

**A FRAMEWORK FOR EFFECTIVE STAKEHOLDER
MANAGEMENT WITHIN THE DECISION-MAKING
PROCESS OF BUILDING ENERGY EFFICIENCY
RETROFITS**

Mohamed Fasly Fathuma Fasna
(178017L)

Degree of Doctor of Philosophy

Department of Building Economics

University of Moratuwa
Sri Lanka

June 2024

**A FRAMEWORK FOR EFFECTIVE STAKEHOLDER
MANAGEMENT WITHIN THE DECISION-MAKING
PROCESS OF BUILDING ENERGY EFFICIENCY
RETROFITS**

Mohamed Fasly Fathuma Fasna

(178017L)

Thesis submitted in partial fulfillment of the requirements for the Degree
Doctor of Philosophy

Department of Building Economics

University of Moratuwa

Sri Lanka

June 2024

DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute 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 thesis, 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).

Signature:

Date:02/06/2024

The above candidate has carried out research for the PhD thesis under my supervision.

Name of Supervisor: Dr. Sachie Gunatilake

Signature of the Supervisor:

Date: 02.06.2024

ABSTRACT

Though currently many organisations are under pressure to adopt Building Energy Efficiency Retrofits (BEER) and minimise energy consumption, still there is comparatively low level of implementation of BEER. This has been attributed to, *inter alia*, lack of proactive guidance for project teams to ensure that they make the right decisions to achieve the desired Energy Efficiency (EE) outcomes, involvement of numerous stakeholders from different disciplines in BEER projects, existence of complex interrelations among such stakeholders and reluctance to involve all such stakeholders within the internal decision-making process. Thus, it appears that informed decision-making and effective Stakeholder Management (SM) are essential to ensure successful implementation of BEER. Hence, this study was aimed at developing a SM framework to ensure effective SM throughout the decision-making process of BEER.

A mixed method design following the “sequential exploratory” research design was adopted to achieve the research aim. Four Sri Lanka National Energy Efficiency Award (SLNEEA) winning hotel retrofit projects were selected from the Western province of the country, representing shallow and medium retrofit projects led by in-house teams and ESCO. Structured and semi-structured interviews were conducted with the stakeholders involved in the selected BEER projects. The collected qualitative data were analysed using the computer-based thematic and content analysis while the quantitative data were analysed using Social Network Analysis (SNA) and mathematical equations.

This research identified the decision-making processes followed in in-house led and Energy Service Company (ESCO) led BEER projects. Findings further revealed, 24 stakeholders involved in the decision-making process along with their functions. 7 roles reflective of the nature of their involvement in the BEER project (i.e. decision-maker, performer, monitor/observer, supporter, advisor, consultant, and informer) were also discovered. Moreover, SNA results also revealed 6 roles of stakeholders in different relationship networks of BEER (i.e. recipient, disseminator, peripheral actor, isolate, gatekeeper/broker, and focal actor). The “Facilities Manager” (FM) was identified as the “key player” with the highest level of influence and interest in in-house led projects. On the other hand, in ESCO led BEER projects, both the “ESCO” and “FM” were revealed to be the “key players”. Findings also revealed 20 CSFs and 62 strategies to ensure effective SM during different stages of BEER projects. These strategies include 8 strategies to effectively manage different stakeholder interests, 42 strategies to effectively deal with the identified CSFs for the effective SM, 9 suitable engagement approaches for managing stakeholders with different characteristics, and 3 strategies to improve stakeholder relationships.

This study is novel in offering a framework that could help in ensuring effective SM within the decision-making process of BEER. The proposed SM framework consists of four main sections, addressing the decision-making process of BEER, stakeholder involvement, SM process, and CSFs for effective SM. It is believed that the outcomes of this study will serve as a roadmap for industry practitioners in implementing BEER projects whilst effectively managing the stakeholders, which could in turn enhance the level of adoption of BEER in the long run.

