

**DEVELOPMENT OF DESIGN GUIDELINE
INCORPORATING CULTURAL VALUE CONSIDERATION
FOR GREEN PRODUCT**

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**DEVELOPMENT OF DESIGN GUIDELINE
INCORPORATING CULTURAL VALUE
CONSIDERATION FOR GREEN PRODUCT**

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DEVELOPMENT OF DESIGN GUIDELINE INCORPORATING CULTURAL VALUE CONSIDERATION FOR GREEN PRODUCT

ABSTRACT

Over the past few years, there have been a lot of efforts in promoting green products in developing countries. These efforts were driven by companies to not only focus on the profit orientation, but were encouraged with the involvement in protecting the environment through their products. However, issues may arise regarding the preferences of customers on the green products, which can be different to each other. These differences can be caused by many factors, including the influence of cultural values. These factors could complicate the designers in incorporating the green product features into their design that suit the customer preferences. Currently, there is a lack of guidelines for the consideration of cultural values into the green products design. Thus, the aim of this study was to construct a guideline to incorporate the influence of cultural values into the green products design. The sources of data were obtained from both the customers and designers perspectives. Indonesia and Malaysia were selected as the locations of study. For customers' data, a questionnaire was distributed to collect the preferences from 1,256 samples (615 from Malaysia and the rest from Indonesia). Pre-testing was performed to ensure the reliability and validity of the questionnaire. The collected data was statistically analysed based on the satisfaction level, for the exploratory, confirmatory factor analysis and structural equation modeling. For designers' data, the perspectives on the cultural consideration and design strategies to develop the green products were collected. The data collection was performed by conducting interviews for different profiles of designers. The results showed that the customer preferences in Malaysia were mostly influenced by the dimensions of uncertainty avoidance, long-term orientation and power distance. Under these influences, the Eco-label was identified as the most important strategy of green products, whereas the Indonesian customers were mostly

influenced by the uncertainty avoidance and long-term orientation. In comparison to Malaysia, most of the Indonesian customers preferred to provide services for green products. A guideline was proposed to assist the designers in incorporating the cultural values influence into the green products design. The guideline was developed based on the identified cultural values, designers' perspectives and literature analysis, to describe in more detail of the strategies for the green products design. The applicability of the guideline was validated using the case study. The designers agreed that the influence of cultural values is an important aspect that should be considered in the development of green products. Most of the designers also confirmed that the proposed guideline is useful to identify the customers' needs and establish a design concept for the green products development. Based on the findings, this study confirmed that the consideration of cultural values can be used to evaluate the customer preferences on green products. Hence, a new guideline has been established, in order to assist designers in incorporating the cultural values into the process of designing the green products.

Keywords: Cultural value influences, designers, green product, Malaysia, Indonesia.

PEMBANGUNAN GARIS PANDUAN REKA BENTUK DENGAN MENGGABUNGAN PERTIMBANGAN NILAI BUDAYA UNTUK PRODUK HIJAU

ABSTRAK

Sejak beberapa tahun kebelakangan ini, terdapat banyak usaha untuk mempromosikan produk hijau di negara-negara membangun. Usaha tersebut didorong oleh syarikat yang bukan sahaja menumpukan kepada keuntungan, tetapi menggalakkan penglibatan dalam melindungi alam sekitar melalui produk mereka. Walau bagaimanapun, isu mungkin timbul tentang keutamaan diberi pelanggan terhadap produk hijau, yang mungkin berbeza antara satu sama lain. Perbezaan ini mungkin disebabkan oleh pelbagai faktor termasuklah pengaruh nilai budaya. Faktor-faktor ini akan merumitkan para pereka untuk menggabungkan ciri-ciri produk hijau ke dalam reka bentuk mereka yang sesuai dengan keutamaan pelanggan. Buat masa ini, kurangnya garis panduan untuk pertimbangan nilai budaya ke dalam reka bentuk produk hijau. Oleh itu, tujuan kajian ini adalah untuk membina satu metodologi yang dapat menggabungkan pengaruh nilai budaya ke dalam reka bentuk produk hijau. Sumber data telah diperolehi daripada perspektif pelanggan dan pereka. Indonesia dan Malaysia telah dipilih sebagai lokasi kajian. Soal selidik untuk data pelanggan telah diedarkan untuk mengumpulkan data daripada 1,256 sampel (615 sampel dari Malaysia dan bakinya dari Indonesia). Pra ujian telah dijalankan untuk memastikan kebolehpercayaan dan kesahan soal selidik. Data yang dikumpulkan telah dianalisis secara statistik berdasarkan tahap kepuasan untuk pemodelan tinjauan, analisis faktor pemastian dan persamaan struktur. Manakala untuk data pereka, perspektif tentang pertimbangan budaya dan strategi reka bentuk untuk membangunkan produk hijau telah dikumpulkan. Pengumpulan data dijalankan dengan melakukan temu bual ke atas pereka yang mempunyai profil yang berbeza. Keputusan menunjukkan bahawa keutamaan pelanggan di Malaysia kebanyakannya dipengaruhi oleh dimensi pengeluaran

ketidakpastian, orientasi jangka panjang dan jarak kuasa. Di bawah pengaruh tersebut, label Eko telah dikenal pasti sebagai strategi produk hijau yang paling penting, sedangkan pelanggan Indonesia kebanyakannya dipengaruhi oleh pengelakan ketidakpastian dan orientasi jangka panjang. Berbeza dengan Malaysia, kebanyakan pelanggan Indonesia memilih produk hijau yang menekankan perkhidmatan. Satu garis panduan telah dicadangkan untuk membantu para pereka menggabungkan pengaruh nilai budaya ke dalam reka bentuk produk hijau. Garis panduan ini dibangunkan berdasarkan pada nilai-nilai budaya yang dikenal pasti, perspektif pereka dan analisis literatur, untuk menerangkan dengan lebih terperinci tentang strategi untuk reka bentuk produk hijau. Kebolegunaan garis panduan ini telah disahkan menggunakan kajian kes. Para pereka bersetuju bahawa pengaruh nilai budaya adalah satu aspek penting yang harus dipertimbangkan dalam pembangunan produk hijau. Kebanyakan pereka juga mengesahkan bahawa garis panduan yang dicadangkan ini berguna untuk mengenal pasti keperluan pelanggan dan menetapkan sesuatu konsep reka bentuk untuk pembangunan produk hijau. Berdasarkan dapatan ini, kajian ini mengesahkan bahawa pertimbangan nilai budaya boleh digunakan untuk menilai keutamaan pelanggan terhadap produk hijau. Oleh itu, garis panduan baharu telah dihasilkan untuk membantu pereka dalam menggabungkan nilai-nilai budaya dalam proses merekabentuk produk hijau.

Kata kunci: Pengaruh nilai budaya, pereka, produk hijau, Malaysia, Indonesia.

