays can lead to cost overrun when the delay is substantial enough for a project to exceed its contractual completion dateline and the developer or contractor needs to pay LAD (liquidated and ascertained damages).

5.4.2 Project teamwork and ethical issues

This factor is made up of 1) cultural clash among parties involved in project, 2) litigation, 3) lack of cooperation from local authorities, 4) unfavourable government policy, 5) fraudulent practices and briberies, 6)

inappropriate mode of financing project, and 7) unclear lines of responsibility and authority.

Generally this factor concerns the issues of various parties with incongruent objectives and beliefs working together as essential parties of a construction project. The parties are the government, financial institutions, the developer, the contractor and the consultants. The most crucial of the parties is the government of which certain policies and ineffectiveness of governance give rise to fraudulent practices and contribute to financial difficulties of the developer.

The unfavourable government policies which correspond to variable number 4 are the sell then build system, the lack of strict licensing for developers, and the burdensome requirement to build affordable housing. The sell then build system allows the sale of houses before the houses are being built; therefore there is more cash flow from the start of the construction phase and less requirement for the developer's own capital. This enabled more houses to be built at a faster rate and a lower price (Chen 2007). Unfortunately, this has also enabled more developers of smaller capital to be involved in the business. The lack of strict licensing for developers contributed to the problem (Ibrahim 2006). Being small, these developers have to rely critically on their sales to meet their cash flow, which corresponds to variable number 6. When sales is not up to target, developers rely on bridging loans from financial institution, but then financial institutions are cautious about the risks and only approve bridging loans in the range of 50 to 80% of sales which is near the

breakeven point of cost recovery and not really helpful. Related to inappropriate mode of financing, it is also reported that some developers practice high leveraging, such as using bank loans to finance the development land. Any delays can cause cost overrun due to the continuous interest charges. The government's requirement for housing developers to build 30% low cost houses is also unfavourable to the cash flow of smaller developers because the price of the houses are low and fixed, therefore the profit margin is low. Low cost houses are also more susceptible to poor sales because these houses can only be sold to a certain lower income category and most buyers of this category have poor credit rating which the banks are reluctant to lend money.

Ineffectiveness of governance, roughly corresponding to variable number 3, includes issues such as ineffective and lack of legal remedy against errant developers, lack of financial monitoring and control, and slowness in selecting eligible buyers for low cost houses. These examples together with the unfavourable government policies mentioned give rise to fraudulent practices as in variable number 5 such as over claiming of fund from the HDA account, siphoning of money out of a project, and avoiding paying of LAD. Errant developers know house buyers who would sue them would face an uphill task due to the infamous long, tedious and costly legal process in Malaysia. Furthermore, these developers are normally protected behind limited liability companies, whether privately owned or public listed. Besides, any misappropriation of funds would normally be hidden under legal ways that is hard to take action against. For abandoned housing projects, the Ministry of

Housing and Local Government (MHLG) does blacklist errant developers. This is a deterrent for big developers, but less so for small time one project developers. This may be because blacklisted company directors can still use proxies, e.g. their friends or relatives to conduct businesses on their behalf. However, there is no blacklisting for commercial projects. An example of a related fraud is when a project is delayed, the developer abandons the project at near project completion to collect as much profit as possible and to avoid paying LAD (liquidated and ascertained damages) for completing the project late because the developer is not afraid of being sued for abandoning the project.

There is a lack of financial monitoring similar to those in the Housing Development Act 1966 (HDA 1966) for commercial projects. For example, money can be siphoned between projects, i.e. from a healthy project to a project lack of sales. Also, the government cannot ensure that adequate money is allocated for a project. For instance, a big commercial project was abandoned because the developer did not foresee the need to allocate enough money to wholly complete infrastructure works like septic tank and retention pond even if the sales is only partial. Even though there is control by the government for housing projects in the form of HDA accounts, some developers are able to withdraw money fraudulently from the HDA accounts before the money is siphoned out. For example, a developer may only have completed 30% of the construction, but have already withdrawn 70% of the money from the HDA account. They may do this by conspiring with the contractors and consultants. This may be due to the not stringent enough

procedures to withdraw money from the HDA accounts. It is hard for house buyers to sue the developers because the misappropriations are often hidden under legal ways.

The sell-then-build system is also less risky than a build-then-sell system from bankers' point of view (Teoh & Lim n.d.). This might have resulted in banks not exercising a duty of care by often relying on architects employed by the developer to sign off progress certificates, knowing that they can still collect repayment from house buyers even if a project is abandoned (Heng 2011). This might encourage over claiming of fund by the developer, either resulting in mismanagement of fund or fraud and eventually abandonment of project.

5.4.3 Uncertainties

Uncertainties include 1) difficulty of design and construction, 2) adverse weather or acts of God, 3) unavailability of materials and equipment, 4) unexpected location difficulty, and 5) ambiguity or mistakes in scope of work, specifications or drawings.

Generally this factor is related to unexpected site conditions, sudden increase of the price of material, and ambiguity or mistakes in scope of work, specifications or drawings.

