

FRAMEWORK OF DECISION MAKING PROCESS FOR VARIATION WORKS
TO ANALYSE IMPACTS CAUSED BY FACTORS INFLUENCING DECISIONS

NORAZAM BIN OTHMAN

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Universiti Teknologi Malaysia

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To my beloved wife, sons and daughters

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ABSTRACT

Standard forms of contract provide guidelines in managing variations to construction projects. However, problems exist as there are factors influencing construction professionals in the decision making process. Thus the specific objectives of this study are to identify and establish the decision making process for variation works, to determine the factors that influences construction professionals in the decision making, to identify and establish the best practice for developing a conceptual framework of decision making process and to develop a framework of decision making process for variation works that is able to analyze the impacts caused by these factors. The literature review suggested that there are factors such as standard forms of contract, practice, professionals and institutions, client and employers, contractors, other construction professionals, experience and knowledge acquisition and procurement system that influences construction professionals during the decision making process. Available framework of decision making lack the methodological assessment of these factors influencing decisions on variations which is needed to embrace positive changes and mitigate negative changes effectively. Data of the study consist of 18 construction professionals and the transcripts of the interview were exported into computer software to quantify the data, manage and find out the pattern of their responses to the questionnaire. The data analysis showed that the impact caused by the factors influencing decisions on variation can be analysed to determine whether it give a positive, negative or neutral impacts. The score sheet provided the methodological assessment in the conceptual framework taking into consideration best practices of the decision making process. The developed framework of decision making process was validated by construction industry's expert to consolidate its criteria of comprehensiveness, reliability, practicality and adaptability. The findings of the study shows that the developed framework are able to improve on the decision made by providing a methodological assessment of these factors influencing decisions on variations.

ABSTRAK

Borang kontrak standard membantu memberikan petunjuk kepada pengurusan perubahan kerja projek pembinaan. Namun masalah wujud kerana terdapat faktor yang mempengaruhi profesional pembinaan semasa proses membuat keputusan. Oleh itu objektif spesifik kajian adalah mengenalpasti dan menetapkan proses membuat keputusan untuk perubahan kerja, menentukan faktor yang mempengaruhi keputusan profesional pembinaan semasa proses tersebut, mengenalpasti dan menetapkan praktis terbaik dalam membentuk kerangka kerja konseptual proses membuat keputusan dan membangunkan kerangka kerja membuat keputusan untuk perubahan kerja yang berupaya untuk menganalisis impak yang disebabkan oleh faktor-faktor tersebut. Kajian literatur mencadangkan terdapat faktor seperti borang kontrak standard, praktis, profesional dan institusi profesional, klien dan majikan, kontraktor, lain-lain profesional pembinaan, pengalaman dan penerimaan ilmu dan sistem perolehan yang mempengaruhi profesional pembinaan semasa proses membuat keputusan. Kerangka kerja membuat keputusan sedia ada kekurangan penilaian secara metodologi faktor-faktor yang mempengaruhi keputusan terhadap perubahan kerja yang diperlukan untuk meliputi perubahan positif dan mengurangkan perubahan negatif secara efektif. Data kajian diperolehi daripada 18 individu profesional pembinaan dan transkrip temubual dimasukkan kedalam perisian komputer bagi membentuk data kuantitatif, mengurus dan mendapatkan pola tindakbalas kepada soal selidik. Analisis data menunjukkan impak yang disebabkan oleh setiap faktor-faktor tersebut berupaya dianalisis untuk mendapatkan sama ada memberi impak secara positif, negatif atau neutral. Hasil analisis faktor-faktor ini memberikan skor yang menyumbang kepada penilaian secara metodologi dalam kerangka kerja konseptual apabila mengambilkira praktis terbaik proses membuat keputusan. Kerangka kerja yang dibangunkan telah disahihkan pakar industri pembinaan untuk mengukuhkan kriteria secara menyeluruh, kebolehharian, penggunaan dan kebolehsuaian. Dapatan dari kajian menunjukkan bahawa kerangka kerja yang dibangunkan berupaya untuk memperbaiki keputusan yang dibuat dengan penyediaan suatu penilaian secara metodologi terhadap faktor-faktor tersebut.

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LIST OF ABBREVIATIONS AND ACRONYMS

CIDB	-	Construction Industry Development Board, Malaysia
JKR	-	Jabatan Kerja Raya
PAM	-	Pertubuhan Arkitek Malaysia
PWD	-	Public Works Department

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter introduces the background of the study and the problems, research questions, aim and objectives of the study, significance of the study and structure of the thesis.