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TABLE OF CONTENTS

ABSTRACT	iv
ABSTRAK	vi
ACKNOWLEDGEMENTS	viii
TABLE OF CONTENTS	ix
LIST OF FIGURES	xiv
LIST OF TABLES	xvi
LIST OF SYMBOLS AND ABBREVIATIONS	xx
CHAPTER 1 : INTRODUCTION	1
1.1 Background	1
1.2 Problem statement	3
1.3 Research aim	4
1.4 Research objective	4
1.5 Research scope	4
1.6 Thesis structure	5
CHAPTER 2 : LITERATURE REVIEW	8
2.1 Introduction	8
2.2 Customer preferences and product design	10
2.2.1 Preferences on appearance	12
2.2.2 Preferences on functionality	13
2.2.3 Preferences on price	15
2.2.4 Previous studies on customer preferences and product design	17
2.3 Green product	19
2.3.1 Resources efficiency	25
2.3.2 Size and weight reduction	26
2.3.3 Using non-toxic material	27
2.3.4 Recyclable material	27
2.3.5 Using recycled material	28
2.3.6 Easy to reuse	28
2.3.7 Easy to maintain	28
2.3.8 Providing product service	29
2.3.9 Eco-label	29
2.3.10 Biodegradable material	30

2.3.11 Easy to upgrade	30
2.4 Customers preferences on green product	34
2.5 Cultural value	36
2.5.1 Definition of culture	36
2.5.2 Cultural dimension	37
2.5.2.1 Individualism-collectivism	38
2.5.2.2 Masculinity-femininity	39
2.5.2.3 High-low uncertainty avoidance.....	39
2.5.2.4 High-low power distance.....	40
2.5.2.5 Long-short term oriented.....	40
2.6 Culture and customer preferences.....	46
2.7 Conceptual model development.....	48
2.7.1 Hypotheses and preferences evaluation.....	48
2.7.1.1 Collectivism-individualism	49
2.7.1.2 Masculinity-femininity	51
2.7.1.3 Uncertainty avoidance	52
2.7.1.4 Power distance	53
2.7.1.5 Long-short term orientation.....	54
2.7.2 Designers perspective consideration	58
2.7.3 Literature supporting sources	58
2.8 Guideline development	58
2.9 Guideline validation.....	59
2.10 Research gaps discussion	61
2.11 Summary	67
CHAPTER 3 : RESEARCH METHODOLOGY	69
3.1 Introduction.....	69
3.2 Research design	69
3.3 Data collection	76
3.3.1 Data collection on customers.....	77
3.3.1.1 Questionnaire development	77
3.3.1.2 Design of the questionnaire	77
3.3.1.3 Scale of the questionnaire.....	79
3.3.1.4 Translation of the questionnaire	80
3.3.1.5 Pre-test and pilot study	81
3.4 Sampling procedure	83

3.4.1	Sample frame.....	83
3.4.2	Sample size.....	83
3.4.3	Access to sample	84
3.5	Data analysis	85
3.5.1	Sampling adequacy and reliability test.....	85
3.5.2	Missing value treatment	86
3.5.3	Exploratory factor analysis.....	86
3.5.4	Confirmatory factor analysis	87
3.5.4.1	Justification using PLS-SEM	88
3.5.4.2	Specifying measurement model	89
3.5.4.3	Assessing reflective measurement.....	94
3.5.4.4	Assessing formative measurement	95
3.5.5	Assessing structural model.....	97
3.5.6	Identifying the customer preferences	103
3.6	Data collection on designers	104
3.6.1	Analysis for interview data.....	106
3.6.2	Guideline development.....	107
3.6.3	Validation of the guideline	108
3.6.3.1	Design of questionnaire.....	110
3.6.3.2	Participants	112
3.6.3.3	Product stimuli.....	113
3.7	Research quality.....	113
3.8	Summary	116
CHAPTER 4 : IDENTIFYING CULTURAL INFLUENCES		117
4.1	Introduction.....	117
4.2	Customer perspective	118
4.2.1	Descriptive analysis.....	118
4.2.2	Research quality for quantitative: overview.....	119
4.2.3	Missing value analysis.....	120
4.2.4	Sample adequacy and reliability analysis.....	120
4.2.5	Exploratory factor analysis.....	121
4.2.6	Confirmatory factor analysis	125
4.2.6.1	Convergent validity	125
4.2.6.2	Discriminant validity	128
4.2.6.3	Formative measurement model	129

4.2.7	Structural modeling	130
4.2.7.1	Assessing R^2 (Coefficient of determination)	135
4.2.7.2	Assessing the effect size (f^2).....	136
4.2.7.3	Assessing predictive relevance (Q^2).....	137
4.2.7.4	Assessing effect size q^2	140
4.2.8	Identifying preferences on green product.....	141
4.2.9	Discussion of the result: overview	143
4.2.9.1	Identified cultural value influences	143
4.2.9.2	Uncertainty avoidance	145
4.2.9.3	Power distance.....	147
4.2.9.4	Long-term orientation.....	150
4.2.9.5	Collectivism-individualism	152
4.2.9.6	Masculinity-femininity.....	152
4.3	Designer perspectives	153
4.4	Literature analysis.....	164
4.5	Summary	167
CHAPTER 5 : GUIDELINE DEVELOPMENT AND VALIDATION.....		169
5.1	Introduction.....	169
5.2	Guideline development	170
5.3	Scope of the guideline.....	172
5.4	How to use the guideline.....	176
5.5	Case study of proposed guideline	181
5.6	Evaluation of guideline	188
5.7	Summary	195
CHAPTER 6 : CONCLUSION		196
6.1	Introduction.....	196
6.2	Achievement of research objectives	196
6.2.1	The achievement of objective 1.....	197
6.2.2	The achievement of objective 2.....	199
6.2.3	The achievement of objective 3.....	200
6.2.4	The achievement of objective 4.....	201
6.3	Research contributions.....	201
6.3.1	Contribution to knowledge	202
6.3.2	Contribution to practices	203
6.4	Novelties an originality of the research	204

6.5 Research limitations and direction for future study	205
6.6 Summary	206
REFERENCES	207
LIST OF PUBLICATIONS	232
APPENDICES	233
APPENDIX A CVSCLE.....	233
APPENDIX B SURVEY QUESTIONNAIRE.....	234
APPENDIX C TRANSLATED QUESTIONNAIRE.....	244
APPENDIX D QUESTIONNAIRE FOR VALIDATION	254
APPENDIX E EXAMPLE OF TRANSCRIPT FOR THE INTERVIEW	276
APPENDIX F THE EVIDENT OF CALCULATION PROCESS.....	278
APPENDIX G RAW DATA	282

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LIST OF FIGURES

Figure 2.1: The structure of Chapter 2	9
Figure 2.2: The process of product design (Ulrich & Eppinger, 2008, p.16)	10
Figure 2.3: Differentiation of functional design based on the functionality to meet the customer preferences (Noble & Kumar, 2008)	14
Figure 2.4: The approaches used by previous studies to identify the customer preferences	19
Figure 2.5: Three pillars of sustainable development	20
Figure 2.6: Five cultural dimensions (Hofstede, 1993)	38
Figure 2.7: Cultural dimensions index for Malaysia and Indonesia (Hofstede, 2017) ...	41
Figure 2.8: Consumer responses model (Bloch, 1995)	47
Figure 2.9: The integration of cultural value into the product design (Salmi & Sharafutdinova, 2008)	47
Figure 2.10: Framework to identify cultural value influences on green product preferences	49
Figure 2.11: Hypotheses evaluation	56
Figure 2.12: Conceptual model for the incorporation of cultural values consideration into the design of the green product	60
Figure 2.13: Research gap	62
Figure 2.14: Compilation of research gaps, aim and objectives	68
Figure 3.1: The research methodology used in this study	75
Figure 3.2: Flow of questionnaire development	82
Figure 3.3: Construct and indicators in the proposed model	89
Figure 3.4: The (a) reflective and (b) formative measurement models	93
Figure 3.5: Flow of procedure to evaluate the convergent validity (Hair et al., 2016) ...	94
Figure 3.6: Convergent validity procedure for the formative measurement model (Hair et al., 2016)	96
Figure 3.7: Procedure for assessing formative measurement model (Hair et al., 2016) ..	97