Unexpected site conditions are related to variables number 1, 2 and 4. Hilly area, ex-mining land and squatter land are examples of development sites that are prone to the problems of unexpected site conditions. Related problems include weak soil condition hence the need to increase reinforcement such as piling, the land is too hilly therefore it needs a lot of cutting and filling and is more prone to slope failure, and another case where the land is too low and it needs to be filled up. Concerning squatters, a developer overlooked the costs of paying compensations and building temporary settlements for the squatters. Also included is infrastructure problem whereby the developer overlooked the need to tap water from a farther source which is costlier. Another unexpected site condition mentioned is flooding.

The sudden increase of the price of material, which corresponds to variable number 3, could lead to cost overrun. An example is the rise of the prices of raw material such as steel and cement in 2008 (Cheah 2008). Due to the 2008 oil price hike as well as the intense constructions in China in preparation for the Olympics, the price of steel bar went from about RM 2 thousand per ton to about RM 4 thousand per ton. Certain developers do not allow the increase of the price of contract for the contractors, causing abandonment by the contractors, leading to more cost overruns due to delays and the need to engage new contractors with higher prices.

Ambiguity or mistakes in scope of work, specifications or drawings, which corresponds to variable number 5 and related to variable number 1, may be due to undecided client who results in change of scope and subsequently

variations, and abandonment. Other causes include the developers' unawareness of certain regulations, such as amendments or new requirements by local authorities and service providers, e.g. providers of water and electricity, and incomplete/insufficient design by the consultant. Incomplete/insufficient design by the consultant may be due to too low a fee paid or too little time given to the consultant. Approval problems result in delays, cost overruns, and eventually abandonment of projects.

5.4.4 Project planning, monitoring and controlling

Project planning, monitoring and controlling include 1) inappropriate project planning and scheduling, 2) project control problems, and 3) poor contract administration.

Generally, this factor is related to the problems of planning at the beginning of a project, the disintegrated nature of contracting and subcontracting, and that these conditions contribute to the problems of monitoring and controlling.

The problems of planning may be due to overconfident developers. Overconfident developers are often inexperienced developers who result in overestimation of sales and overpricing of products of development projects. Developers do not consider whether the location is good, i.e. there are enough population and good transportation which are important for good sales. However, one interviewee pointed out that there will inevitably be units which

are hard to sell initially, e.g. units facing junction, units near sewage treatment plant, units too near a slope, units too near the main road, units too near a cemetery and units with access road that is too narrow. These internal bad units are inevitable even in good locations. The lack of proper feasibility studies and inaccurate market research may result in unsuitable project scheme to be undertaken for the prevailing market (Kaur 2011). Unattractive marketing strategies may further exacerbate a less attractive scheme of project already undertaken by a developer.

Another interviewee gave an example where the developer was overconfident. The project consisted of eight blocks of low cost flats, 840 units in total, of which 524 were sold. The project was abandoned because all the eight blocks were open for sales at once. The houses sold were scattered across the eight blocks. This affected the payment because the developer could not have concentrated cash flow on the blocks being built. For example, when the contractor was constructing the first block, because the houses sold were scattered across all eight blocks, the houses sold in the first block was not enough to pay the contractor. Instead the developer should have anticipated a stage by stage sale of the houses.

Concerning the disintegrated nature of contracting and subcontracting, a few problems reported illustrate the fact. One is the excessive layers of subcontracting for government projects. The results are under-pricing of contract and disruption of payment, which is factor number 1, and the same consequences. Another problem reported is that, due to the disintegrated nature

of contracting and subcontracting, when there is a substantial increase of the price of labour and material, e.g. steel, cement and plywood, the developer does not allow increase of the price of contract. Yet another problem reported is the substandard workmanship and material, concealed by the contractor by way of bribery. In other words, these problems show the discord in a contracting and subcontracting environment in terms of the sharing of risk and information, which are essential in the monitoring and controlling of a project.

5.4.5 Contract administration

Contract administration consists of 1) faulty tender process, 2) inappropriate pricing/incentives of services rendered by contractors or consultants, 3) lack of appropriate dispute resolution method, and 4) ambiguities or mistakes in scope of work, specifications or drawings.

Generally, this factor mainly concerns inappropriate terms of contract as a result of poor contract administration. The inappropriate terms of contract refer to inappropriate pricing/incentives of services rendered by contractors or consultants, lack of appropriate dispute resolution method, and ambiguities or mistakes in scope of work, specifications or drawings.

Demand by developer for a low price coupled with high competition among contractors can result in underpricing by contractors. This can result in cash flow problems of contractors and eventually abandonment by contractors. Excessive layers of subcontracting in government projects can also result in

underpricing by contractors besides having less competent contractors. As for consultants, too low a fee paid or too little time given to the consultant may result in incomplete/insufficient design by the consultant, corresponding to variable number 4.

A related scenario is given by an interviewee whereby the developer and the land owner were engaged in a lopsided joint venture. The developer was allowed to charge the land to the bank to borrow money. The developer promised the land owner too high a percentage of the completed units as return, maybe 30% when normally it was only about 20%. After some time, the project became not viable, and the developer decided not to continue. The landowner might be too greedy for bigger return to allow the developer to charge the land, which is very risky. It is also pointed out that good developers never use owner's land for financing and they should have their own source of financing.