1.2 Background of the study

It is imperative that decisions concerning variations (on whether it is a change to the design or not as in the agreement or contract) must be thoroughly examined and the decision making process map out to aid construction professionals in determining its legitimacy. Construction professionals as decision makers must be able to substantiate and provide compelling reasons for their decisions, without which further disputes and conflict may occur leading to post-contractual claims and even presumably litigation. As variations are specifically provided for in the contracts, any deviation from the rules and procedure might be disputed. For example, if a particular change to the design is decided and deemed to be a variation, it confers to the client the unilateral right to vary the work. Without it, a contractor is not obliged to accede to any request for change. Any departure from the work for which the contractor has agreed to do can and will be subjected to a new and separate agreement (Powell-Smith and Sims 1983; Murdoch and Hughes 1992) including payment at a

quantum meruit or reasonable rate for the work as decided in *McAlpine Humberoak Ltd. v. McDermott International Inc.* [1992] 58 BLR 1 (CA), [1992] 28 ConLR 68 (QBD). If the client still persist on having the change, the contractor may treat the insistence as repudiating the contract. Dorter (1991) quotes *Ettridge v. Vermin Board of the District of Murat Bay* [1928] SASR 124 (FC) being such a precedent.

Making decisions is extremely important to construction professionals and the decision making process, although cumbersome and involving many steps, must be established and applied. Wysocki (2014) admitted that the essence of the decision analysis process for decision making is by using different decision criteria, different types of information, and information of varying quality. It describes the elements in the analysis of options, alternatives and choices, as well as the goals and objectives that guide decision-making. However, Dietrich (2010) cautioned that there are many factors that influence the decision making process that can cause a negative impact, presumably affecting project performance standards of cost, time and quality (Phua 2013). In a construction project the most critical and problematic stage of the decision making process is due to the high incidence and impact caused by factors that influence decisions concerning variations (Arain and Low, 2005). If these factors can be systematically identified, analysed and evaluated than a better decision can be made (Drucker 1955; CII 1994; Ibbs 2001; Motawa 2003).

If the decision making process are susceptible to influencing factors, it is also probable that construction professionals as decision makers is also subject to similar or other factors brought on by the rules and procedures codified in the agreement or contract. Rules and procedures seek to specify the key variables concerning the construction process (Clegg 1992) and together with the idealisations of the law of contract, impose and influence the behaviour of construction professionals. The term 'influence' is linked to synonyms such as authority, prestige, weight and credit and as a noun defined as "the act or power of producing an effect without apparent exertion of force or direct exercise of command" and "the power or capacity of causing an effect in indirect or intangible ways" (Merriam-Webster 2008). Issues faced by the construction professionals are to align the decision made to a specific standard operating procedure and compliance with contractual conditions but at the same time

fulfilling project performance standards of cost (value for money), time (complete on time) and quality (within appropriate specifications).

1.3 Research problems

Variations are inevitable and common to all types of project (Oladapo 2007; SSegawa *et al.* 2002) and the problems are linked to time and cost overruns (Chan and Yeong, 1995; Koushki *et al.* 2005; Lee *et al.* 2011; Meng *et al.* 2008). There are numerous reasons or causes for any variation to be issued, ranging from different site conditions (Ismail *et al.* 2012), design and specifications considerations (Haseeb *et al.* 2011) to defective instructions (Ijaola and Iyagba, 2012). Although variations are essentially a significant part of most construction projects, Ndiokuburayo and Haupt (2009) opined that its advantages and value to the project may be compromised as the problems derived from variations may impede the decision making process. Construction professionals such as the Architect, Engineer and Quantity Surveyor are most likely susceptible as there are many factors that influence the construction professionals in making decisions that had an impact on the decision made.

These factors include standard forms of contract or standard operating procedures (Alzahrani and Emsley, 2013; Oladinrin *et al.* 2013), practice of construction professionals (Hawken and Henning, 2012; Matonsi and Thwala, 2012), professionals and their institutions (Hansen and Zenobia, 2011), factors attributed to clients and employers (Huang 2011), factors attributed to contractors (Ibrahim *et al.* 2011; Jha and Hyer, 2006), factors attributed to other construction professionals not decision makers (Oyeniyi 2011), experience and knowledge acquisition (Atwal and Cadwell, 2006) and procurement and contract system (Oladinrin *et al.* 2013). The revelation that there are many factors influencing decisions are not surprising as there are contentious issues related to the issuance of any variation order, which in turn may affect project performance in terms of cost, time and quality. Each variation order need to be properly managed and controlled and involved many facets of human and non human factors.