Figure 3.8: Steps to evaluate the proposed structural model (Hair et al., 2016).....	99
Figure 3.9: The types of hierarchical component model. (a) Reflective-reflective, (b) reflective-formative, (c) formative-reflective, and (d) formative-formative (Hair et al., 2016)	100
Figure 3.10: The two-stages approach for the HCM analysis (Hair et al., 2016).....	101
Figure 3.11: The HOC-LOC classification	101
Figure 3.12: The classification of construct measurement	103
Figure 3.13: The flow of guideline development.....	108
Figure 4.1: Outer loading computation (Indonesia).....	126
Figure 4.2: Outer loading computation (Malaysia).....	127
Figure 4.3: Two-stages analysis in HCM. The constructs can be transformed to be new indicators using their latent variable scores (Hair et al., 2014).....	131
Figure 4.4: Structural modeling computation (Indonesia).....	132
Figure 4.5: Structural modeling computation (Malaysia).....	134
Figure 4.6: The calculation of Q2 value (Indonesia)	138
Figure 4.7: The calculation of Q2 value (Malaysia)	139
Figure 4.8: The designers' perspectives on the green product and cultural values consideration in designing the green product	162
Figure 4.9: Three sources of data for the guideline development.....	167
Figure 5.1: Flow of the validation process.....	170
Figure 5.2: The proposed guideline for designing the green product while considering the cultural value influences in Malaysia.....	173
Figure 5.3: The proposed guideline for designing the green product while considering the cultural value influences in Indonesia.....	174
Figure 5.4: The procedure to use the proposed guideline	180
Figure 6.1: Conceptual model for incorporating the cultural value consideration in designing the green product	198

LIST OF TABLES

Table 2.1: The attributes of product appearance.....	12
Table 2.2: The attributes of the product functionality	15
Table 2.3: The attributes of product price.....	16
Table 2.4: Green product characteristics from previous studies.....	22
Table 2.5: Common green product characteristics found in the literature.....	25
Table 2.6: Strategies related to the customer preferences on green product characteristics.....	32
Table 2.7: The characters of cultural dimensions (Hofstede, 1980)	43
Table 2.8: Hypotheses of the research	57
Table 2.9: Previous studies on customer preferences	64
Table 2.10: Research position to consider the influence of cultural values to the customer preferences on green product	65
Table 3.1: Differences between quantitative and qualitative methodologies, as adapted from Cresswell (2009) and Chua (2010)	72
Table 3.2: Constructs and items in the questionnaire	79
Table 3.3: Sample adequacy and reliability test	82
Table 3.4: Types of questionnaire distribution (Sekaran & Bougie, 2010, pp 197-198)	84
Table 3.5: Consideration of choosing PLS-SEM and CB-SEM (Hair et al., 2014)	88
Table 3.6: The indicators of collectivism construct.....	90
Table 3.7: The indicators of masculinity construct.....	90
Table 3.8: The indicators of uncertainty avoidance construct	91
Table 3.9: The indicators of power distance construct	91
Table 3.10: The indicators of long-term orientation construct	91
Table 3.11: The indicators of appearance construct	91

Table 3.12: The indicators of functionality construct	92
Table 3.13: The indicators of price construct	92
Table 3.14: The indicators of green product characteristics construct	92
Table 3.15: The consideration for using formative or reflective measurements (Hair et al., 2014)	93
Table 3.16: The assessments in reflective measurement model (Hair et al., 2016).....	95
Table 3.17: Questions for the interview	105
Table 3.18: The advantages and disadvantages of the face-to-face and telephone interviews (Sekaran & Bougie, 2010).....	106
Table 3.19: Important consideration in the case study method.....	109
Table 4.1: Demographic profile of respondents	119
Table 4.2: Sample adequacy and reliability test	121
Table 4.3: Factor analysis result	122
Table 4.4: CVSCALE factor analysis	124
Table 4.5: Compilation of factor loading, AVE and CR values for Indonesia and Malaysia.....	128
Table 4.6: Heterotrait-Monotrait Ratio (HTMT) for discriminant validity (Indonesia)	129
Table 4.7: Heterotrait-Monotrait Ratio (HTMT) for discriminant validity (Malaysia)	129
Table 4.8: Variance inflation factor (VIF) for Indonesia.....	130
Table 4.9: Variance inflation factor (VIF) for Malaysia.....	130
Table 4.10: Results of the structural equation model (Indonesia)	133
Table 4.11: Results of the structural equation model (Malaysia)	135
Table 4.12: The result for the calculation of adjusted R2.....	136
Table 4.13: Results of the effect size (f2) for the construct of customer preferences on green product	137
Table 4.14: Predictive relevance (Q2 value).....	139

Table 4.15: Results of the effect size q^2	141
Table 4.16: The outer weight results.....	142
Table 4.17: Scores for cultural value dimensions (Hofstede, 2017).....	144
Table 4.18: Scores for cultural value dimensions	144
Table 4.19: Approach and strategies to relate the uncertainty of customers on green product	147
Table 4.20: Approach and strategies to relate the low power distance influences towards green product preferences	150
Table 4.21: Approach and strategies to relate the long-term orientation influences towards the green product preferences	152
Table 4.22: Profiles of designers.....	153
Table 4.23: Designers perspectives on green product.....	154
Table 4.24: Designers' perspectives on green product characteristics	155
Table 4.25: Designers' perspectives on the strategies to design the green product.....	156
Table 4.26: The designers' perspectives on the cultural value consideration in designing the green product.....	157
Table 4.27: Designers perspectives on the method for the consideration of cultural values in designing the green product.....	158
Table 4.28: Designers perspectives on the development of a guideline for the incorporation of cultural value consideration in designing the green product.....	158
Table 4.29: Designers' perspectives on which phase cultural values consideration can be involved.....	160
Table 4.30: Focus of content analysis for the designers' perspectives	161
Table 4.31: Design strategies extracted from the literature	165
Table 5.1: Guideline development of the design strategies for the green product considering the cultural value influences.....	171
Table 5.2: Identified ranks of the green product characteristics based on the SEM results	172
Table 5.3: Strategies and sub-strategies to design the green product while considering the cultural value influences	175

Table 5.4: Checklist of the strategies for designing the green product to relate the cultural value influences (Malaysia)	177
Table 5.5: Checklist of green design strategies to relate with the cultural value influences (Indonesia)	178
Table 5.6: Green product strategies checklist (Malaysia)	178
Table 5.7: Green product strategies checklist (Indonesia)	179
Table 5.8: Selected green strategies and substrategies	180
Table 5.9: Profiles of the designers	181
Table 5.10: The compilation of filled checklist that was performed by the designers for the selection of green product characteristics considering the cultural value influences	182
Table 5.11: The compilation of filled checklist that was performed by the designers for the selection of strategies and substrategies for the incorporation of green product characteristics while considering the cultural value influences	183
Table 5.12: Compilation of the designers' answers for questions 1	188
Table 5.13: Designers evaluation on the proposed guideline	190
Table 5.14: Implementation of the guideline in the design process	192
Table 5.15: Recommendation from the designers to improve the guideline	194

LIST OF SYMBOLS AND ABBREVIATIONS

Abbreviations Descriptions

AVE	Average variance extracted
CB-SEM	Covariance based-structural equation modeling
CFA	Confirmatory factor analysis
CR	Composite reliability
CVSCALE	Cultural value scale
DFE	design for environment
ECQFD	environmentally conscious quality function deployment
EFA	Exploratory Factor Analysis
EM	Expectation maximization
f^2	Effect size; a measure to assess the relative impact of predictor construct on an endogenous construct.
Gpc	Green product characteristic
HCM	Hierarchical component models
HOC	Higher-order component
HTMT	Heterotrait-monotrait
k	Number of exogenous latent variables used to predict the endogenous latent variable under consideration.

KMO	Kaiser Meyer Olkin
LCA	life cycle assessment
LOC	Lower-order component
MPC	Malaysia productivity cooperation
n	Sample size
PDA	Personal Digital Assistant
PLS	Partial least square
Q^2	Predictive relevance, to predict model accuracy
q^2	a measure to assess the relative predictive relevance of a predictor construct on an endogenous construct
QFD	Quality Function Deployment
R^2	Coefficient of determination; value amount of explained variance of endogenous latent variables in the structural models
R^2_{adj}	Modified measure of the coefficient of determination that takes into account the number of predictor construct
SEM	Structural equation modeling
VIF	Variance inflation factor; quantifies to severity of collinearity among the indicators in formative construct

CHAPTER 1: INTRODUCTION

1.1 Background

The world population is expected to be over 8.9 billion by 2050 (United Nations, 2004). Furthermore, future population growth is also predicted in developing countries, particularly in the South-East Asian region, such as Malaysia and Indonesia. Malaysia is expected to see a significant rise in its population, with an estimate of more than 32.4 million people by 2020 (Department of Statistics, 2016). Similarly, according to a statistical report by the Indonesian government, the Indonesian population has been increased from 119 million to 237.6 million (from year 1971 to 2010), and the growth was predicted to continue for the next 10 years (Statistics Indonesia, 2017). In this respect, manufacturers are expected to increase their production capacities, to meet the demand of this rapid population growth. The amplification of production rate will consequently results in the deterioration of the environment, due to the over consumption of natural resources, waste generation and gas emission, by the households (users) and product manufacturers (producers).

