

**AN INVESTIGATION OF PROJECT PROCUREMENT
STRATEGIES AND PROJECT COST OF WATER SUPPLY
PROJECTS IN SRI LANKA**

H.E.P. Manjula Perera

(179026V)

Thesis/ Dissertation submitted in partial fulfillment of the requirements for the
degree of Master of Science Project Management

Department of Building Economics
Faculty of Building Economics

University of Moratuwa
Sri Lanka

September 2024

DECLARATION

I hereby declare that this submission is my own work and this dissertation does not incorporate without acknowledgement any materials previously submitted for a Degree or Diploma in any other University or institution of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Also, I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my dissertation, in whole or in part, in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books)

H.E.P. Manjula Perera

Date

Department of Building Economics
University of Moratuwa,

Statement of the Supervisor

The above candidate has carried out research for the Master's Dissertation under my supervision,

Name of the supervisor: Prof.(Mrs) Udayangani Kulatunga

Signature of the Supervisor

Date

ACKNOWLEDGEMENT

I would like to express my heartfelt appreciation to my supervisor, Professor (Ms) Udayangani Kulatunga, for her invaluable guidance and mentorship throughout my research. She has inspired me to become a better researcher and supported me in every aspect of my study. I am deeply indebted to her for her generosity and wisdom.

I am also thankful to Ch. QS Dr. (Ms) Anuradha Waidyasekara, the Head of the Department of Building Economics, and other academic and non-academic staff members, for their assistance and efforts in helping me complete my master's degree.

I am grateful to all the interviewees who participated in my research and shared their insights and feedback with me. Their knowledge and experience were essential for the success of my work, and I appreciate their cooperation and time.

I would like to acknowledge the unwavering support of my family members, especially my wife, who has been a source of inspiration and motivation for me throughout this journey. They have always believed in me and encouraged me to pursue my dreams. I could not have done this without them.

I would also like to thank my office staff for their constant encouragement and understanding during this challenging period. They have been supportive and helpful, and I am lucky to have them as colleagues.

DEDICATION

To my supervisor Professor (Ms) Udayangani Kulatunga, who guided me with her wisdom and kindness, and to my wife and children, who have been my strength and motivation throughout this journey.

.

An Investigation of Project Procurement Strategies and Project Cost of Water Supply Projects in Sri Lanka

ABSTRACT

The efficient management of capital investment costs is crucial for the successful execution of construction projects, particularly in the context of water supply projects. The selection of an appropriate procurement strategy can significantly impact capital investment costs. This study investigates the procurement strategies employed in water supply projects in Sri Lanka and examines their influence on achieving value for money. To conduct this investigation, a qualitative methodology is employed, which includes an extensive review of literature, industry practices, and expert opinions. Based on the comprehensive findings, the study provides several key recommendations for future water supply projects. Firstly, the traditional procurement method (design-bid-build) is recommended for its proven effectiveness in minimizing hidden costs and facilitating thorough investigations during the pre-contract phase. In contrast, the design build method and unsolicited proposals is discouraged due to its higher costs and inherent challenges in risk management. Moreover, the study advises against the use of unsolicited proposals due to their elevated costs and their tendency to prioritize social benefits over economic viability. Instead, it suggests adopting a life-cycle costing approach, which allows for a holistic assessment of the total cost of ownership and enables the selection of cost-effective procurement strategies. By implementing these recommendations, the study aims to support industry practitioners in optimizing project outcomes, reducing cost overruns, and minimizing delays. Furthermore, it emphasizes the importance of delivering sustainable and economically viable water supply projects. The findings of this study hold significant value for both practitioners and policy makers involved in water supply projects in Sri Lanka. By utilizing the insights gained from this research, they will be able to make informed decisions and enhance the overall success of future water supply projects in the country.

Keywords: *Capital Investment, Life-cycle costing, Project procurement strategies, Water supply projects*

TABLE OF CONTENT

DECLARATION.....	I
ACKNOWLEDGEMENT.....	II
DEDICATION.....	III
ABSTRACT	IV
TABLE OF CONTENT	X
LIST OF FIGURES.....	XIV
LIST OF TABLES.....	XIV
ABBREVIATIONS	XV
CHAPTER 01	1
1. INTRODUCTION	1
1.1 Background of the Study	1
1.2 Statement of the Problem	4
1.3 Aim and Objectives	5
1.4 Significance of the Study	6
1.5 Limitations of the Study	7
1.6 Research Methodology	8
1.7 Chapter Breakdown.....	9
CHAPTER 02	10
2. LITERATURE REVIEW	10
2.1 Introduction	10
2.2 Public procurement Systems	11
2.3 Types of Bidding in Procurement	12
2.4 Procurement Methods.....	12
2.4.1 Traditional Procurement Method	13
2.4.2 Design and Build.....	14
2.4.3 Unsolicited Proposals.....	15