Key words: Building Energy Efficiency Retrofits (BEER), Decision-making process, Hotel Sector, Social Network Analysis (SNA), Stakeholder Management (SM)

DEDICATION

This piece of work is wholeheartedly dedicated to my beloved family for their endless love, encouragement, and consistent support, which made me see this adventure through to the end.

ACKNOWLEDGEMENT

I wish to extend my sincere gratitude to all the individuals who have supported me throughout this PhD journey. First and foremost, I would like to express my heartfelt gratitude to my research supervisors Dr. Sachie Gunatilake and Prof. Andrew Ross for their immense support and guidance. Without their valuable advice and constructive criticism, this PhD research would not have been made possible. I would also like to thank Dr. Anupa Manewa for her continuous support and valuable insights throughout my study, which helped me in directing this research towards success.

A special thanks goes to all the interview participants for devoting their valuable time in sharing their views and experiences, despite their busy schedules. Especially, I would like to acknowledge Mr. Ranjith Pathmasiri (Managing Director, SEWIN Exergy Solutions (Pvt) Ltd), Mr. Rukshan Sheriff (Director/CEO of ECO33 – Sri Lanka), and Mr. Lahiru Munasinghe (Head of Engineering – Jetwing hotels) for their support in obtaining access to suitable cases. Further, I would like to extend my greatest appreciation to all academic and non-academic staff of Department of Building Economics - University of Moratuwa, for their invaluable support throughout my PhD journey. I am very grateful to Senate Research Committee of University of Moratuwa for funding this PhD (Grant SRC/LT/2018/28).

Finally, I express my heartfelt thanks to my dear parents Mr. Mohamed Fasly and Mrs. Fathima Atheeka, for their love, care, continuous support, and encouragement. I owe very special thanks to my husband Mr. Shifky Mohamed for his love, support, and encouragement in all circumstances which helped me to make this effort a success. Last but not least, I owe special thanks to my lovely son Azlaf for bringing happiness and joy to my life.

TABLE OF CONTENTS

Declaration	i
Abstract	ii
Dedication	iii
Acknowledgement.....	iv
Table of Contents	v
List of Figures	xiii
List of Tables.....	xv
List of Abbreviations.....	xvii
List of Appendices	xix
Chapter 01	1
1 Introduction	1
1.1 Background to the Study	1
1.2 Problem Statement	4
1.3 Aim, Objectives, and Research Questions	7
1.4 Research Methodology	10
1.5 Scope and Limitations of the Study	12
1.6 Contribution to Knowledge and Originality.....	13
1.7 Chapter Breakdown	13
Chapter 02	16
2 Decision-Making Process of BEER.....	16
2.1 Introduction	16
2.2 Overview of Energy Efficiency (EE) and EE Improvement Approaches...	16
2.3 Building Energy Efficiency Retrofits (BEER): Definitions and Benefits...	18

2.3.1	Types of retrofits	21
2.4	A Review of Existing Decision-making Processes	26
2.5	Conceptual Decision-making Process of BEER Projects.....	27
2.6	Enablers and Barriers for the Adoption and Implementation of BEER in Existing Buildings.....	34
2.7	Chapter Summary	37
Chapter 03	38
3	SM within the Context of BEER Projects.....	38
3.1	Introduction	38
3.2	The Concept of ‘Stakeholder’	38
3.3	Stakeholder Management (SM).....	41
3.3.1	Importance of SM to BEER projects	42
3.4	SM Process	43
3.4.1	Identifying the stakeholders in implementing BEER	46
3.4.2	Stakeholder analysis.....	49
3.4.3	Developing strategies for dealing with and managing the stakeholders (i.e. Action)	58
3.5	A Review of Existing Stakeholder Analysis Methods	59
3.6	Need for a New SM Framework	60
3.7	SNA: An Overview	62
3.8	CSFs and Strategies for Effective SM in BEER	66
3.9	Chapter Summary	70
Chapter 04	71
4	A Conceptual SM Framework	71
4.1	Introduction	71