Thus the emphasis and objectives of Construction Industry Institute, Project Change Management System (PCMS) and Knowledge Based System (KBS) were to develop a framework to better manage and control variations (CCI 1997; Ibbs *et al.* 2001; Motawa *et al.* 2003; Arain and Phang, 2006). However the developed frameworks are insufficient as it lack the details to make quantitative assessment of the variations. A methodological assessment of the factors influencing decisions on variations is needed to embrace positive changes and mitigate negative changes effectively. Ibbs *et al.* (2001) and Sutrisna *et al.* (2003) also suggested that there is no available framework of decision making process for variation works that can be used to analyse and evaluate the influence caused by these factors. This is quite significant especially within the context of Malaysia's construction industry. Therefore, there is a pressing need to study and develop a framework of a decision making process for variation works, to analyse the impact caused by these factors and later manage the impact to produce a better decision. The evaluation of these factors will improve on the accuracy of the decision making process and provide more refined options to the decision-makers (Stone *et al.* 2013) in regard to the quality of the decisions, either good or bad (Arvai and Froschauer, 2010)

1.4 Research questions

Therefore in relation to the interest of this study, the research question approach has been adopted to address the key issues and problems, i.e:

1. What are the decision making process by construction professionals in variation works;
2. What are the best practices of the decision making process?
3. What is the relationship between variations and framework of a decision making?
4. How the framework can improve the process of decision making?
5. What is the most suitable framework of a decision making process and how it is related to the decision making process for variation;

6. What are the factors that influences the construction professionals in the decision making process for managing variations;
7. What is the impact caused by the factors and how can we evaluate and manage the impact?
8. Can a framework of a decision making process be used to analyse the impact caused by the factors?
9. How to develop a framework of decision making process for variations?

1.5 Aim and objectives of the study

The aim of this study is to improve the decision making process for managing variations of the construction project. The specific objectives of this study are as follows:

1. To identify and establish the decision making process for variation works.
2. To determine the factors that influences the construction professionals in the decision making process for managing variations works.
3. To identify and establish the best practice for developing a conceptual framework of decision making process.
4. To develop a framework of decision making process for variation works that is able to analyse the impacts caused by the factors.

1.6 Scope of the study

The study covers issues concerning a particular variation or change to the construction work in any project recently completed and data collection and analysis was confined to that particular variation amid other verified and authorised variations. The particular variation was selected and agreed upon by all the construction

professionals in each of the case study – the researcher had suggested that the agreement would enable better focus and response to the questions pertaining to the background and facts of the construction projects. Construction professionals involved in the study consisted of the Architects, Engineers and Quantity Surveyors responsible in managing variations work in the construction project.

Each case study was let traditionally, using standard forms of contract for use by private clients with almost no major amendments to the rules and procedure regarding variations. Physical work for all six case study were completed between the year of 2004 and 2007, all of the projects started after the year 2002 with most of the interviews conducted before the final account report of the project had been submitted. The business environment during the period of completion (year 2004-2007) was mildly robust with all construction professionals having some projects in hand apart from the completed case study.

The interviews were conducted in a single session although due to geographical locations of the construction professionals and the need to collect supporting information from project's documentation, additional session was needed. Each case study had the architect as the gatekeeper and all case study started with the architect being interviewed, followed by either the quantity surveyor and civil and structural engineer.

The format of the semi-structured interviews were strictly kept within the protocol of profiling each respondents as to their names, education, experience and past working relationship with other construction professionals and client. The general questions were in regard to the respondents' involvement in the project in terms of their roles and responsibilities, day-to-day tasks and their opinions on variations. The specific questions were on the particular variation work that became the focus of the study and these questions were on 'how' the variation was dealt with (the respondents' level of involvement or participation in the decision making process in terms of their views and opinions sought) and 'why' (reasons or basis of the decision). The content analysis of the transcripts will reveal whether there was any deviation from the prescribed rules and procedures governing variations and if there

are deviations, what are the factors that influences the deviation to occur and the extent of these factors influencing the final decision.

The determination of these influencing factors will then be used to complement the development of a framework of the decision making process for managing variations. The framework covers only from identification of the factors that influence the decision made and analyzing the impacts caused by the factors. The next step of managing the impacts was excluded in the scope of this study. However, the research has come up with the suggestion on how these impacts can be managed based on the conceptual framework of decision making proposed in Chapter 6.

1.7 Significance of the study

The framework of a decision making process for managing variations is able to analyze the impact caused by the influencing factors and therefore, the impacts can be better managed to improve the decision made.

Problems that arise after an instruction to vary the work has been issued may be reduced, even eliminated as the process will highlight the various influencing factors that ultimately became the grounds for further disputes and conflict, escalating to claims and litigation. The framework will aid decision-makers, especially construction professionals as the decision making process in variations to the construction work is not only a process to determine the best options or alternatives but also a process to legitimise the decision based on the agreement or contract.