Variable number 3, i.e. lack of appropriate dispute resolution method implies that there is a lack of dispute resolution. Related to this, Heng (2011) stated that developers may use proxies to protect themselves from being liable in case of abandonment of project, therefore the lack of dispute resolution. This preemptive measure by the developers contributes to the problems of ineffective and lack of legal remedy against errant developers in the current legal environment as mentioned in factor number 2. Besides, it is mentioned by an interviewee that misappropriation of funds would normally be hidden under legal ways that is hard to take action against. This may also hint poor contract

administration regarding the legal ways. Concerning variable number 4, undecided client results in change of scope and subsequently variations and abandonment.

5.4.6 Financial management

Financial management includes 1) financial difficulties faced by the owner, 2) unexpected bad economic conditions, 3) delays in interim payments, and 4) inadequate project feasibility studies.

Generally this factor concerns the internal and external reasons that cause cash flow problems and how the owner anticipates and responds to the problems. This factor is wide in scope as financial matters are crucial in almost every aspect of construction management. This is evident in that the Cronbach's α for this factor is substantially lower than the rest (i.e. 0.621 for this factor versus 0.807 to 0.903 for factors number 1 to 5), and that it is lower than 0.7 which according to Field (2005) it means that the factor is diverse in nature. As this factor is wide in scope, it is related to factors number 1, 3 and 4 and some of the points in factors number 2 and 5.

Apart from those related to the previous factors, there are also other points that have yet to be mentioned. Firstly, it concerns having a tight budget. A tight budget puts a project at a higher risk to suffer from cash flow problems and to become not viable and hence abandonment. A developer who is financially weak and practices high leveraging has a tighter budget due to the

extra cost of capital, plus it puts itself at greater risk of increased cost of capital due to any eventual rise of interest rates. High leveraging is also more susceptible to delays due to the continuous interest charges. A tight budget may also be due to the developer siphoning funds intended for the project for other use. Also, a tight budget may be due to cheap pricing of development products as a result of highly competitive market.

The other points are related to poor sales. Poor sales can be due to higher interest charge that discourages potential home buyers to buy residential properties and competition of new residential projects (Ibrahim 2006). Then, there are projects which are inherently riskier in terms of poor sales, such as high rise residential and high rise strata unit office building, apart from projects which involve low cost residential already mentioned in factor number 2. For high rise residential and high rise strata unit office building projects, the risk is higher because the sale is top down, whereby the upper floor units are preferred by buyers, but the payment is based on the sequence of construction which is bottom up. The developer might be able to build until the car park, but not the bottom units if the developer is financially weak. Furthermore, high rise buildings are riskier because, unlike landed properties which can be completed unit by unit based on units sold, high rise buildings must be completed wholly in order to be certified fit for occupation.

5.4.7 Inexperienced client/owner

Inexperienced client/owner is made up of only one variable which is inexperienced client/owner. Similar to factor number 6, this factor is also wide in scope as the developer plays a central role in every development. This factor has consequences related to all the previous factors. Two important causes of this factor are detailed in factor number 2, i.e. the sell then build system which enabled developers of smaller capital to be involved in the business of housing development; and the lack of strict licensing for developers (Ibrahim 2006).

5.5 Summary

In terms of general adequacy, the quantitative and qualitative data are found to be adequate in complementing the lack of available literature. For example, both the quantitative and qualitative data now have representation of non-residential projects. The ranking of the causes of abandoned construction projects has helped to shed some light onto the causes of abandoned construction projects as a significant proportion of the top 20 causes either weakly correspond with or are not found in the literature. The top 20 causes are found to be well interpreted by underlying factors number 1, 2, 4, 5, 6 and 7 extracted from factor analysis in the section on interpreting the factors with the results of literature review, open-ended question of questionnaire and semi-structured interviews. In comparing causes of abandoned construction projects between results of literature review, open-ended question of questionnaire and semi-structured interviews, the results from semi-structured interviews and

open-ended question of questionnaire show a marked increase of internal issues. Common points have been discovered from the different qualitative methods. The commons points may have higher credibility, and they are found related to 1) poor estimation of sales, 2) cost overrun, 3) tight budget, 4) unhelpful financial institution, 5) siphoning of money out of a project, 6) lack of control and monitoring by the government, 7) burdensome requirement to build affordable housing, 8) ineffective and lack of legal remedy against errant developers, and 9) the sell then build system. The underlying factors extracted from factor analysis have been interpreted with the results of literature review, open-ended question of questionnaire and semi-structured interviews, and it has been found that the initial apparent name of the factors number 1 and 3 could be further refined into ‘under-pricing of contract and disruption of payments to contractor’ and ‘uncertainties’ respectively. This results in more blame towards the developer for factor number 1. All in all, the owner has been found to be mainly responsible for the abandonment of construction projects, followed by the role of government regulations, and that the triangulation method of crossing the results of quantitative methods with the results of qualitative methods has produced synergistic results.

CHAPTER 6

CONCLUSIONS

This chapter covers the conclusions of this research, the proposals to manage the problem of abandoned construction projects, limitations of this research, and the implications of this research for research and for practice.

6.1 Conclusions

The aim of this work has been to manage the problems of abandoned construction projects in Malaysia. To achieve this aim, five objectives have been outlined, i.e. 1) to review the issues surrounding the problems, 2) to review existing research on causes of the problems, 3) to investigate the causes of the problems, 4) to investigate the potential solutions to the problems, and 5) to propose solutions to the problems.

