

**DEVELOPING A POLICY FRAMEWORK FOR THE
DESIGN AND MANUFACTURE OF
ENVIRONMENTALLY SUSTAINABLE FOOD
PACKAGING**

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DECLARATION OF THE CANDIDATE & SUPERVISOR

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ABSTRACT

Food packaging plays a vital role in human existence by eliminating barriers to satisfying food requirements regardless of geography. Since food is a basic requirement of all human beings, a billion-dollar industry has been developed surrounding the food supply chain. Providing protection against chemical (oxygen, moisture, carbon dioxide, etc.), physical (vibration and shock), and biological (insects, microorganisms) agents while facilitating the handling of food items in bulk or in appropriate portions for easy and efficient logistics are the primary requirements of food packaging. Concurrently, the adverse consequences of food packaging have caused higher resource consumption and waste generation. Food packaging contributes to significant plastic waste accumulated in landfills, open environments and oceans. Due to the high contribution to single-use plastic waste, organisations and nations are taking several actions to minimise the environmental burden caused by food packaging. However, limited efforts are being made to introduce systematic frameworks that could help packaging designers and policy developers to design and manufacture food packaging. This research focuses on proposing a policy framework for designing and manufacturing food packaging that oversees the triple bottom line of sustainability; environmental, economic, and social. The initial phase of the study identifies the considerations in the development of food packaging concerning rigid packaging and how sustainability could be numerically represented as a decision support tool. Multiple methods, such as public surveys, questionnaires, and focus group interviews, were used for data collection. Then, Quality Function Deployment (QFD) was used to analyse the data to identify the prioritised set of design considerations. Based on the analysis, different designs were developed and evaluated to identify the product characteristics that would influence the sustainability of food packaging. The next phase focused on developing a policy framework using the results of the from the analysis of the case studies. The design science research (DSR) method was used to develop the framework combining different food packaging aspects and graphically representing them in a diagram. The main outcome of this research is the policy framework for designing and manufacturing food packaging that integrates the three main aspects of food packaging. The proposed framework was modified and validated with expert insight, adding credibility to the research outcome.

DEDICATION

To my lovely family, who gave their best to me,

To my wife, who was with me through thin and thick,

and specially,

To all the Sri Lankans for their contribution to free education.

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TABLE OF CONTENTS

Declaration of the Candidate & Supervisor	i
Abstract	ii
Dedication	iii
Acknowledgement	iv
Table of Contents	v
List of Figures	viii
List of Tables.....	x
List of Abbreviations.....	xii
List of Appendices	xiii
1. Introduction	1
1.1. Research Background	1
1.2. Problem definition	2
1.3. Research aim, objectives and scope	3
1.4. Research deliverables	4
1.5. Thesis structure.....	5
2. Literature Review.....	8
2.1. Introduction to sustainable packaging	8
2.2. Food packaging categorisation and classification	9
2.2.1 Classification based on packaging level	9
2.2.2 Categorisation by ISO	10
2.3. Evidence of packaging initiations for sustainability.....	11
2.3.1 Initiations by packaging organizations	12
2.3.2 Food Packaging policies- local context	13
2.3.3 Related policies in the rest of the world and other national-level interferences	13
2.4. Factors affecting the sustainability of food packaging	14
2.4.1 Factors related to the environment	14
2.4.2 Factors related to social sustainability	18
2.4.3 Factors related to financial viability	19
2.4.4 Evidence of collective assessment of the above indicators	20