Environmental policies and legislations have been introduced, to minimise the impact of manufacturing activities and products towards the environment. Manufacturers are now expected to ensure that their products not only have the desired appearances, functionalities and prices, but should also be environmentally friendly, throughout the products' entire life cycle (Bovea & Pérez-Belis, 2012; Kaebernick et al., 2003; Gungor & Gupta, 1999). Products with inherent environmental characteristics are mostly known as the green products (Ljungberg, 2007). Green products are expected to be harmless to the living environment (Masui et al., 2013), use less materials and energy (Ljungberg, 2007), and are easy to be reused (Amelia et al., 2009). The purpose of green products is to save the environment not only in the present, but also in the future.

The preferences on green product nowadays expanded rapidly in the developed countries and this such situation also will be followed by developing countries (Yadav & Pathak, 2017). However, the level of awareness and concern amongst consumers towards the green products and the environment, respectively, are differently to each other, since it depends on how they perceive the characteristics of the green products. These characteristics may be perceived and valued as either positively or negatively by the customers, depending on their preferences (Luchs et al., 2010). The variety of product preferences can be influenced by the cultural values, which are set as the natural characters or behaviours of the customers.

The influence of cultural values on the customer preferences is an important factor which product designers should consider, during the development of new products. Crilly et al. (2004) described cultural values as a collective of minds in a group or area, which can influence the customer preferences. Studies by Salmi and Sharafuthdinova (2008), Bloch (1995) and Bong and Jin (2017) underlined that the cultural values can affect the customer preferences on the products. Therefore, if the designer misunderstood the influence of cultural values towards the purchasing decision of the customer, there is a possibility that the product will appear less appealing to the customer, which consequently may results in the failure of the product in that particular market.

During the development phase of a new product, the designer will account for the customer preferences into the design consideration (Ulrich & Eppinger, 2008), which generally include the product's appearance, functionality and price (Bloch, 1995). Raising the awareness on the environmental concern has also becoming more significant during the product development phase. Therefore, the designer should also be able to recognise which particular green characteristics that may influence the preference of the customer, and thus decide the best design that balance between the cultural values and green characteristics. The consideration on the influence of cultural values is important,

to precisely evaluate the collective preferences based on the confined characters or behaviours of the targeted customers, rather than struggling on an individual evaluation (Soron, 2010). It can assist the designer to minimise the misinterpretation in determining the specification of the green products that relate to the customer preferences. However, the study on the consideration of cultural values in designing the green products has yet to be performed. Therefore, the development of a guideline to assist the designers in incorporating the consideration of cultural values into the design of green products is needed.

1.2 Problem statement

Manufacturers are encouraged by the legislation to participate in the environmental sustainability by producing green products (Yenipazarli, 2016). This pressure requires the designers (as the front line in the product development) to clearly recognise the suitable characteristics of green products, that are related to the customer preferences. However, determining the customer preferences can be difficult, as it involved qualitative judgement which can vary between customers and influenced by many factors (Wang & Tseng, 2008). Recognising the preference of an individual customer and set the design specification according to the preference, may as well be a challenge for the designers (Soron, 2010). This is because, the preference can be suitable for a customer, but not for the others. As a result, the market involved with the designed products could be jeopardised. In order to address this problem, the influence of cultural values needs to be consider as a potential approach in deciding the suitable preferences, for the green products design. However, cultural values influence on the customer preferences in the green products design has not been investigated by previous researchers, especially in Indonesia and Malaysia. Thus, this study is performed to address this problem by

providing a guideline, to assist designers in incorporating the consideration of cultural values for the design of green products.

1.3 Research aim

The aim of this study was to develop a guideline to assist designers in incorporating the cultural values into the green products design.

1.4 Research objective

To achieve the research aim, four research objectives were formulated, which include:

1. To develop a conceptual model for the incorporation of the cultural values into the green products design.
2. To identify the significant relationship between the cultural values and the preferences of customers on green products.
3. To develop a guideline for the consideration of cultural values in designing the green products for Malaysia and Indonesia.
4. To validate the guideline of cultural values consideration in green products design.

1.5 Research scope

This research was conducted in two countries, i.e. Malaysia and Indonesia, since geographically, these countries have almost similar weather, language and culture. Therefore, these similarities may provide more information, in order to increase the understanding on how the cultural values influence the customer preferences in choosing the green products.

This study focused to identify the preferences of customers on the characteristics of the green products, with no specific product used as the stimuli. There were 11 characteristics used in this study, which were generated from an in-depth literature review.

1.6 Thesis structure

This thesis consists of seven chapters. Brief descriptions on Chapter 2 to Chapter 6 of this thesis are described as follows:

Chapter 2: This chapter is classified into 3 main sections. In the first section, review of the literature was carried out by focusing on the customer preferences, which include the evaluation approaches, and the aspects that can influence the customer preferences. In the second section, literature review that focused on the studies related to green products, was presented. Identification on the characteristics of green products, and the customer preferences towards them are also described in this section. The development of a conceptual model was also described in this chapter. The model includes; the evaluation on the hypotheses related to customer preferences, determination of designers' perspectives, and validation of the guideline that has been developed. There are 10 hypotheses for the evaluation of the cultural values influence on the preferences of green products. The designers' perspectives are required to identify the cultural values in designing the green products which include, the perspectives on the characteristics and design method of the green products. A guideline was developed based on the perspectives of the customers, designers and those obtained from the literature. The validation was conducted to ensure the applicability of the guideline. In the last section, the review of literature was focused on the cultural values involved. Finally, research gaps were identified, at the end of the review.

Chapter 3: This chapter elaborates the overall research method used in this study. The method is classified into two major sections. The method chosen to identify the influence of cultural values towards the customer preferences on the green products, were explained in the first section. In this section, the data collection process based on the customer's perspective was explained. Explanation on the method used to identify the designer's perspectives on the green products development, was elaborated in the second section. This covers the designer's perspectives on the consideration of cultural values, product characteristics and the methods used, in the design of the green products. Literature analysis was also used as the secondary data, in order to recognise additional design strategies apart from the strategies obtained from the designers.

Chapter 4: The purpose of this chapter is to present the process of data analysis. This includes the analysis of the customer preferences and strategies used by designers in the consideration of cultural values for the green product design. The analysis of the customers' data consists of the missing data treatment, sample adequacy and evaluation of the data reliability. The cultural values (which include five cultural dimensions) influence on the customer preferences on green products, were tested by looking at the critical threshold of significance level, following the statistical calculation process. For data from the designers, content analysis was performed to identify the designers perspectives on; the cultural values consideration, product characteristics and methods used in designing the green products. Discussions of the result were also described in this chapter.

Chapter 5: The development of a guideline for the incorporation of cultural values into the design of the green products, was present this chapter. The input for this guideline was obtained from data on the perspectives of the customers, designers, as well as those

extracted from the literature, which was discussed in Chapter 5. The guideline consists of the strategies on the green product design with the consideration of cultural values. The validation of the guideline was also described in this chapter.

Chapter 6: This chapter present the conclusion of the research, following the achievement of the four research objectives. Findings that contribute to new knowledge and current practices, were also presented in this chapter. Finally, the research novelties, limitations and recommendations for future direction, were described in the last section of this chapter.