The issues surrounding the problems have been reviewed in Chapter 1. The issues cover adverse consequences to the economy, society and environment. Perhaps, the most severely affected victim is house buyers, followed by contractors. Despite the issues, there has been lack of research on the subject matter. Existing literature focused mainly on housing projects; the sources of literature consisted of mostly news article, a few unpublished theses and conference papers; the methodologies of the unpublished theses lack the ability to generalise the findings to represent the whole construction industry.

Existing research on the causes of the problems have been reviewed in Chapter 2. The causes of abandoned construction projects from the literature review are found to be related to 1) mismanagement, 2) unfavourable government policies, 3) inefficient public delivery system, and 4) unfavourable economic conditions.

The causes of abandoned construction projects have been investigated via the triangulation method, i.e. using both the quantitative and qualitative methods together to achieve synergy. The quantitative method has yielded the following results:

1. The ranking of causes of abandoned construction projects as presented in Chapter 4. The top 10 causes of abandoned construction projects in Malaysia are: 1) financial difficulties faced by the owner, 2) financial difficulties faced by the contractor, 3) unexpected bad economic conditions, 4) inappropriate mode of financing project, 5) delays in interim payments, 6) inadequate project feasibility studies, 7) incompetent contractors or subcontractors, 8) project control problems, 9) inappropriate project planning and scheduling, and 10) bureaucracy and red tape within the project.
2. The seven underlying factors of abandonment of construction projects as presented in Chapter 4. The seven underlying factors extracted from factor analysis are 1) site worker and related problem with contractor, 2) project teamwork and ethical issues, 3) design, sourcing of resources and acts of God, 4) project planning, monitoring and controlling, 5)

contract administration, 6) financial management, and 7) inexperienced client/owner.

Meanwhile, the qualitative method has produced the following results:

1. The causes of abandoned construction projects from the open-ended question of questionnaire as presented in Chapter 4. This is a short, unexpected but informative result. The themes that have emerged are 1) financial matters, 2) fraud, and 3) others.
2. The causes of abandoned construction projects from the semi-structured interviews as presented in Chapter 4. The themes that have emerged are 1) problems affecting cash flow and viability, 2) fraudulent practices, and 3) the role of government.
3. The common causes of abandoned construction projects discovered by comparing the results of literature review, open-ended question of questionnaire and semi-structured interviews. The results are presented in Chapter 5. The commons points may have higher credibility, and briefly they are found related to 1) poor estimation of sales, 2) cost overrun, 3) tight budget, 4) unhelpful financial institution, 5) siphoning of money out of a project, 6) lack of control and monitoring by the government, 7) burdensome requirement to build affordable housing, 8) ineffective and lack of legal remedy against errant developers, and 9) the sell then build system.

When the quantitative and qualitative results are crossed in triangulation, the following results have been produced:

1. The interpretation of the underlying factors extracted from factor analysis with the results of literature review, open-ended question of questionnaire and semi-structured interviews. The results are presented in Chapter 5. It has been found that the initial apparent name of the factors number 1 and 3 could be further refined. Therefore the seven underlying factors now become 1) under-pricing of contract and disruption of payments to contractor, 2) project teamwork and ethical issues, 3) uncertainties, 4) project planning, monitoring and controlling, 5) contract administration, 6) financial management, and 7) inexperienced client/owner. This results in more blame towards the developer for factor number 1.
2. The discovery that the top 20 causes are well interpreted by underlying factors number 1, 2, 4, 5, 6 and 7 extracted from factor analysis in the section on interpreting the factors with the results of literature review, open-ended question of questionnaire and semi-structured interviews.

All in all, the owner has been found to be mainly responsible for the abandonment of construction projects, followed by the role of government regulations, and that the triangulation method of crossing the results of quantitative methods with the results of qualitative methods has produced synergistic results.

The potential solutions to the problems have been investigated via the open-ended question of questionnaire and the semi-structured interviews. The results are presented in Chapter 4. In brief, the results of the two methods are as the following:

1. The two main themes that have emerged from the results of the open-ended question are 1) general answers, and 2) answers specific to resolving already abandoned projects. In general answers, the suggestions are found related to feasibility studies, finance, client/owner/developer, consultant, contractor, projects team, contract, authorities, and others. In answers specific to resolving already abandoned projects, the suggestions are found related the role of authorities, restructuring and refinancing, and others.
2. The suggestions from the semi-structured interviews can be summarised into 10 main points, i.e. 1) having a competent team, especially the developer, 2) proper selection of contractors, 3) proper market research, 4) adequate cash flow allocation, 5) differentiated pricing for low cost housing according to location, 6) government taking over the role of building affordable housing, 7) having the BTS (build then sell scheme), 8) partial issuance of CCC (certificate of completion and compliance) for landed residential projects, 9) more control by the government for commercial projects, 10) white knights to help revive abandoned housing projects.

Last but not the least, a few solutions to the problems have been proposed in section 6.2 below.

6.2 Proposals to Manage the Problem

Since the causes of abandoned construction projects discovered mainly converge into 1) the standard of practice of the owner, and 2) the role of government regulations, it is proposed that any effort to solve the problems should focus on 1) raising the standard of practice of the owner in terms of their know how and financial strength, and 2) renewing government regulations. The proposals can be divided into short term and long term measures.