2.5. Incorporating sustainability measures into food packaging	23
2.5.1 Reducing direct environmental impact through adapting the waste hierarchy into food packaging	23
2.5.2 Reducing indirect environmental impact through reducing food losses and waste	26
2.6. Evidence of policy framework	27
2.6.1 Policy hierarchy	28
2.6.2 Existing frameworks	28
2.7. Research gap	29
3. Methodology	31
3.1. Research design	31
3.2. Review methods	32
3.3. Case studies	32
3.4. Kano's theory for classifying the functional requirements	35
3.5. QFD for identifying and prioritising design characteristics	37
3.5.1 Feature identification	38
3.5.2 Assigning weights for functional attributes	39
3.5.3 Correlating design characteristics and packaging functions	40
3.6. Developing food packaging designs	41
3.6.1 Assuring the structural integrity	42
3.6.2 Minimizing food losses and waste	42
3.7. Evaluating packaging designs	42
3.7.1 LCA for assessing the environmental impact	43
3.7.2 Questionnaire for assessing consumer preference	49
3.7.3 Analytical approach for costs estimations	50
3.7.4 Interpreting sustainability using a single index	52
3.8. Approach to developing the policy framework	56
3.9. Validating the framework- Delphi method	57
3.9.1 Identification of validation criteria	58
3.9.2 Assessment of validity- Questionnaire	60

4. Case Study Analysis and Results	62
4.1. Case 1- Ketchup bottle	62
4.1.1 Classifying functional requirements of ketchup bottles	62
4.1.2 Identifying and prioritising features/ characteristics	63
4.1.3 Designing packaging options	65
4.1.4 Calculating the sustainability index	69
4.2. Case 2- Ice cream containers	77
4.2.1 Classifying functional requirements of ice cream containers	78
4.2.2 Identifying and prioritising design characteristics	79
4.2.3 Designing packaging options	80
4.2.4 Calculating the sustainability index	82
4.3. Insights from the case studies in developing the policy framework.....	88
4.3.1 The influence of occupied volume	89
4.3.2 Sustainability index	93
5. Development of the Framework.....	94
5.1. Proposed framework.....	94
5.1.1 Type selection	98
5.1.2 Design phase	99
5.1.3 Scrutinizing phase	102
5.1.4 Finalizing phase	103
5.2. Framework validation.....	105
6. Discussion and Conclusions.....	108
6.1. Research summary.....	108
6.2. Limitations.....	109
6.3. Contribution to knowledge	110
6.4. Further research	111
References	113
Appendices	133

LIST OF FIGURES

Figure 1.1: Organization of objectives with thesis structure	7
Figure 2.1: Rigid food packaging [41]	10
Figure 2.2: Flexible food packaging [46]	11
Figure 2.3: Food packaging categorization	11
Figure 2.4: Waste hierarchy.....	23
Figure 2.5: Policy hierarchy [128].....	28
Figure 3.1: Research Design.....	31
Figure 3.2: Market share for food packaging in the Asia-Pacific region [42].....	34
Figure 3.3: Components of House of Quality.....	38
Figure 3.4: System boundary considered for the LCA (the elements considered for the LCA system boundary is highlighted in maroon colour)	43
Figure 3.5: The occupied volume is shown in the cuboid	47
Figure 3.6: Cost components considered (the elements considered for the LCA system boundary is highlighted in maroon colour)	51
Figure 3.7: DSR framework [172].....	57
Figure 4.1: Functional attributes of ketchup bottles	63
Figure 4.2: Partially opening flip-flop caps	66
Figure 4.3: Completely removable threaded caps	66
Figure 4.4: Total deformation of ketchup bottles under top loading	68
Figure 4.5: Environmental impact from ketchup bottle design options	70
Figure 4.6: Global warming potential from ketchup bottle designs	71
Figure 4.7: Different Ketchup bottle designs	72
Figure 4.8: Percentage-wise functional satisfaction of different bottle designs.....	73
Figure 4.9: House of Quality for ketchup bottles	74
Figure 4.10: Estimated cost for ketchup bottle designs.....	75
Figure 4.11: Normalised parametric values for ketchup bottle designs	76
Figure 4.12: Aggregated sustainability score for the ketchup bottles	77
Figure 4.13: Functional attributes of ice cream containers	78
Figure 4.14: Stacking ice-cream containers in a space-saving way	80
Figure 4.15: Ice-cream container designs	82

