

**DECISION SUPPORT SYSTEM FRAMEWORK FOR FEASIBILITY
STUDY IN CONSTRUCTION PROJECT**

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*"To my love ones...
Papa, Mama and Kakak..."*

*To the important people in my life...
Abg. Azreen and Lati..."*

*I appreciate all the love,
understanding and support from
each one of you..."*

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ABSTRACT

The construction projects present a unique situation where each project is different with different situation and parties. One of the important stage involve in a construction project is the preparation of the feasibility study. Feasibility study needs a lot of information and the process to analyze the information is tedious and time consuming. The decision support system (DSS) is an attempt to simplify the analyzing process and to reduce the time needed in preparing the study. The aim of this research is to proposed Decision Support System Framework particularly for quantity surveying consultants to improve the effectiveness of the decision making process. The objectives of the study are to identify the current practice of decision making process in the feasibility study of construction project, to identify the DSS that is able to improve the decision making process in the feasibility stage and to develop a Decision Support System Framework for feasibility study. The information gathered for the first and the second objectives mainly via interviews and internet sources were used as a guideline to develop the framework. The framework was developed based on the DSS identified during the second objectives. The framework of the system provides terminology, concepts and guidelines that are useful to apply the system. By understanding the factors considered for the study as the area of application for the DSS, the type of DSS application are able to be identified, that is the cost estimation DSS. Then, the requirement of the cost estimation DSS identified that is the Crystal Ball are gathered to complete the framework. The framework can be use as a guideline to develop the prototype of the system and as a guide to apply the system.

ABSTRAK

Sesebuah projek pembinaan adalah unik dengan setiap projek melibatkan keadaan dan pihak yang berbeza-beza. Kajian kemungkinan merupakan salah satu peringkat yang penting dalam sesebuah projek pembinaan. Kajian kemungkinan memerlukan banyak maklumat serta proses untuk menganalisa kesemua maklumat tersebut rumit serta memakan masa. *Decision Support System* (DSS) adalah satu langkah untuk memudahkan proses menganalisa serta untuk membantu menjimatkan masa dalam penyediaan kajian kemungkinan. Matlamat penyelidikan ini adalah untuk mencadangkan Rangka Kerja *Decision Support System* khususnya untuk perunding juruukur bahan untuk meningkatkan keberkesanan proses membuat keputusan. Objektif penyelidikan ini pula adalah untuk mengenalpasti praktis semasa proses membuat keputusan dalam penyediaan kajian kemungkinan untuk projek pembinaan, untuk mengenalpasti *DSS* yang dapat menambah baik proses membuat keputusan dalam penyediaan kajian kemungkinan serta untuk membina Rangka Kerja *Decision Support System* untuk kajian kemungkinan. Maklumat yang telah didapati bagi objektif pertama dan kedua yang diperolehi melalui temuduga serta bahan daripada internet telah digunakan sebagai panduan untuk membina rangka kerja tersebut. Rangka Kerja tersebut memberikan terma, konsep dan panduan yang berguna untuk mengaplikasikan sistem ini. Dengan memahami bahawa faktor-faktor yang terlibat dalam kajian kemungkinan sebagai satu keadaan dimana *DSS* boleh diaplikasikan, jenis aplikasi *DSS* yang sesuai dapat ditentukan iaitu *cost estimation DSS*. Kemudian, maklumat mengenai keperluan bagi *cost estimation DSS* yang telah dikenalpasti iaitu Crystal Ball dikumpul untuk melengkapkan rangka kerja ini. Rangka kerja tersebut dapat digunakan sebagai panduan untuk membina prototaip bagi sistem ini serta sebagai panduan untuk mengaplikasikan sistem ini.

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CHAPTER I

INTRODUCTION

1.1 Introduction

Good decision making is imperative for organizations to survive. In order for good decision making to occur, the proper steps must be taken to ensure accurate information used. Decision Support System (DSS) is a computer-based system that is designed to aid decision makers in making decision that may include multiple attributes, objectives and goals (Cascante et al, 2002). Good decision making tools are necessary to make good strategic decisions. The framework of the system will provides terminology, concepts and guidelines that are useful to apply the system.