6.2.1 Short term measures

In the short term, it is proposed that there should be 1) tighter conditions for owner while maintaining competitiveness, 2) more effective policing of fraud, and 3) using risk management principles on the uncertainties identified. First is concerning tighter conditions for owner while maintaining competitiveness. It is learned from this research that, for housing projects, the STB (sell then build scheme) enabled smaller developers with lesser know how and financial strength into the business, thus causing the problems of abandonment, and that there are suggestions both from the questionnaire survey and semi-structured interviews for the BTS (build then sell scheme). However, for the BTS, an interviewee cautioned that the house price would be

higher because the cost of financing is now factored in, and especially so at the beginning of the implementation of the BTS due to the lack of competition. But then, the interviewee also said the lack of competition / monopoly is temporary as smaller developers would eventually merge into bigger ones in several years. However, it is felt that the BTS is an extreme measure that benefits the large developers and penalise the society in terms of higher house price.

Therefore it is proposed that a middle ground approach be adopted. It is proposed that, through government regulation, a certain percentage, say 50% of the financing be borne by the developer and 50% be borne by the house buyers. Since there is a higher percentage of financing borne by the developer, it is now the burden of the financial institution to choose a stronger developer whom they could trust. It is felt that the adverse effect of higher house price would be lower than the BTS with this approach. Then it is also proposed that the government monitor the rate of abandonment of projects closely, and that the initial percentage of 50:50 developer versus house buyer financing be adjusted accordingly, i.e. to lower the developer's financing percentage to decrease house price but with increasing rate of abandonment, or to increase the developer's financing percentage to decrease rate of abandonment but with increasing house price.

Regarding more effective policing of fraud, it is proposed that the MACC (Malaysian Anti-Corruption Agency) devote more attention to policing siphoning of money out of a housing project to protect house buyers' interest. It is also proposed that the Government impose higher penalties for fraud

relating to the siphoning of money, and to continue to streamline the judicial system to punish fraudsters more efficiently, i.e. in shorter time and with lesser cost. Also, it is proposed that the Government encourage whistleblowing by protecting the whistle-blowers and paying them commensurate reward.

Another short term measure is concerning the use of risk management principles on the uncertainties identified. Generally, risk management calls for the identification of the risks, the prioritisation of the risks, the identification of the strategies to deal with the risks, and the prioritisation of those strategies (Cretu et al. 2011). Identification of the risks has been aided by the discovery of the underlying factor 'uncertainties' through factor analysis (See section 5.4.3 in page 133). Examples of the 'uncertainties' identified include unexpected site conditions and the sudden increase of the price of material. However, it is proposed that more detailed risks items be identified in actual practice to better suit the unique conditions of each project, using those identified in this research as a guide. Prioritisation of the risks involves estimating the likelihood and the severity of each risk item, and calculating the expected loss of each risk item as a product of each one's likelihood and severity. The higher the expected loss is, the higher the priority of the risk item. Consequently, the strategies to deal with the risks should be identified according to the four basic principles, i.e. 1) to retain, 2) to reduce, 3) to transfer, or 4) to avoid, and prioritised. For prioritisation of the strategies to deal with the risk, it is proposed that a benefit versus cost analysis be conducted, i.e. the benefit being the reduction in the expected loss calculated earlier in the prioritisation of risks. In the long term, this risk management is

proposed to be implemented within the framework of BIM (Building Information Modelling) as a subset expert system module. This will be discussed further in the following section.

6.2.2 Long term measures

In the long term, it is proposed that there should be 1) higher standards of education, 3) dissemination of latest research findings, 3) higher awareness, and 4) the implementation of BIM (Building Information Modelling). For higher standards of education, it means the incorporation of the latest research findings into the syllabus of courses at institutions of higher learning. For dissemination of latest research findings, it means the dissemination of the latest research findings through publications, seminars for developers, and even direct dissemination of the latest research findings to the developers by the government. For higher awareness, the public should be informed of the problems through the media so that they are wiser in choosing a good development project to invest their money.

BIM (Building Information Modelling) is basically the virtualisation of the whole project lifecycle in shareable digital format (Eastman et al. 2011). Among its functions and benefits are to simulate, analyse, share information, retain knowledge, reduce uncertainties, reduce wastage, aid in decision making, and etc. However, what is most relevant to tackling abandonment of construction projects are the ability to simulate to reduce uncertainties, a.k.a. risk management as mentioned in the previous section; and the retention of

information and knowledge of a project. For risk management, it is proposed that an expert system module be developed. The expert system shall be the culmination of extensive research into the risk elements, involving industry wide surveys and interviews with industry experts. The expert system shall be able to foresee uncertainties and suggest strategies to mitigate them earlier and more efficiently than the conventional risk management proposed as a short term measure. In fact, the expert system developed as a module of BIM is better than a standalone one because of shared parameters, whereby similar parameters are shared among different modules within the BIM, so that when a parameter is changed or updated, all modules that use the same parameter are updated instantly.

