Study of Factors Affecting the Selection of Procurement Systems in Construction Industry: A Multi-Criteria Decision Support Model

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December 2006

A Study Submitted

in Partial Fulfillment of the Requirement for the

Award of Maser of Philosophy

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Dedication……..

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To

My beloved family

&

The peace of my mother land

Declaration

I hear by declare that this submission of thesis is my own work and that, to the best my knowledge and belief, it contain neither materials or facts previously published or written by another person nor materials or facts which to a substantial extent has been accepted for the award of any degree or diploma of a University or other Institute of higher studies, except where an acknowledgement is made in the text.

UOM Verified Signature

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List of Abbreviations

AHP	- Analytical Hierarchy Process
DSS	- Decision Support System
NEDO	- National Education Development Office
COV	- Coefficient of Variation
PCA	- Principal Component Analysis
MAUT	- Multi Attribute Utility Technique
UK	- United Kingdom
IDE	- Integrated Development Environment
SDK	- Soft Development Kit
BOT	- Build Operate Transfer
BOO	- Build Own Operate
ICTAD	- Institute for Construction Training And Development
BOOT	- Build Own Operate Transfer
SPSS	- Special Package for Standard Statistical
IPA	- Iterated Principal Axis
SD	- Standard Deviation
IT	- Information Technology
JDK	- Java Development Kit
J2SDK	- Java 2 Soft Development Kit
MS	- Microsoft
RDMS	- Relational Database Management System
NGO	- Non Governmental Organization

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Acknowledgement

I would like to take this opportunity in offering my heartiest gratitude to a great number of people who contributed in carrying out this research and making the MPhil thesis a success.

It has been a real pleasure to work with Dr.R.Rameezdeen who as my main supervisor gently guided and directed me by giving invaluable advices and firm guidance in making this thesis a success. Especially, I am greatly indebted to my co-supervisor Prof. Chithra Weddikkara (Dean, Faculty of Architecture) for her encouragement, guidance and support to carry out this research in a fitting manner.

Especially, I am thankful to Mr.I.S.W Gamage and Mr.A.L.Najeeb for their support on industry survey. Further, I wish to acknowledge the help received from all leading professionals of the construction industry, for their kind co-orporation and valuable interviews towards the achievement of a victorious Delphi and Expert opinion survey.

Also I would like to express my sincere gratitude to External Examiners, Prof. Peter Brandon and Mr. H.D. Chandrasena for their valuable comments and support. My special thanks are extended to Dr.Dilanthi Amaratunga (Director –Postgraduate Studies, University of Salford, UK) for her kind help in publishing the research findings, Prof.Emmanuel (Senior Lecturer, Faculty of Architecture) for his valuable advices and comments and Dr. Harsha Munasinghe (Director, Postgraduate Studies, Faculty of Architecture), for his guidance and support towards the success of this research.

I would also like to thank all collogues at research unit and other academic & non-academic staff members of the Department of Building Economics for their unfailing assistance rendered towards this research. Also, I take this opportunity to give my special gratitude to my friend Ms.T.Jeyanthine for her advice and support on this research.

Finally, I owe my special appreciation to my parents and brother for the spiritual and emotional reinforcement.

R.Shiyamini

December 2006.

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Abstract

The procurement system is a key means through which the client creates pre-conditions for successful achievement of project specific objectives. Different procurement systems are used for different projects and the correct choice may help to avoid problems and be the key to the attainment of project specific goals. Procurement selection therefore received much attention from researchers in recent past. In dealing which procurement system to apply, there is a need to take into consideration various factors from the projects' internal and external environment in which the industry operates. Therefore, a systematic and realistic approach for the selection of best procurement system is critical to the success of any project thus to achieve the clients' ultimate goals and ensure value for money.

As far as the Sri Lankan construction industry is concerned, project procurement seems to be one of the key areas which have to be developed to a great extent. Majority of the public and private sector projects are procured through traditional procurement system, especially by Measure and Pay. The number of different types of procurement systems used in Sri Lanka is less when compared to other developing countries. Therefore, there is a need to explore new ways of delivering construction projects. Further, in Sri Lanka, the practice of procurement selection seems to be rather unstructured and ad hock. There is no logical & consistent approach is used to select an appropriate procurement system for a particular project. Therefore, a development and application of such approach for the selection is essential to aid the clients in selecting most appropriate procurement system. In this context, the major aim of this study is to develop a Decision Support System for the procurement selection which is useful for the construction clients and their consultants who often involve in procurement selection by the quickest and ad hoc methods without being fully aware of the various factors and alternative procurements options. The attempt to develop such a Decision Support System is based on the review of alternative approaches developed over the past decade and the current practice of procurement selection in construction industry.

This study has adopted the Delphi technique together with MAUT to develop the model. These two techniques were used to facilitate a more systematic and consistent approach in the selection process, hence improving objectivity and reducing subjectivity in decision making. Four rounds of Delphi survey were carried out to investigate the most significant factors and their level of

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influence on various construction procurement systems. From the third and fourth round of Delphi, final set of selection criteria was determined and the utility values for each factor against various procurement systems were derived. Based on the selection criteria and the utility values, a Multi Attribute Utility model was developed. The special feature of this Decision support model is the inclusion of a set of exclusive selection criteria at macro level and wide range of various procurement options. The outcome of the model was evaluated for its applicability and efficiency with the use of case studies and an expert opinion survey. The implementation of this model to aid procurement selection is advocated to place the client in best possible position to select correct method of procurement for his project at a particular circumstance. The model has the potential to assist the clients/his consultants and it seeks to overcome any inconsistency in the effective decision making process.

Finally, the evaluated model was further enhanced to a Computer Aided Decision Support System (DSS). DSS allows users to make intelligent and informed decisions on selection of procurement routes for various building projects. It also provides an interactive and automated system for procuring construction projects in timely manner. The expert opinion survey, which targeted to validate the model, revealed that the DSS provides assistance in initial decision-making on project procurement selection to construction clients of the construction industry. DSS can be effectively used by the industry clients only through further development of a fully functional system

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Key words: *Construction Procurement, Procurement selection, Multiple criteria model, Decision Support Systems,*