A Feasibility Study report is a business plan for a specific development project. It provides the rationale and the support for that rationale to pursue a specific development project from the feasibility phase, pre-construction, construction and occupancy through investment management. It offers a comprehensive format that emphasizes the justification of the project relative to the target market's needs and wants, and a thorough risk analysis with appropriate mitigations.

A feasibility report is dynamic and should as often as necessary to incorporate any changes to assumptions or to incorporate new information. As a result, all assumptions made and external dependencies specified in the feasibility study are meticulously documented. The report is prepared in close consultation

with the client (in addition to an architect and other construction consultant) since some of the work included in the report most likely has already been completed by the client or his consultants, that is, the idea or vision for the project or the market study.

1.2 Problem Statement

In order to effectively and efficiently practice decision making, decision support system (DSS) have been used in some of the phases of the decision making process. Decision support system are systems under the control of one or more decision makers that provide an organized set of tools to impart structure to portions of the decision-making situation and to improve the ultimate effectiveness of the decision outcomes. The construction project present a unique situation to those involved in managing the construction process (Barton, 1985). Each project is different from all others, with different situation involving a large number of different organizations and individuals, all of whom have different and often conflicting priorities and objectives.

There are several estimates and predictions must be made which attempt to forecast the future. Inevitably the forecasted value will deviate from the actual outcome, due to a lack of complete information about future events. The feasibility study is also providing the forecasted value and may involve with uncertainty. The many contributing factors to the construction problem are referred to collectively as uncertainty. According to a noted engineering expert and member of the National Committee of the Chinese People's Political Consultative Conference (CPPCC) stressed the necessity of strengthening feasibility study of major construction projects in order to improve their return on investment. As a source of analysis and recommendations, a feasibility study is an important tool that investors can rely on to help them make management and development decisions.

Where there is uncertainty as to which events might occur, the logic of the decision process should include the necessary information. Feasibility study needs a lot of information and the process to analyze the information is very tedious and consumed a lot of time. The DSS is an attempt to simplify the analyzing process and to reduce the time needed in preparing the study.

1.3 Background

A Decision Support System (DSS) is defined as an interactive system that provides the user with easy access to decision models and data in order to support semi-structured and unstructured decision making tasks (Watson et al, 1997). The user is typically a manager or a staff professional. A key part of the system is the software interface that makes the system easy to use. The system contains models that are used to analyze data. Data are maintained to be used in the analysis. According to Steven Alter (1977), any application that provides information that supports decision making is DSS, even systems that only provide access to data. Thus, the absence of model component does not preclude its classification as a DSS.

Building on the capabilities of Management Information System, DSS are reoriented to produce information to support specific decision processes. There is a human/machine interface where these two components of decision processes are operating interactively to produce quality decisions. The DSS will be using Monte Carlo simulation that is a sophisticated form of what-if analysis as a model of decision making. Monte Carlo simulations help to manage risk and simulate complex systems. They are best for modeling uncertainty and volatility. Monte Carlo simulation allows user to replace point estimates with fuzzy values that reflect the uncertainty. This helps user to characterize the range of potential outcomes in a situation and assess the probability of reaching specific targets. Like decision trees, Monte Carlo simulations result in an expected value that aids in choosing the most attractive course of action. They also provide information about the range of outcome, probability of reaching specific targets, most likely outcomes, etc.

The feasibility study processes covers various aspect and among them that usually being considered are the economic analysis, technical analysis, financial analysis and the environmental assessment. The economic analysis will consider the market or demand analysis that would provide estimates on the benefits or revenue derived from the project whilst the technical analysis would provide the physical requirements (site, machinery and equipment, building and construction) and hence the cost of the project. The next step is the financial analysis that would compare the benefits or revenue of the project with to its corresponding cost to determine whether benefits or revenue is more than the cost. However, the financial analysis provides only the net benefits attributable to the project but does not assess the impact of the project on the economy as a whole.