Concerning the retention of information and knowledge of a project with the implementation of BIM, there are three anticipated benefits within the context of abandonment of construction projects. One is regarding the fact that when a contractor abandons a project, it causes delays and cost overrun to the developer because of information loss and that a new contractor would have to relearn the project in a steep learning curve (See section 5.4.1 in page 127). With BIM, it reduces information loss and allows the new contractor to learn the project quickly because more information has been retained and is easily accessible, thus reducing delays and cost overrun. Another benefit is regarding the revival of abandoned projects, whereby the parties involved are often disintegrated after abandonment, and hence the loss of information and knowledge. With BIM, the revival process would be quicker and less costly because there are retained project information and knowledge. Yet another

benefit is project learning, a.k.a. knowledge management, to better prevent abandonment in subsequent projects by a developer because of the retention of learned experiences from previous projects.

6.3 Limitations

It should be noted that there are certain limitations to this research. The first is regarding the profile of the respondents of the questionnaire survey, in that even though there appears to be a fair representation by different categories of respondents, e.g. role of respondent and type of project, it is not known whether this represent the actual profile of the industry. Besides, it is also not known the bias of each group of respondent's opinion, i.e. the deviation of their opinion from the truth. Therefore, if there is any actual bias, it is not known which group's opinion should be compensated, or whether the proportion of representation by that group should be increased. For example, the majority of the respondents or 119 out of 225 respondents do not have experience in abandoned projects, and it is not known whether this is an advantage or a limitation. It may be advantageous in the sense that these respondents know more of how to avoid abandonment of projects, or it may be a limitation in that they provide more speculative information that does not represent the truth.

Also, there may be a certain degree of subjectivity over the supposed objectivity of questionnaire survey. For example, in the first question of the questionnaire the respondent is asked to choose whether they have any

experience in 1) an abandoned project, 2) an almost abandoned project, or 3) no experience in abandoned projects. The interpretation of the phrase ‘almost abandoned project’ is subjective.

Even though the objectives of this research cover investigating the causes as well as the potential solutions to abandonment of projects, investigating the causes appears to be given more priority over the potential solutions. Hence more information on the causes is obtained through the questionnaire survey and the semi-structured interviews as compared to the potential solutions. This is due to constraints of cost and time, and the logical sequence that the causes should be known first prior to the solutions. This limitation is highlighted as one of the potential further works in section 6.4.1 below.

6.4 Implications

It is anticipated that this research would have the following implications for research and for practice.

6.4.1 For research

Even though this research is about abandonment of construction projects in Malaysia, the findings could be applied to other countries with the same problems. If there is any similar research to be conducted in other countries, this research could serve as a reference. Also, this research could be

a valuable addition to the wider body of knowledge on the criteria for success and failure of construction projects, or even for non-construction projects of similar nature.

For further works, it is proposed that the following researches be conducted as a progression from this research:

1. SEM (Structural Equation Modelling) on the underlying factors of factor analysis to study the causal relationships between the underlying factors in a quantitative manner.
2. A study that focuses on investigating the potential solutions to abandonment of projects to complement the lack of this research.
3. A study on the implementation of the middle ground solution between the STB (sell then build scheme) and the BTS (build then sell scheme) proposed in section 6.2.1 above. The study should include the setting of the initial proportion of financing between developer and house buyers, and the mechanism to change this proportion according to resultant rate of abandonment of projects and house prices.
4. A study on the ineffective and lack of legal remedy against fraudulent developers, and how to mitigate this problem.
5. A study on developing an expert system as a BIM (Building Information Modelling) module on risk management to mitigate the uncertainties that could lead to abandonment of projects as proposed in section 6.2.2 above.

6. A study on the implementation of BIM (Building Information Modelling) in the Malaysian construction industry.

6.4.2 For practice

The findings of this research could serve as useful reference for practitioners, especially the developer, to have higher standards of practice for general project success and to avoid abandonment of projects in particular. For example, by referring to the causes of abandoned projects identified, the developer could be more mindful of the causes so as to avoid abandonment of projects. The developer could also implement the risk management proposals as suggested in section 6.2.1 above to mitigate the risks that could lead to abandonment of projects.

Also, the findings of this research, especially the proposals to manage the problem could result in better government regulations. For example, the government can implement the middle ground solution between the STB (sell then build scheme) and the BTS (build then sell scheme) as proposed in section 6.2.1 above. The government could also call for a revamp of the judicial system to better mitigate the problems related to fraud and the ineffective and lack of legal remedy against errand developers. Besides, the government could also call for an across the board implementation of the BIM (Building Information Modelling) to improve the Malaysian construction industry as a whole. All in all, actual reduction in the number of abandoned construction projects could mean savings in millions of ringgit.