4.2	Conceptual SM Framework to Ensure Effective SM within the Decision-making Process of BEER Projects	71
4.2.1	SNA based model for SM in the study	76
4.3	Chapter Summary	78
Chapter 05	79
5	Research Methodology.....	79
5.1	Introduction	79
5.2	Research Process	79
5.3	Stage 1: Background Study	79
5.4	Stage 2: Literature Synthesis	81
5.5	Stage 3: Conceptual Framework Development.....	82
5.6	Stage 4: Research Design	82
5.7	Research Philosophy	82
5.7.1	Philosophical position of the research.....	83
5.8	Approaches to Theory Development.....	84
5.9	Methodological Choice	85
5.10	Research Strategies	86
5.10.1	Case study as a research strategy	86
5.11	Time Horizon.....	93
5.12	Research Techniques and Procedures.....	93
5.13	Stage 5: Data Collection	94
5.13.1	Data collection process	94
5.13.2	Respondents of the study	98
5.14	Stage 6: Data Analysis and Discussion of the Findings	103
5.14.1	Analysis of semi-structured interview data: Thematic analysis and content analysis	103

5.14.2	Analysis of structured interview data: SNA and mathematical equations	105
5.14.3	Within case analysis.....	110
5.14.4	Cross-case analysis.....	110
5.15	Stage 7: Refinement and Validation of SM Framework.....	111
5.16	Stage 8: Conclusions, Recommendations, and Limitations of the Study	112
5.17	Reliability and Validity of the Research Findings.....	112
5.18	Chapter Summary	113
Chapter 06	116
6	Decision-Making Process for the Adoption and Implementation of BEER in Existing Hotel Buildings.....	116
6.1	Introduction	116
6.2	Phase 1 Data Analysis: Background and Processes Adopted	116
6.3	Perception on BEER and Reasons for the Adoption of Selected BEER Projects.....	117
6.4	Decision-making Process for the Adoption and Implementation of BEER Projects.....	120
6.4.1	Decision-making process of BEER projects: In-house led scenario..	123
6.4.2	Decision-making process of BEER projects: ESCO led scenario	127
6.5	Roles and Functions of Stakeholders in the Adoption and Implementation of BEER Projects.....	130
6.5.1	Stakeholders and their roles and functions in different stages of the BEER project: In-house led scenario	133
6.5.2	Stakeholders and their roles and functions in different stages of the BEER project: ESCO led scenario	138
6.6	Enablers and Barriers for the Adoption and Implementation of BEER	143

6.6.1	Enablers for the adoption and implementation of BEER.....	143
6.6.2	Barriers for the adoption and implementation of BEER.....	149
6.6.3	SFs for the adoption and implementation of BEER projects	158
6.7	Discussion of the Findings	161
6.7.1	Perception on BEER and reasons for the adoption of selected BEER projects	161
6.7.2	Decision-making process of BEER projects	162
6.7.3	Stakeholders and their involvement (i.e. functions and roles) in different stages of the BEER project.....	166
6.7.4	Enablers and Barriers for the Adoption and Implementation of BEER	170
6.8	Chapter Summary	172
	Chapter 07	174
7	Stakeholder Analysis within the Context of BEER in Existing Hotel Buildings	174
7.1	Introduction	174
7.2	Phase 2 Data Analysis: Background and Processes Adopted	174
7.2.1	Rationale for prioritising the stakeholders and SFs	175
7.3	Stakeholder Analysis within the Context of BEER Using Influence-Interest Matrix.....	176
7.4	Interests of Stakeholders in the Adoption and Implementation of BEER.	177
7.5	Influence of Stakeholders in the Adoption and Implementation of BEER	186
7.6	Influences of Stakeholders on BEER Project Success	187
7.6.1	Relationships between the stakeholders and SFs of BEER project (i.e. Influence of stakeholders on SFs).....	187
7.6.2	Influence of each SF on project success	195
7.6.3	Influence of each stakeholder on project success	199