It is also without any doubt that projects would have either a positive or negative effect on the environment. If the effects are negative (such as air and water pollution, land erosion, depletion of fish stock, etc.), it would not only incur costs for any corrective actions but also result in a negative impact on the quality of life. With the rapid pace of economic development, the environmental impact assessment is essential to prevent environmental problems. It should be noted that due to the specific characteristics of the different types of projects (agricultural, industrial, infrastructure, social projects), the techniques outlined in this research will serve as guides only.

1.4 Aim and Objectives

The aim of this research is to proposed Decision Support System framework particularly for construction consultants that involves in preparing the feasibility study in order to improve the effectiveness of the decision making process. The objectives of the study are listed as follows:-

1. To identify the current practice of decision making process in the feasibility study of construction project in an organization.
2. To identify the Decision Support System that is able to improve the decision making process in the feasibility stage.
3. To develop a Decision Support System Framework for feasibility study.

1.5 Scope and Limitation

The research will be limited to the construction consultants firm which involved in preparing the feasibility study. Since there are several factors considered for the feasibility study, the factors considered for this research are those that are considered by consultants whose been interviewed. The extent of knowledge acquisition was limited by time constraint.

1.6 Importance of Study

The framework of Decision Support System is useful as a guideline to the professionals to apply the system to enhance the decision making process for the purpose needed. It is important in the state of the world today that demanded better decision making by professionals (Jones, 2006). There are believes that decision of improved quality can still be obtained by improving the process of decision-making. DSS is a tool to enhance the performance of decision maker/professional as they

helped them to gain more knowledge, experience and expertise and consequently enhance as well as improving the quality and the process of the decision making (Irtishad, 1990).

The feasibility studies help development owners, investors and lenders make informed decisions by providing critical information about a specific concept or project, such as new construction, redevelopment or renovation of an existing property, or reuse of underutilized or abandoned facilities. Because a feasibility study provides specific and organized information about a development project, a comprehensive feasibility study is a crucial part of the development process. It outlines investors, end users, government, community and the developer about a project's operations and goals. The importance of a comprehensive, thoughtful feasibility study cannot be overemphasized. Much of the project's success hinges on it. The DSS is an attempt to aid and support the decision making during the feasibility stage.

1.7 Expected Finding

The expected findings are being made based on the objectives to be achieved. The current practice of decision making process involved during the feasibility stage may considered certain factors as a basis of the decision made. The considered factors have to be supported by analyzed information that may be prepared in a complex way. DSS may improved the decision making process in providing more efficient analyzing approach. A suitable DSS that are available in the market will be proposed even the use is not very common in the construction industry. The requirement of the framework will be identified and the framework develop are hope to improve the decision making process during the feasibility study.

1.8 Structure of Research

This research is divided into five chapters as follows:-

a) Chapter I : Introduction

This chapter discussed briefly on the introduction to the research topic that are the decision support system and feasibility study in construction industry. This chapter furthermore outlined the problem statement, background, aim and objectives, scope and limitation for this research, the importance of this research and as well as the expected findings for this research.

b) Chapter II : Literature Review

In this chapter, the literature review is discussed in detail. The discussion focuses on the two main elements of this research as stated earlier that are the decision support system and feasibility study in construction industry. The literature is on the concept and the detail description on the decision support system and the theory and guideline for the feasibility study.

c) Chapter III : Research Methodology

For this chapter, the research methodology of this research is explained. The methodology consists of the methodology for the whole research and the framework methodology. It have outlined in several stages on what need to be done, how it would be done and what information needed for this research in order to ensure the achievement of the research objectives.

d) Chapter IV : Result and Discussion

This chapter has presented the result of this research based on the determined objectives to be achieved. It has clarified on the data and information collection and their analysis. In achieving the objectives, the findings, that are the current

practice of decision making for feasibility study, the suitable DSS for feasibility study and the DSS framework for the study are explain and discussed.

e) Chapter V : Conclusion and Recommendation

This chapter discussed the conclusion for this whole research, the problem encountered during the research, recommendation for the result and suggested some idea for further research.