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APPENDIX A

Categories of factors according to different functional entities in and around a project

Author(s) **Merged categories**	Chan et al. (2004)	Belassi & Tukel (1996)	Chua et al. (1999)	Dissanayaka & Kumaraswamy (1999)		Chapman (2001)	El-Diraby & Gill (2006)	Westerveld (2003)		Zhi (1995)		
Project characteristic related factors	project-related factors	Factors related to the project	Project characteristics	Non-procurement related factors	Factors related to project	Project						
Procurement related factors	procurement-related factors		Contractual arrangements	Procurement related factors	Work packaging Functional grouping Payment modality Selection modality Conditions of contracts			Contracting				
Project management factors	project management factors	Factors related to the project manager and the team members						Project management	Scheduling Budget Organization Quality Information Risks	Internal	Project	Schedule delay Cost overrun Defective physical works
								Resources		Internal	Company	Materials and equipments
Project participants related factors	project participants-related factors		Project participants	Non-procurement related factors	Factors related to client/client representative	Client		Stakeholder management				Employer/owner
					Factors related to designer		Engineering	Policy and strategy				Architect
					Factors related to contractor							Labor and subcontractors
					Factors related to team performance			Leadership and team				
External factors	external factors	Factors related to the external environment			Factors related to external conditions		Political			External	Nation/Region	Political situation
							Economic					Economic and financial situation
							Financial					Social environment
						Industry					Construction industry	Market fluctuations
												Law and regulations
												Standards and codes
												Contract system
						Environment	Environmental					
Other factors		Factors related to the organization	Interactive processes							Internal	Company	Internal

APPENDIX B

Questionnaire

Respondent's Information

Please provide information about yourself by completing the following questions. You can tick more than one box where appropriate.

1) Have you been involved in a project that was:

- ☐ abandoned
- ☐ almost abandoned
- ☐ * I have never been involved in an abandoned or almost abandoned project.

* If you have not been involved in an abandoned or almost abandoned project, please answer the following questions based on a project which your opinions on abandoned construction projects will be based upon.

2) What was your role in the project?

- ☐ Client/Owner
- ☐ Consultant
- ☐ Contractor/Supplier
- ☐ Government official
- ☐ Others. Please specify:

_____

3) How many years of experience do you have in the project?

_____ year(s)

4) What was the type of the project?

- ☐ Residential
- ☐ Non-residential
- ☐ Civil work
- ☐ Special trades

5) How was the project funded?

- ☐ Privately
- ☐ Publicly
- ☐ Jointly funded using private and public funds

Sample questionnaire

Causes of Abandoned Construction Projects

6) Please tick in the appropriate columns to indicate how much you agree that the following factors are causes of abandoned construction projects.

	Factors	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1	Difficulty of design and construction					
2	Inappropriate risk allocation among project team members					
3	Inappropriate pricing/incentives of services rendered by contractors or consultants					
4	Faulty tender process					
5	Ambiguities or mistakes in scope of work, specifications or drawings					
6	Inadequate project feasibility studies					
7	Lack of appropriate dispute resolution method					
8	Poor contract administration					
9	Financial difficulties faced by the contractor					
10	Financial difficulties faced by the owner					
11	Delays in interim payments					
12	Inappropriate project planning and scheduling					
13	Project control problems					
14	Bureaucracy and red tape within the project					
15	Site acquisition problems					
16	Adverse weather or acts of God					
17	Unexpected location difficulty					
18	Problems related to change orders/variation orders					
19	Involvement of large number of participants of project					

Sample questionnaire continued

	Factors	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
20	Unavailability of materials and equipments					
21	Incompetent contractors or subcontractors					
22	Incompetent consultants					
23	Unskilled/incompetent site workers					
24	Shortage of site workers					
25	Lack of motivation of site workers					
26	Poor relationship among project team members					
27	Poor safety management on site					
28	Inexperienced client/owner					
29	Negative impact of project towards society or environment					
30	Lack of cooperation from local authorities					
31	Unexpected bad economic conditions					
32	Unfavorable government policy					
33	Cultural clash among parties involved in project					
34	Litigation					
35	Poor quality control					
36	Relationship between contractor and labor (industrial relation)					
37	Fraudulent practices and briberies					
38	Unclear lines of responsibility and authority					
39	Problems of communication and coordination					
40	Inappropriate contract arrangements (traditional design-bid-build/design & build/management contracting/etc.)					
41	Inappropriate mode of financing project					

Sample questionnaire continued

7) How do you think the problems of abandoned construction projects can be solved? (Optional question)

Thank you for your time and effort in completing this survey form.

We would very much appreciate it if you could provide your contact details in case we need to contact you for further information. Please rest assured that your identity will be kept confidential and will not be disclosed.

Name: _____
Company: _____
Telephone: _____
Fax: _____
Email: _____
Address: _____
_____

Please mail, fax or email completed questionnaire back to:
Yap Eng Hoe
Postgraduate Office, Faculty of Engineering and Science, Universiti Tunku Abdul Rahman,
Jalan Genting Kelang, 53300 Setapak, Kuala Lumpur.
Fax: 03-82101270
Phone: 017-5805360
Email: yeyonghe@gmail.com