7.7	Stakeholder Interrelationships in terms of Communication, Information Exchange, and Knowledge Exchange	204
7.7.1	Structure and properties of communication network.....	206
7.7.2	Structure and properties of information exchange network.....	220
7.7.3	Structure and properties of knowledge exchange network	235
7.8	Influence-Interest Matrix of Selected BEER Projects.....	249
7.9	Discussion of the Findings	255
7.9.1	Interests of each stakeholder in the adoption and implementation of BEER	255
7.9.2	Influences of each stakeholder on BEER project success.....	257
7.9.3	Stakeholder interrelationships in terms of communication, information exchange, and knowledge exchange	259
7.9.4	Stakeholder analysis within the context of BEER using influence-interest matrix.....	264
7.10	Chapter Summary	266
	Chapter 08	267
8	CSFs and Strategies for the Effective SM in BEER in Existing Hotel Buildings	267
8.1	Introduction	267
8.2	CSFs for the Effective SM in BEER in Hotel Buildings	267
8.3	Strategies for the Effective SM in BEER in Hotel Buildings in Sri Lanka	281
8.3.1	Strategies to effectively manage different stakeholder interests.....	281
8.3.2	Strategies to effectively deal with the identified CSFs for the effective SM	286
8.3.3	Suitable engagement approaches for managing stakeholders with different characteristics	293

8.4	Discussion of the Findings	300
8.5	Chapter Summary	306
Chapter 09		307
9	Refinement and Validation of the Framework for Ensuring Effective SM within the Decision-Making Process of BEER	307
9.1	Introduction	307
9.2	Refined SM Framework to Ensure Effective SM within the Decision-making Process of BEER Projects	307
9.3	Validation of the Refined SM Frameworks.....	315
9.3.1	Agreement with the refined SM frameworks.....	316
9.3.2	Usefulness of the SM framework during the course of BEER	318
9.3.3	Applicability of the refined SM frameworks to sectors other than hotels 320	
9.4	Strengths and Limitations of the Developed SM Framework.....	322
9.5	Chapter Summary.....	324
Chapter 10		325
10	Conclusions and Recommendations	325
10.1	Introduction.....	325
10.2	Overview of the Research and the Adopted Research Process	325
10.3	Conclusions Drawn from the Study.....	327
10.3.1	Objective 1: Critically review and evaluate the decision-making aspects in adoption and implementation of BEER projects, SM process including existing stakeholder analysis methods and indicators for assessing different stakeholder interrelationships, and necessity of SM in BEER projects.....	327
10.3.2	Objective 2: Develop a conceptual SM framework to ensure the effective SM throughout the BEER decision-making process.....	329

10.3.3	Objective 3: Investigate the decision-making process in the adoption and implementation of BEER in existing hotel buildings in Sri Lanka.....	330
10.3.4	Objective 4: Evaluate the interests and influences of each stakeholder on BEER project	333
10.3.5	Objective 5: Assess the stakeholder interrelationships and the structure and properties of stakeholder networks.....	336
10.3.6	Objective 6: Investigate the CSFs and strategies for the effective SM in BEER in existing hotel buildings in Sri Lanka	338
10.3.7	Objective 7: Refine and validate the developed conceptual SM framework to ensure the effective SM in BEER projects in existing hotel buildings by mapping the findings from the above objectives	340
10.4	Contribution of Knowledge	342
10.4.1	Theoretical contribution	342
10.4.2	Methodological contribution.....	343
10.4.3	Empirical contribution	344
10.5	Limitation of the Study	345
10.6	Recommendations and Further Research	346
10.6.1	Recommendations for government and industry institutions like SLSEA	346
10.6.2	Recommendations for the industry practitioners including ESCOs ..	347
10.6.3	Recommendations for academics on the directions for further research	347
	References	349
	List of Research Publications.....	392
	Appendices.....	394