University of Malaysia

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

There have been significant efforts to promote green products in emerging and developing nations (Yadav & Pathak, 2017). However, some problems exist on the preferences of customers, which were attributed by different understandings on the matters relating to green products. It has been suggested that cultural values may have a significant influence on the customer preferences. Thus, to explore in more detail on how the cultural values influence the customer preferences towards green products, the focus of this chapter was to review related studies on the customer preferences, green products and cultural values. This chapter is classified into three main sections. The first section comprised of the literature review that focused towards the understanding of the term “customer preferences”. This includes the definition, influencing aspects, evaluation approaches and the importance of customer preferences, for consideration in the design and development of the green products. The second section focused on the review of literature related to green products. This include, studies that cover the importance of green products in reducing the environmental problems, identification of the product characteristics and the customer preferences on the green products. In the last section, the review was narrowed down to explore in more detail on the cultural values involved. This consists of the cultural values definition, dimensions, characters and index for developing countries (especially Indonesia and Malaysia). In order to obtain more information on how these cultural values provide significance influences towards the customer preferences, the review of related studies on the relationship between cultural values and customer preferences was as well included in this chapter.

The research gaps were identified at the end of the review, by generating the research aim and objectives. The structure of this chapter is illustrated in Figure 2.1.

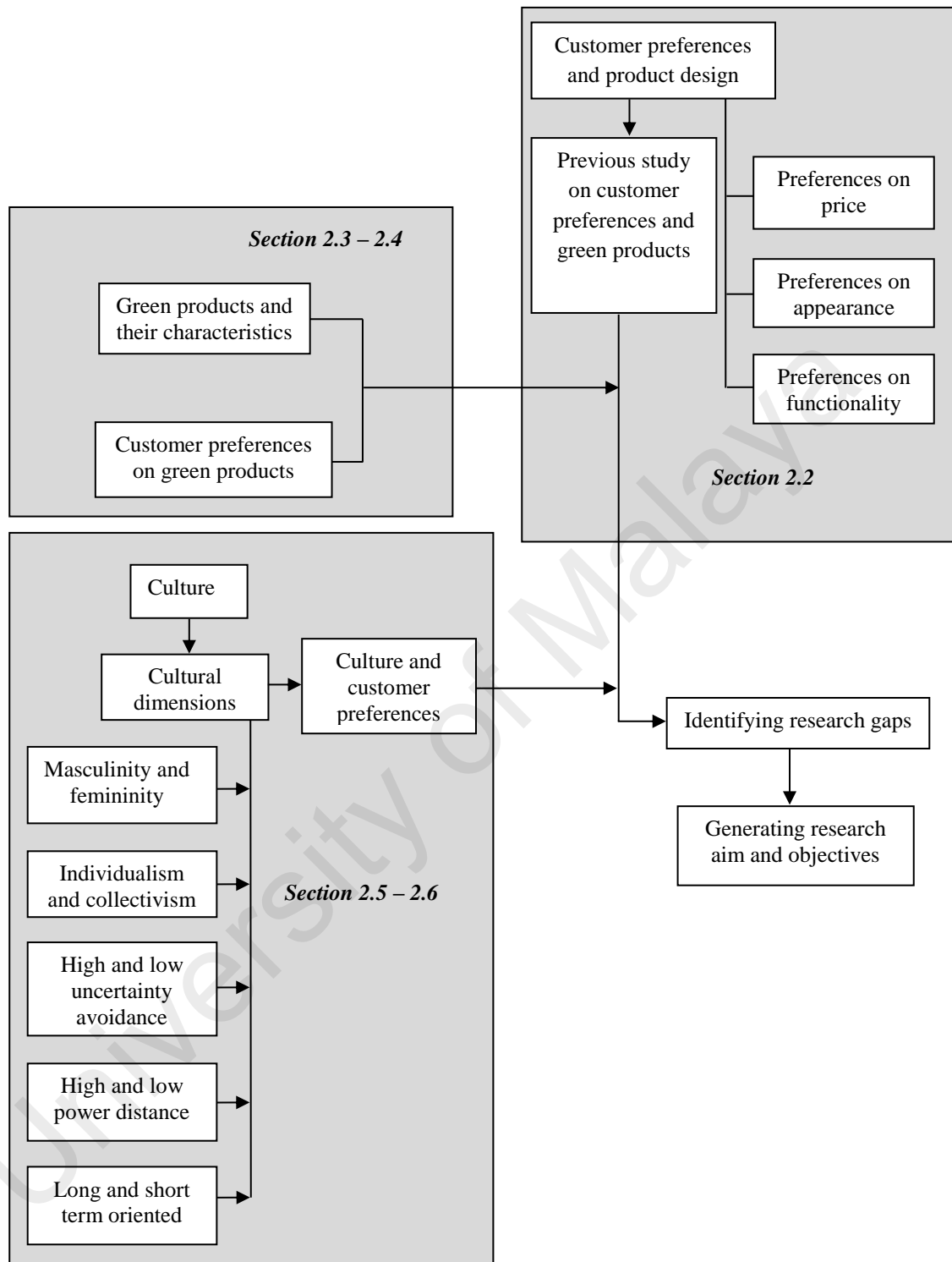


Figure 2.1: The structure of Chapter 2

2.2 Customer preferences and product design

An important consideration when designing new products is to take into account the customer preferences (Creusen & Schoormans, 2005). Customer preferences can be described as the basic perceptions on the product values, and the outcome of the customer evaluation on the product benefits, which may be followed by the willingness in the purchase and usage of the products (Zeithaml, 1988). The customer preferences for a product may be different when another product is bought, because the attributes of each product are different (Wang & Tseng, 2008).

Preferences on the products were perceived as an abstract impression which can be influenced by many factors, such as the appearance, functionality, and the product price (Bloch, 1995). In the product development, the designers need to determine the customer preferences in the early stage of the designing process, since the ideas in the product development for all stages were set up based on the customer preferences as the user of the products (Ulrich & Eppinger, 2008). The flow of the design process is illustrated in Figure 2.2.

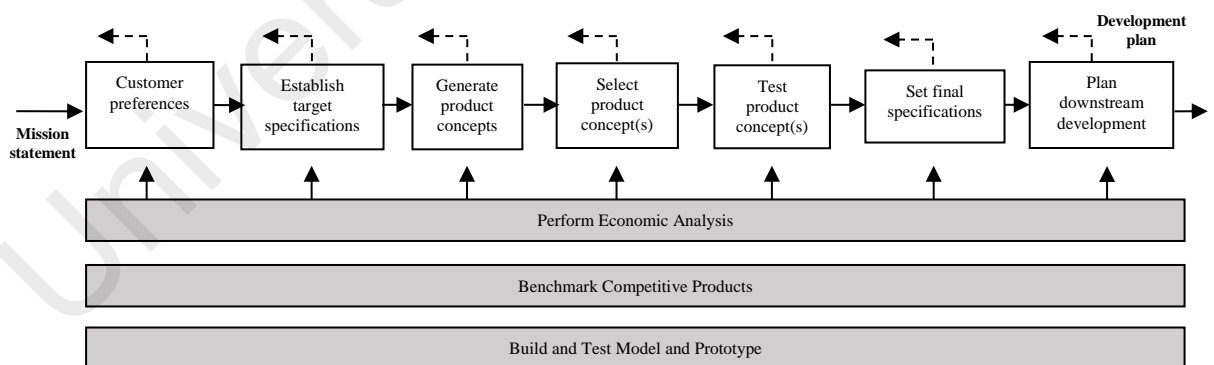


Figure 2.2: The process of product design (Ulrich & Eppinger, 2008, p.16)

As illustrated in Figure 2.2, the customers preferences should be considered in the early stage of the product design. This is because, if the customer preferences were correctly identified, it can also assist the designers to correctly adjust the product specifications,

generate the product concept, and up to the stage of setting the final specifications of the product. However, determining the customer preferences has always been a challenge to the designers, up to this date, since the preferences of the customers are different amongst each other. According to Lilien et al. (1992) as highlighted by Wang and Tseng (2008), there are four factors that can influence the preferences of the customers, i.e. the difference in personalities and decisions, such that:

1. The heterogeneity of customer preferences on the products was due to the difference in personality, value and range.
2. The chosen attributes in one product (as most preferred product) were different when the customer chooses the other kind of products.
3. Each customer has different perspective when purchasing a product, as it can be caused by emotional mood and budget.
4. The choice of an attribute often influence the decision to consider the other attributes, when the customer intends to buy a product.