Figure 4.16: Environmental impact from ice-cream container designs.....	83
Figure 4.17: Global warming potential of ice-cream containers	83
Figure 4.18: Estimated costs for ice cream containers	86
Figure 4.19: Normalised parametric values for ice cream container designs.....	87
Figure 4.20: Aggregated sustainability index for ice cream containers	87
Figure 4.21: Relationship between design characteristics and performance indicators	89
Figure 4.22: GWP vs occupied volume of transportation for ketchup bottles	90
Figure 4.23: GWP vs occupied volume of transportation for ice cream containers.....	90
Figure 4.24: Comparison between two transportation models- ketchup bottles	92
Figure 4.25: Comparison of two transportation models- ice cream containers.....	92
Figure 5.1: Stakeholders and their involvement in the food supply chain	95
Figure 5.2: Proposed Framework V 1.0	97

LIST OF TABLES

Table 2.1: SPA's definition of sustainable packaging	9
Table 2.2: Organizations for improving the sustainability of packaging	12
Table 2.3: Summary of the literature review	21
Table 3.1: Functional attributes	36
Table 3.2: The features of FP components	39
Table 3.3: Performance indicators (PI) used to interpret the environmental impact.....	45
Table 3.4: Cost of items.....	52
Table 3.5: Linguistic variables for pair-wise comparison of each criterion [168]	53
Table 3.6: Table used for recording data during interviews to facilitate AHP.....	53
Table 3.7: Normalized comparison matrix for FAHP	54
Table 3.8: Geometric mean of fuzzy comparison values	55
Table 3.9: Fuzzy weights for each criterion	55
Table 3.10: Weights for each criterion	56
Table 3.11: Evaluation criteria in literature	59
Table 3.12: Validation criteria used for validating each phase of the proposed framework	60
Table 3.13: Validation criteria used for validating the overall framework	60
Table 4.1: Assigning weights to functional attributes for ketchup bottles based on Questionnaire-A	63
Table 4.2: Prioritised design features for ketchup bottles with feature-function relationships ..	65
Table 4.3: Component combinations for packaging options	69
Table 4.4: LCI for ketchup bottles.....	70
Table 4.5: Consumer preference, eco-impact, and cost incurred for ketchup bottles	75
Table 4.6: Assigning weights to functional attributes for ice cream containers based on Questionnaire-A.....	78
Table 4.7: Prioritised design features for ice cream containers using HOQ	79
Table 4.8: LCI for ice-cream containers.....	82
Table 4.9: Consumer preference over ice cream containers.....	85
Table 4.10: Consumer preference, eco-impact, and cost estimations for ice-cream containers.	86
Table 5.1: Miscibility of Materials [25]	101
Table 5.2: Experts' perception of the validity of each phase under different criteria	106

Table 5.3: Experts' perception of the validity of the overall framework under different criteria
..... 107

LIST OF ABBREVIATIONS

AHP	Analytical Hierarchy Process
APCO	Australian Packaging Covenant Organization
DSR	Design Science Research
EoL	End-of-Life
FEA	Finite Element Analysis
FLW	Food Losses and Waste
FP	Food Packaging
FW	Food Waste
GDP	Gross Domestic Products
GHG	Green House Gas
GVW	Gross Vehicle Weight
HDPE	High-Density Polyethylene
HOQ	House of Quality
IML	In Mould Labelling
IOSP	Intelligent or Smart Packaging
LCA	Life Cycle Analysis
LCI	Life Cycle Inventory
LF	Load Factor
PET	Polyethylene Terephthalate
PI	Performance Indicators
PIQET	Packaging Impact Quick Evaluation Tool
QFD	Quality Function Deployment
SPA	Sustainable Packaging Alliance
SPC	Sustainable Packaging Coalition
TBL	Triple bottom line
UN	United Nations

LIST OF APPENDICES

Appendix-A	Questionnaire ‘A’ (Assigning weights on functional requirements)	133
Appendix-B	(Semi-structured interviews with packaging designers)	134
Appendix-C	Questionnaire ‘B’ (evaluating functional satisfaction)	137
Appendix-D	Questionnaire for validating the framework	139
Appendix-E	The conference article published on MERCON 2021	143
Appendix-F	The journal article published in the Journal of Cleaner Production	149