LIST OF FIGURES

Figure 1.1: Research questions	9
Figure 2.1: EE improvement approaches to enhance the EE of the buildings	17
Figure 2.2: Classifications of BEER types based on different criteria	22
Figure 2.3: Modified classification of BEER types	23
Figure 2.4: Conceptual decision-making process of BEER project.....	29
Figure 3.1: Stakeholders of BEER projects: Literature review findings	47
Figure 3.2: Stakeholder relationship types in a project.....	54
Figure 3.3: Key stages of the network analysis process.....	65
Figure 4.1: Conceptual SM framework to ensure the effective SM throughout the BEER decision-making process	73
Figure 4.2: SNA based model for SM.....	77
Figure 5.1: Research process	80
Figure 5.2: Criteria for case selection	89
Figure 5.3: Case study process of the study	92
Figure 5.4: Iterations of phase 2 data collection and their purpose	96
Figure 6.1: Structure of the themes	116
Figure 6.2: Respondents' perception on BEER	118
Figure 6.3: Decision-making process of BEER project under in-house led scenario	121
Figure 6.4: Decision-making process of BEER project under ESCO led scenario .	122
Figure 6.5: Stakeholders and their roles and functions in different stages of BEER project under in-house led scenario.....	131
Figure 6.6: Stakeholders and their roles and functions in different stages of BEER project under ESCO led scenario	132
Figure 6.7: Derived SFs for the adoption and implementation of BEER	159
Figure 7.1: Criteria for prioritising the SFs for the adoption and implementation of BEER	176
Figure 7.2: Key components of influence-interest matrix	176
Figure 7.3: Steps to determine the stakeholder influence on project success	187
Figure 7.4: Two-mode network of Stakeholders vs. SFs of BEER projects.....	189

Figure 7.5: Communication networks of the selected cases 207

Figure 7.6: Information exchange networks of the selected cases..... 221

Figure 7.7: Knowledge exchange networks of the selected cases 236

Figure 7.8: Influence-interest matrices of selected four cases 250

Figure 8.1: Strategies to effectively manage different stakeholder interests within the decision-making process of BEER..... 282

Figure 8.2: Strategies to effectively deal with the identified CSFs for effective SM within the context of BEER 287

Figure 8.3: Engagement approaches for managing stakeholders with different characteristics in a BEER project..... 294

Figure 9.1: Refined and validated SM framework for in-house led projects..... 308

Figure 9.2: Refined and validated SM framework for ESCO led projects 309

LIST OF TABLES

Table 2.1: Definitions for BEER.....	19
Table 2.2: Benefits of BEER.....	20
Table 2.3: Comparison of shallow, medium, and deep retrofits	25
Table 2.4: Enablers and Barriers for the adoption and implementation of BEER.....	36
Table 3.1: Definitions for stakeholder	39
Table 3.2: Definitions for SM	41
Table 3.3: Key steps of SM process: Literature review findings.....	44
Table 3.4: Definitions for stakeholder interests	50
Table 3.5: Interests of different stakeholders in the adoption and implementation of BEER	51
Table 3.6: Brief overview of key stakeholder relationships	56
Table 3.7: CSFs for effective SM	67
Table 5.1: Details of the respondents	100
Table 5.2: Tactics adopted within this study to test the research quality.....	114
Table 6.1: Reasons for the adoption and implementation of BEER projects.....	119
Table 6.2: Enablers for the adoption and implementation of BEER during different stages of process.....	144
Table 6.3: Barriers for the adoption and implementation of BEER during different stages of process.....	150
Table 7.1: Interests pertinent to each stakeholder, weighted importance of the respective interests to the associated stakeholders, and each stakeholder’s level of interest in the project.....	178
Table 7.2: Weighted importance of the stakeholder interests in the adoption and implementation of BEER	180
Table 7.3: Stakeholders’ influence on the SFs and their total influence on project success.....	190
Table 7.4: Priority/rank of SFs for the adoption and implementation of BEER based on their influence on project success	196
Table 7.5: Degree centrality of the stakeholders and their associated roles in communication network.....	213

Table 7.6: Influence level of the stakeholders and their associated priorities in communication network..... 214

Table 7.7: Degree centrality of the stakeholders and their associated roles in information exchange network..... 227

Table 7.8: Influence level of the stakeholders and their associated priorities in information exchange network..... 228

Table 7.9: Degree centrality of the stakeholders and their associated roles in knowledge exchange network 241

Table 7.10: Influence level of the stakeholders and their associated priorities in knowledge exchange network 242