The consideration of customer preferences and technical requirement in the product design are prominent to the manufacturers, in order to achieve a successful product in the market. The designers as the frontline of the product design, need to clearly identify the suitable product specification that is in line with the customer preferences. Past studies have shown that there were three important attributes which mostly provide significant impact to the purchasing decisions of the customers, i.e. appearance, functionality and price of the product (Hasdogan, 1996). In the next section, review of related studies on the customer preferences for these three product attributes is elaborated.

2.2.1 Preferences on appearance

The appearance of a product is congruent with the sensory response of each customer, in which different sets of eyes will see different impression and expectation on the product. Srinivasan et al. (1997) highlighted that the appearance of a product may affect the customer preferences towards it. When the customers see the appearance of a product, they may recognise certain intended attributes of the products' appearance, such as the colour, texture and shape (Blijlevens et al., 2009). Creusen and Schoormans (2005) stressed that in the context of preferences, the product appearance can convey the aesthetic and symbolic values, inform functional characteristics and give an impression on the quality of the product (functional value). Knowledge of what appearance attributes are perceived by the customer on a product can help the designer to communicate certain meaning in the designed product. There were different perspectives from previous studies to describe the attributes of a product appearance. The attributes of the product appearances based on the literature, are listed in Table 2.1.

Table 2.1: The attributes of product appearance

Appearance attributes	References
The colour of product	Choudhury (2014); Blijlevens et al. (2009); Creusen and Schoormans (2005); Khalid and Helander (2004)
Shape of product	Choudhury (2014); Blijlevens et al. (2009); Creusen and Schoormans (2005).
Size of product	Creusen and Schoormans (2005); Khalid and Helander (2004).
Texture of product	Choudhury (2014); Blijlevens et al. (2009); Bloch (1995); Khalid and Helander (2004).
Style of product	Creusen and Schoormans (2005); Khalid and Helander (2004); Hyun et al. (2015).
Brand of the product	Creusen and Schoormans (2005); Ranscombe et al. (2012); Hyun et al. (2015).
Packaging appearance	Choudhury (2014); Creusen and Schoormans (2005); DeBono et al. (2003); Williams et al. (2008).

From Table 2.1, the explained attributes of appearance have been focused on the impression of the human eye sensory. For example, the colour of product can be in the range of dark to bright; the shape can be of rectangular or circular oriented; the size can

be from small to big; the texture can be smooth or rough; the style can be classic or modern; the brand and packaging appearances can be of various options. In short, the preferences on these attributes can be different to each other. The most important thing was to identify which attributes are the most suitable and can mostly relate to the market preferences. The customer preferences on the product appearance may put the designers in difficult situation, in order to determine the related attributes that should be embedded in the design. The customers should have their reasons on which attributes are the most preferred. Not only in the appearance of the product, each customer will also consider the product's functionality and price. The definition and attributes of the product functionality and price are elaborated in the next subsection.

2.2.2 Preferences on functionality

Customers typically evaluate the benefits of the product functionality from various angles. Sheth et al. (1991) described the functionality as the perceived utility acquired from an alternative capacity for functional, utilitarian or physical performances. The functionality is considered as an important attribute for product design, which directly influence the customer's choice and company differentiation strategy (Sheth et al., 1991; Lee et al., 2012). It can be measured based on the choice of product attributes. For instance, the ease of use, high durability and reliability, safety, and multi-functionality, are several attributes of product functionality, which can influence the customer preferences. The theory of consumption value formulated as by Sheth et al. (1991) underlined that the purchasing behaviour of a customer on a product, can be influenced by the embedded functionality in that product.

Noble and Kumar (2008) divided the functionality in design into three major aspects, i.e. utilitarian, kinaesthetic and visual design. First, the utilitarian design can be explained as the product effectiveness, reliability, durability, safety, multi-functionality and

architecture. Second, the kinaesthetic design can be explained as the ergonomics, human factors, sensory cues and intuitive operation. Finally, the visual design can be explained as the zeitgeists, metaphors, novelty and high design. Figure 2.3 shows the aspects of product functionality.

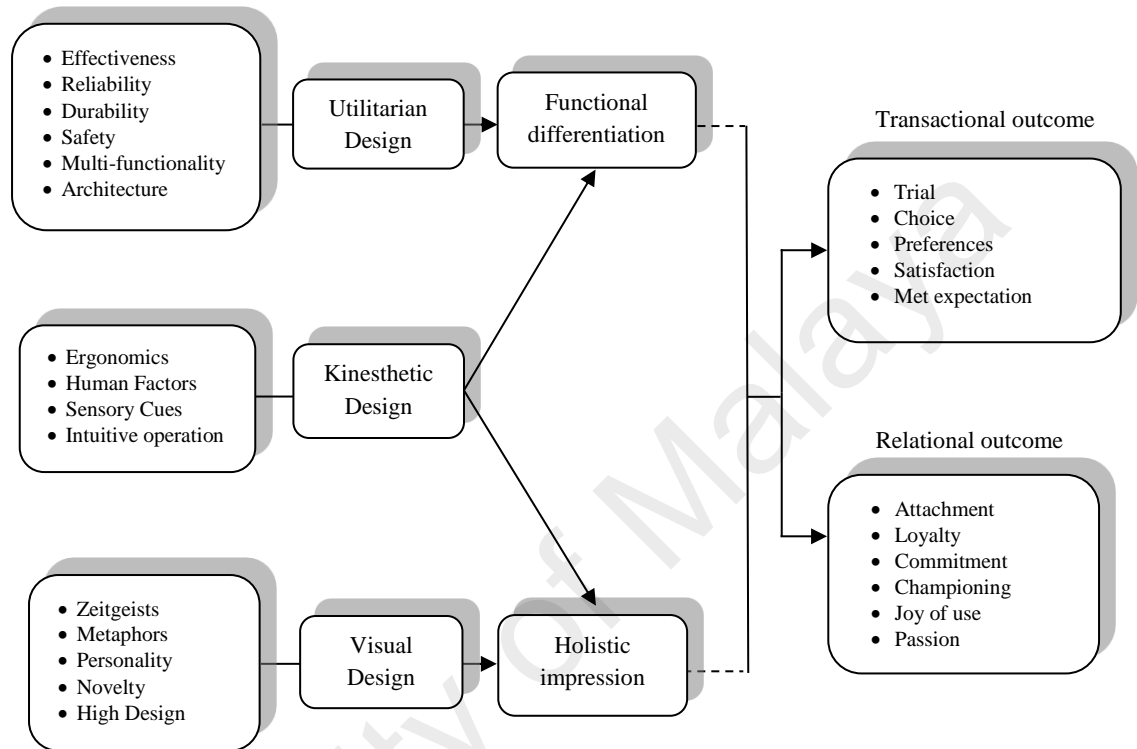


Figure 2.3: Differentiation of functional design based on the functionality to meet the customer preferences (Noble & Kumar, 2008)

As illustrated in Figure 2.3, Noble and Kumar (2008) pointed out that the functional differentiation may lead to the customer preferences in choosing a list of product attributes. This differentiation can cause difficulty for the designers, in determining the best product attributes that relate to the customer preferences. The important of analysing the customer preferences can contribute to the designers' perspectives, in identifying the product specifications which will be included in the design. The functionality of the product attributes are listed in Table 2.2.