1.8 Research methodology

Research methodology guides the researcher to in the process of collecting, analysing, interpreting data and observation and is applied as a logical model of proof that allows drawing inferences concerning the relations among variables under

scrutiny. In order to achieve the aims and objectives of the study, Figure 1.1 is a flowchart outlining the methodology with the details in Chapter 5.

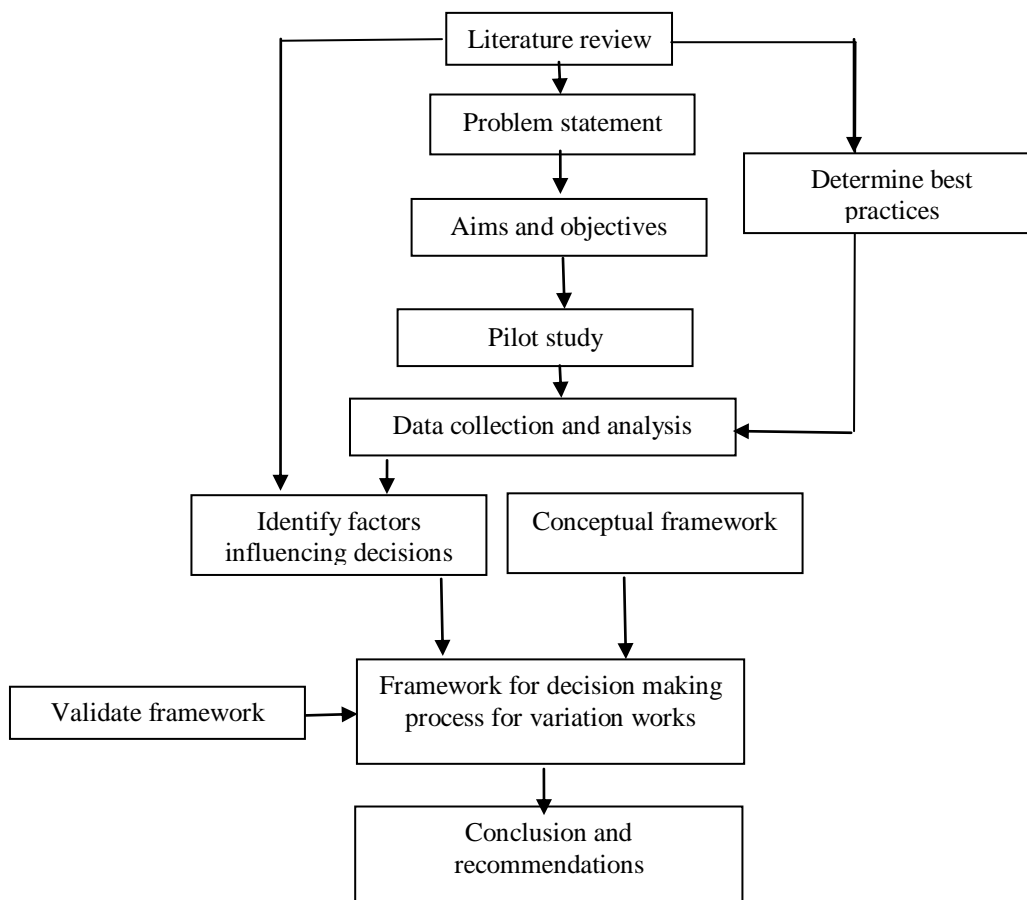


Figure 1.1
Flowchart of research methodology

1.9 Structure of the thesis

The thesis consists of eight chapters. Chapter 1 is the introduction and background of the study, the research problems and statement, research questions, aims and objectives, scope and significant of the study, brief research methodology and structure of the thesis.

Chapter 2 presented the literature review of variation works and its decision making process including various definitions of variations, provisions in conditions of

contract, causes of variations, valuation procedures including the process of managing variations. Knowledge gaps when comparing previous studies are revealed and form the basis for the conceptual framework. Chapter 3 discussed the various influencing factors on decisions making specifically on variations with an overview of variation works and establishing the decision making process for variation. Chapter 4 presented the concepts of the decision making process including the various factors that influence the decision makers and the decision making process. The decision support theories, tools and techniques are also discussed in the chapter. Chapter 5 provided the details of the research methodology, data collection and analysis, provision of computer software for content analysis and data representation. Chapter 6 explained the establishment of a conceptual framework of the decision making process based on best practices. Chapter 7 discussed the results of the data analysis and developed the framework of decision making process including validation. Finally, Chapter 8 summarised the key findings in relation to the objectives of the study, the limitations of the study and ends with recommendations for future research.

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