Table 8.1: CSFs for effective SM during different stages of BEER project..... 268

LIST OF ABBREVIATIONS

Abbreviation	Description
A/C	Air Conditioners
APM	Association for Project Management
BEER	Building Energy Efficiency Retrofits
BEMS	Building Energy Management System
BMS	Building Management System
BOQ	Bill of Quantities
CEO	Chief Executive Officer
CSFs	Critical Success Factors
CPDs	Continuous Professional Developments
DGM	Deputy General Manager
EE	Energy Efficiency
EEBH	Energy Efficient Buildings Hub
EPC	Energy Performance Contract
ESCO	Energy Service Company
ESCOs	Energy Service Companies
ESMAP	Energy Sector Management Assistant Programme
FM	Facilities Manager
FMgt	Facilities Management
GHG	Greenhouse Gas
GM	General Manager
HVAC	Heating Ventilation and Air Conditioning
IAQ	Indoor Air Quality

IEQ	Indoor Environmental Quality
IFCSL	International Finance Corporation Sri Lanka
M&V	Measurement & Verification
NGOs	Non-Government Organisations
NREL	National Renewable Energy Laboratory
PMI	Project Management Institute
PTF-EDSM	Presidential Task Force on Energy Demand Side Management
QS	Quantity Surveyor
REP	Renewable Energy Partners
ROI	Return on Investment
SEAI	Sustainable Energy Authority of Ireland
SF	Success Factor
SFs	Success Factors
SLEMA	Sri Lanka Energy Managers Association
SLNEEA	Sri Lanka National Energy Efficiency Award
SLSEA	Sri Lanka Sustainable Energy Authority
SLTDA	Sri Lanka Tourism Development Authority
SM	Stakeholder Management
SNA	Social Network Analysis
T&C	Test & Commissioning
VSD	Variable Speed Drives

LIST OF APPENDICES

Appendix A: Decision-making processes/approaches - Literature review findings	394
Appendix B: Criteria for evaluating BEER measures.....	395
Appendix C: Benefits that could be gained through effective SM	396
Appendix D: Stakeholders of BEER projects, their definitions, and their functions	398
Appendix E: Approaches/strategies to deal with project stakeholders	403
Appendix F: Popular stakeholder analysis methods: An overview	406
Appendix G: Definitions of SNA terminologies.....	411
Appendix H: A comparison of one-mode vs. two-mode network models.....	413
Appendix I: SNA metrics: A brief overview	415
Appendix J: Profile of the selected cases	422
Appendix K: Phase 1 - Case study interview guideline for employees attached to the selected hotel building.....	426
Appendix L: Phase 1 - Case study interview guideline for employees attached to the ESCO	436
Appendix M: Phase 1 - Case study interview guideline for other stakeholders involved in the project.....	445
Appendix N: Phase 2 Round 1 - Case study interview guideline for stakeholders of in-house led BEER projects	453
Appendix O: Phase 2 Round 1 - Case study interview guideline for stakeholders of ESCO led BEER projects.....	472
Appendix P: Phase 2 Round 2 - Case study interview guideline for stakeholders of Case IH1	492
Appendix Q: Phase 2 Round 3 - Case study interview guideline for stakeholders of Case IH1	504
Appendix R: Phase 1 – Sample case study interview transcript of employees attached to the selected hotel building	514
Appendix S: Phase 2 Round 1 - Sample case study interview transcript of stakeholders of in-house led BEER projects.....	543
Appendix T: Data analysis process and the respective levels of coding.....	591

Appendix U: Phase 2 Round 2 - Sample case study interview transcript of stakeholders of Case IH1	592
Appendix V: Phase 2 Round 3 - Sample case study interview transcript of stakeholders of Case IH1	603
Appendix W: Profile of the experts involved in focus group discussions	614
Appendix X: Decisions to be made throughout a BEER project	618
Appendix Y: Activities to be performed throughout a BEER project	619
Appendix Z: Stakeholders and their functions in the adoption and implementation of BEER	621
Appendix AA: Higher level coding of stakeholder interests	628