Table 2.2: The attributes of the product functionality

Functionality attributes	References
The easiness in using the product	Blijlevens et al. (2009); Blythe et al. (2004); Thompson et al. (2005); Wang and Tseng (2008).
Additional function (Multi-function)	Lee et al. (2012); Thompson et al. (2005); Chen and Carrillo (2011).
Safety when using the product	Blythe et al. (2004); Viscusi (1985); Daughety and Reinganum (1995).
Usefulness of the product function	Govers and Schoormans (2005); Stone et al. (2005); Ziamou and Ratneshwar (2003).
Clear information on how to use the product	Blythe et al. (2004); Ziamou and Ratneshwar (2003); Mital et al. (2014).

In Table 2.2, in terms of the customer preferences, the functionality was not only attributed as single or multiple function. It can also be referred to the easiness of using the product, safety of the product, the usefulness of the product function and the clear information on how to use the product. The customer preferences on the product functionality can be different to each other, as they depend on the benefits from physical utilisation of the product function. The challenge faced by the designers is to decide the suitable attributes that should be embedded into the design, in order to match the customer preferences.

2.2.3 Preferences on price

Product pricing is a critical task for any businesses, particularly when introducing new products into the market. Pricing is considered as a fundamental requisite in any rational decision making processes by the customer (Suri & Monroe, 2003). Putler (1992) examined the inclusion of the effect of price towards the theory of consumer choice, and found that the price of products provides a positive direct effect to the customer's purchasing behaviour. Many previous studies on the perception towards product qualities have set product price as an important indicator for customer consideration. Chi-Chuan et al. (2011) pointed out that the influence of product price and quality significantly affect

the customer preferences in the product purchasing decision. Price is considered as an extrinsic quality signal (Zeithaml, 1988), as the customers will typically compare the products based on the price, quality, function, appearance, etc. (Bakos, 1998).

Price serves not only as an indicator of monetary sacrifice, but also an indicator to determine the quality of the product (Suri & Monroe, 2003; Zeithaml, 1988). However, this depends on the category of the product. Suri and Monroe (2003) explained that the price information may influence the consumer product evaluation in two ways, i.e. the product quality and monetary sacrifice. Price can be used by customer to evaluate the product quality. This means that, overpriced products may be perceived as being superior, in terms of quality and value. The influence of price can also be seen by looking at the customer intention on the branded product. Oh (2000) explained that the overpriced branded product may stimulate the customer's evaluation, particularly towards the quality of the product. The attributes of price from previous studies are presented in Table 2.3.

Table 2.3: The attributes of product price

Price attributes	References
The fairness between price and product quality.	Chi-Chuan et al. (2011); Suri and Monroe, (2003); Zeithaml (1988).
Sacrifice by paying higher price to get branded products.	Oh (2000); Dodds et al. (1991); Zeithaml (1988).

According to Table 2.3, the customer may perceive the price of a product by looking at its quality and brand. When the customer is aware of the popularity of the branded product, the price can positively influence the customer preferences. On the other hand, an unknown brand with a lower price may results in the reduction of the customer preferences, since the product may be perceived as having a lower quality. Hasdogan (1996) described that a customer as the user of a product, has three different levels of expectation when buying a product:

1. Product cost or price, appearance, brand image, etc., are able to influence the customer intentions on buying the product.
2. Initial usage of the product, i.e. product usability and functionality.
3. The customer will compare the product based on previous purchase experiences, whether it matches their expectation.

A review on related studies concerning the product appearance, functionality and price have been presented. It can be seen that there is no solid study to determine the customer preferences, as they consist of abstract entities and can be influenced by many aspects. Plus, customer preferences are very subjective due to individual preferences which are different from one another. In the next section, a review of previous studies on the customer preferences and product design are discussed.

2.2.4 Previous studies on customer preferences and product design

There is a number of studies that considered the customer preferences during the development of a product. Lihra et al. (2012) conducted a study to assess the customer preferences on customised household furniture. This study used conjoint analysis approach to evaluate the most preferred attributes of the customised furniture. Age, income, gender, education level, and location were considered as the aspects that influenced the customer preferences. This study used four customised attributes to design the furniture, i.e. product customisation, customisation time, delivery time and price. By calculating the relative weight of each attributes, the results revealed that the price of the product was identified as the most preferred attributes by the customers, followed by delivery time, product customisation and customisation time.

A work on customer preferences by Li et al. (2012) proposed a method to integrate multiple types of product attribute into its design and development. The quality function deployment (QFD) was used to evaluate the customer preferences on the technical

requirements. This study used personal digital assistant (PDA) as product stimuli and determined seven attributes, i.e. faster run, larger memory space, smaller weight, lower price, larger hard drive space, longer usage time and quieter operation. The highest score showed that faster run was the most preferred attribute, followed by lower price, larger hard drive space and quieter operation. It was found that the preferences on a product can be caused by diverse cultural background, educational level and value system.

Haverila (2011) conducted a research to investigate the customer preferences for mobile phone features among male respondents in Finland. This study used six attributes to determine customer preferences on the features of mobile phone, i.e. support functions, aesthetics and design, parts and processes, solidity, tones and games, and business functionality. The result showed that business functionality had the highest score for customer preferences, followed by parts and processes, and aesthetics and design.

Based on previous studies, it can be concluded that the determination of customer preferences can be performed by identifying the influencing factors, calculating and evaluating the weight on each attribute. The flow for identifying the customer preferences can be concluded as illustrated in Figure 2.4.

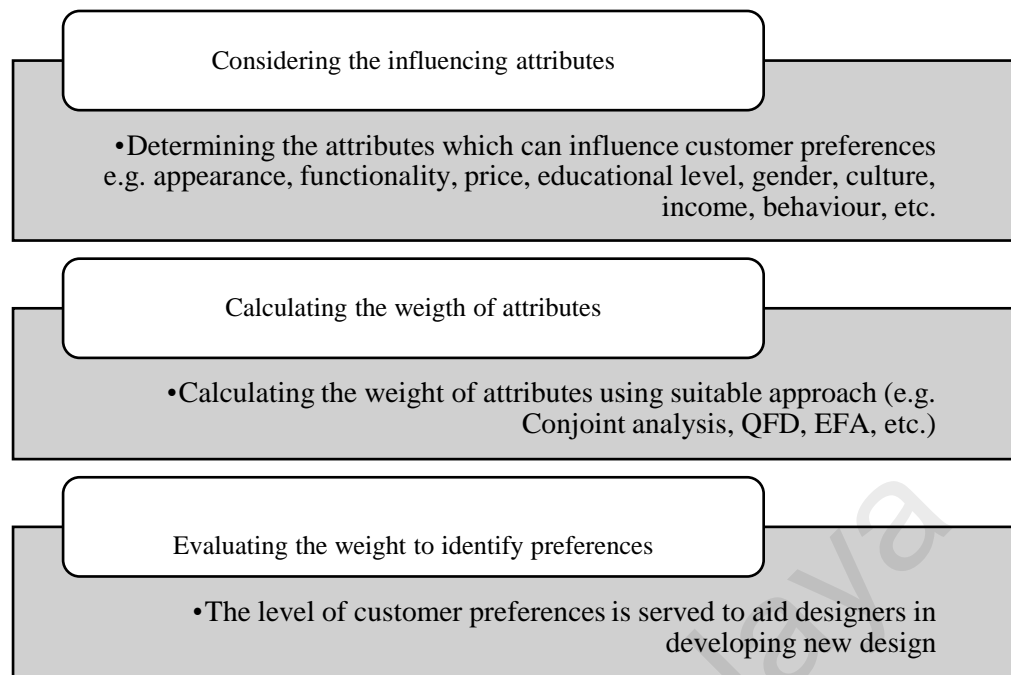


Figure 2.4: The approaches used by previous studies to identify the customer preferences

Previous studies mostly focused on addressing the customer preferences based on the criteria of product appearance, functionality and price. Nowadays, the rising issues on environmental impact encourage the manufacturers to produce product which not only focuses on the appearance, functionality and price, but also gives less impact towards the environment, i.e. the green products. In the next section, the explanation on green products and cultural values are discussed.