2.4.4	Turnkey	16
2.4.5	Contractor Financing.....	17
2.4.6	Public Private Partnership (PPP).....	17
2.4.6. A	Swiss Challenge	19
2.4.6. B	BOO (Build-Own-Operate) Procurement Method.....	19
2.4.6. C	BOT (Build-Operate-Transfer) Procurement Method.....	20
2.4.6. D	BOOT (Build-Own-Operate-Transfer).....	20
2.4.7	Comparison of Procurement Approaches in Infrastructure Projects....	21
2.5	Project Cost Estimation and Management	22
2.5.1	Capital Cost of Water Supply Projects.....	23
2.5.2	Design and Engineering Costs	24
2.5.3	Construction Costs	25
2.5.3. A	Land Acquisition Costs	25
2.5.3. B	Material Cost.....	26
2.5.3. C	Equipment Costs	26
2.5.3. D	Labour Costs	26
2.5.3. E	Indirect Costs	26
2.5.4	Risk Management in Project Estimation.....	27
2.5.4. A	Benefits of risk-based estimating.....	27
2.5.4. B	Risk Identification of Projects.....	28
2.5.4. C	Risk Assessment of Projects	28
2.5.4. D	Methods of Risk Mitigation or Avoiding	28
2.5.4. E	Assessment of Pricing Risk.....	29
2.5.4. F	Contingencies and Risk Management.....	29
2.5.4. G	Contractual Provisions for Risk Allocations and uncertainties	30
2.6	Project Costs.....	30
2.7	Procurement Method Selection	31
2.8	Relationship between Procurement Methods and Project Costs	31
2.9	Case Studies and Examples of Procurement Methods and Project Costs in Water Supply Projects	32
2.10	Chapter Summary	33

CHAPTER 03	35
3. RESEARCH METHODOLOGY	35
3.1 Introduction	35
3.2 Research Design	35
3.3 Research Process	36
3.4 Data Collection	37
3.5 Data Analysis	38
3.6 Ethical Considerations	39
3.7 Chapter Summary	40
CHAPTER 04	42
4. DATA ANALYSIS AND DISCUSSION	42
4.1 Introduction	42
4.2 Selection of expert interviewers	42
4.2.1 Profile of the Selected Expertise	42
4.3 Procurement Strategies in Water Supply Projects	45
4.3.1 Different procurement strategies, including Traditional Procurement Method, Design and Build, and Unsolicited Proposals	45
4.3.2 Traditional Procurement Method	46
4.3.3 Design and Build Procurement	47
4.3.4 Unsolicited Proposals	49
4.3.5 Other Procurement Methods	50
4.3.6 Positive and negative aspects of each procurement strategy	51
4.3.7 Importance of transparency in procurement	55
4.4 Influences on Project Cost and Hidden Costs	56
4.4.1 Influence of funding sources and associated proposals on project costing	56
4.4.2 Differences in repayment periods and interest rates based on funding sources	57

4.4.3	Hidden costs related to insurance, risk factors, and importation of materials.....	58
4.5	Impact of Procurement Strategies on Project Cost.....	60
4.5.1	Comparison of traditional measure and pay method, design and build, and unsolicited proposals.....	60
4.5.2	Considerations for using the latest technology and the need for good data and evaluation criteria.....	60
4.5.3	Challenges in mixing different procurement methods.....	61
4.6	Time and Quality Management Issues	61
4.7	Discussion of Findings	63
4.8	Relationship between Procurement Strategies and Project Cost.....	64
CHAPTER 05		66
5. CONCLUSION AND RECOMMENDATIONS		66
5.1	Chapter Introduction.....	66
5.2	Overview of Research Objectives	66
5.3	Objective 1 – Identify different procurement strategies used globally with particular reference to water supply projects.....	67
5.4	Objective 2 – Identify the existing problems associated with identified procurement strategies in water supply projects	67
5.5	Objective 3 – Evaluate the positive and negative impacts of different procurement strategies on the project cost of water supply projects.....	67
5.6	Objective 4 – Analyse the relationship between procurement methods and project costs in water supply projects.....	68
5.7	Recommendations for Industry Practitioners	68
5.8	Recommendations for Further Research	70
REFERENCES		72
APPENDICES		80
APPENDIX I – INTERVIEW GUIDELINE		80

LIST OF FIGURES

Figure 3.1: Research Process	37
Figure 4.1: Interviewers Responds for Procurement Strategies.....	45

LIST OF TABLES

Table 2:1: Comparison of Procurement Approaches	21
Table 4:1: Profile of the selected Respondents	43
Table 4:2 Advantages and Disadvantages of Selected Procurement Methods	54

ABBREVIATIONS

BOO	Build-Own-Operate
BOOT	Build-Own-Operate-Transfer
BOT	Build-Operate-Transfer
CBA	Cost-Benefit Analysis
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement, and Construction
GOSL	Government of Sri Lanka
ICB	International Competitive Bidding
IT	Information Technology
ITT	Invitation to Tender
NCB	National Competitive Bidding
NPA	National Procurement Agency
O&M	Operation and Maintenance
PM	Project Manager
PPP	Public-Private Partnerships
QS	Quantity Surveyor
R&D	Research and Development