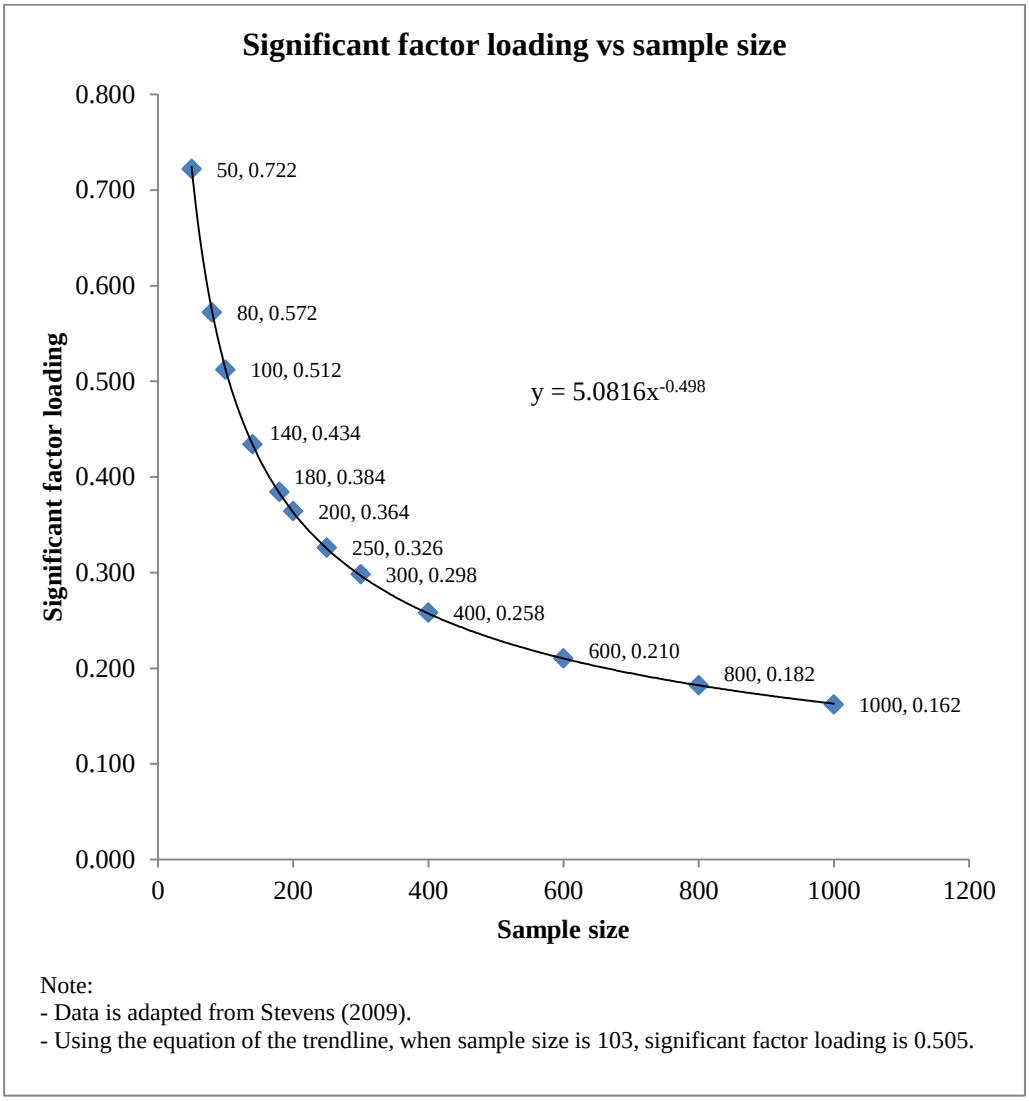
Sample questionnaire continued

APPENDIX C

Measure of sampling adequacy - diagonal of anti-image correlation matrix

No.	Variables	Diagonal of Anti-image Correlation Matrix
1	Difficulty of design and construction	.825
2	Inappropriate risk allocation among project team members	.839
3	Inappropriate pricing/incentives of services rendered by contractors or consultants	.848
4	Faulty tender process	.823
5	Ambiguities or mistakes in scope of work, specifications or drawings	.917
6	Inadequate project feasibility studies	.823
7	Lack of appropriate dispute resolution method	.916
8	Poor contract administration	.898
9	Financial difficulties faced by the contractor	.899
10	Financial difficulties faced by the owner	.686
11	Delays in interim payments	.753
12	Inappropriate project planning and scheduling	.838
13	Project control problems	.861
14	Bureaucracy and red tape within the project	.915
15	Site acquisition problems	.947
16	Adverse weather or acts of God	.919
17	Unexpected location difficulty	.926
18	Problems related to change orders/variation orders	.931
19	Involvement of large number of participants of project	.897
20	Unavailability of materials and equipments	.807
21	Incompetent contractors or subcontractors	.860
22	Incompetent consultants	.868
23	Unskilled/incompetent site workers	.871
24	Shortage of site workers	.898
25	Lack of motivation of site workers	.824
26	Poor relationship among project team members	.935
27	Poor safety management on site	.888
28	Inexperienced client/owner	.820
29	Negative impact of project towards society or environment	.924
30	Lack of cooperation from local authorities	.916
31	Unexpected bad economic conditions	.615
32	Unfavorable government policy	.902
33	Cultural clash among parties involved in project	.905
34	Litigation	.863
35	Poor quality control	.946
36	Relationship between contractor and labor (industrial relation)	.926
37	Fraudulent practices and briberies	.908
38	Unclear lines of responsibility and authority	.950
39	Problems of communication and coordination	.941
40	Inappropriate contract arrangements (traditional design-bid-build/design & build/management contracting/etc.)	.922
41	Inappropriate mode of financing project	.862

APPENDIX D



Note:
- Data is adapted from Stevens (2009).
- Using the equation of the trendline, when sample size is 103, significant factor loading is 0.505.

Significant factor loading vs sample size for factor analysis