2.3 Green product

The increased in raw material consumption brings negative impacts towards the environment, such as depletion of natural resources, increasing waste generation and growing pollution. This was supported by Ljungberg (2007), who underlined that the environmental issues can be caused by three factors, i.e. over consumption of natural resources, high level of pollution and overpopulation. Steffen et al. (2004) argued that the environmental problems has been continuously appeared, since the effort to participate in

the environmental protection is not balance with the depletion of natural resources and increasing waste generation. Therefore, to address this issue, there is a need to consider the strategies on how to fill the human needs, with less burden to the environment. This condition is mostly known as an approach to achieve sustainable development (Brundtland, 1987).

"Humanity has the ability to make development sustainable - to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland, 1987)

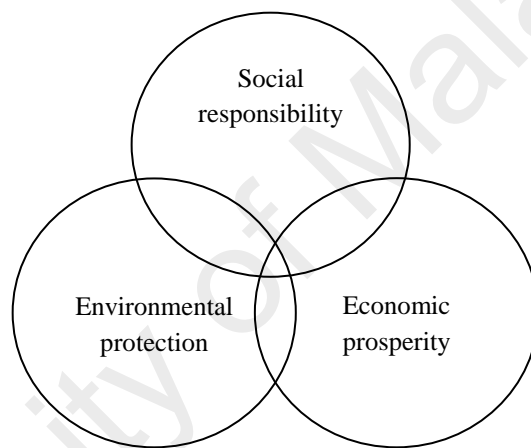


Figure 2.5: Three pillars of sustainable development

As illustrated in Figure 2.5, sustainable development can be achieved by considering the three pillars. Beckerman (1994) described that the goal of sustainable development was to achieve social equity and responsibility, economic prosperity, and environmental protection. Questions related to the concept of sustainable development include; what to be sustained and developed, and for how long (Kates et al., 2005). Hence, in order to support a sustainable development, manufacturers are encouraged to increase the number of environmentally friendly products into the market (Luchs et al., 2010). Environmentally friendly products, also known as the green products, are those that give minimal impact to the environment, throughout their entire life cycle (Ljungberg, 2007).

During the production process, manufacturers could incorporate green characteristics into their products, such as reducing the use of virgin material and energy consumption, and utilising environmentally harmless materials (Masui et al., 2003). However, as the products reach the market, not all customers will be concern with the environmental impact (Roberts, 1996), because the preferences on green products depend on the perceptions and knowledges of the customers on the green characteristics (MacDonald et al., 2010). Each characteristic can positively or negatively influences the customer preferences (Luchs et al., 2010). There are different perspectives on the classification of green product characteristics in the current literature, as presented in Table 2.4.

University of Malaya

Table 2.4: Green product characteristics from previous studies

Authors	Green product characteristics
Chiu and Chu (2012)	<ol style="list-style-type: none"> 1. Easy to disassemble. 2. Rebuildable. 3. Recyclable. 4. Easy to repair. 5. Easy to maintain. 6. Service is available. 7. Can be modularised.
Vinodh and Rathod (2010)	<ol style="list-style-type: none"> 1. Less material usage. 2. Easy to transfer and retain. 3. Less energy consumption. 4. Easy to disassemble. 5. Harmless to living environment.
Yan et al. (2009)	<ol style="list-style-type: none"> 1. Saving energy consumption. 2. Used recycled material, substitution material to reduce the resources used. 3. Reduce emission. 4. Reduce weight, volume, size of packaging. 5. Recyclability, disassembly design, modularity. 6. Serviceability.
Ljungberg (2007)	<ol style="list-style-type: none"> 1. Reduce the materials and the use of energy for a product. 2. Reduce emissions, dispersion and creation of toxic. 3. Increase the amount of recyclable materials. 4. Maximise the green use of renewable resources. 5. Minimise the service intensity for products and services. 6. Extend the useful life for a product. 7. Assess and minimise the environmental impact. 8. Having a “functional economy”. 9. Increase the efficiency in the usage phase.
Luttrupp and Lagerstedt (2006)	<ol style="list-style-type: none"> 1. Do not use toxic substances and utilise closed loops for necessary but toxic ones. 2. Minimise energy and resource consumption in the production phase and transport. 3. Use structural features and high-quality materials to minimise weight. 4. Minimise energy and resource consumption in the usage phase. 5. Promote repair and upgrading. 6. Promote long life. 7. Invest in better materials, surface treatments or structural arrangements. 8. Prearrange upgrading, repair and recycling. 9. Promote upgrading, repair and recycling. 10. Use as few joining elements as possible.

Table 2.4, continued

Authors	Green product characteristics
Maxwell (2003)	<ol style="list-style-type: none"> 1. Reduced volume of raw materials. 2. Eliminated and/or reduced hazardous raw materials usage. 3. Reduced energy usage. 4. Eliminated/reduced waste generation. 5. Recyclable, reusable. 6. Easy to disassemble . 7. Use of raw materials and assembly techniques to increase the reuse and recycling options at end of life. 8. Extending the operational life by upgrading, maintenance, service element of product. 9. Increased energy efficiency.
Junfeng et al. (2010)	<ol style="list-style-type: none"> 1. Operated easily and safely. 2. Increased lifetime, portable. 3. Resources efficiencies, such as reducing the consumption of material and energy. 4. Reduce packages. 5. Easier to transfer and storage. 6. Increased durability. 7. Easy to re-use. 8. Easy to disassemble. 9. Easy to clean and sort. 10. Harmless to the living environment of the users. 11. Ease of disposability.
Roy (2000)	<ol style="list-style-type: none"> 1. The selection of low-impact (e.g. renewable, recycled) materials. 2. Reducing the weight or volume of materials in the product. 3. Using cleaner (e.g. less wasteful, polluting) techniques for product manufacture. 4. Reduction of environmental impacts arising from the packaging and distribution of the product; reduction of environmental impacts arising from the use (e.g. energy consumption) and maintenance of the product. 5. Optimising the life cycle of the product (e.g. by creating durable, 'classic' designs). 6. Reuse, remanufacture, recycling or disposal at the end of the product's life.
De Coster and Bateman (2012)	<ol style="list-style-type: none"> 1. Product service system (pss) contract: to close with the customer strategies and can understand what the customer needs. 2. Upgradable. 3. Maintainable. 4. Can be modularised.

There are various green product characteristics found from previous studies. For example, less material usage or light weight material was described as the green product characteristics which focused in reducing the usage of natural resources (Byggeth et al., 2007; Dangelico & Pujari, 2010; Kang & Schoenung, 2005; Kibert et al., 2000; Ljungberg, 2007; Masui et al., 2003; Vinodh & Rathod, 2010). Previous studies also

pointed out that the characteristics of the green products also focused in minimising the disposal stages of the products. This can be achieved by considering the characteristics of easy to reuse (Amelia et al., 2009; Ljungberg, 2007; Masui et al., 2003; Min & Galle, 1997; Sakao 2007), product made from recycled material (Bovea & Wang, 2003; Chen & Liu, 2014; Hong et al., 2008; Hsu, 2012; L. Simões et al., 2013; Tsoufas & Pappis, 2006; Zsidisin & Siferd, 2001), easy to maintain (Ajukumar & Gandhi, 2013; Hanssen, 1999; Ljungberg, 2007; Manzini & Vezzoli, 2003; Roy, 2000), usage of recyclable material (Dangelico & Pujari, 2010; Gungor & Gupta, 1999; Ljungberg, 2007; Mohanty et al., 2002; Thurston et al., 1994), easy to upgrade (Hanks et al., 2008; Luttrupp & Lagerstedt, 2006; Rondinelli & Berry, 2000; Thierry et al., 1995; Williams, 2007), and availability of product service (Manzini & Vezzoli, 2003; Maxwell, 2003; Mont, 2002; Roy, 2000; Tukker, 2004; Yang et al., 2009).

Green products should also be harmless to the environment (Bereketli et al., 2009; Ljungberg, 2007; Masui et al., 2003; Sakao, 2007; Vinodh & Rathod, 2010). If a green product was made from recycled or recyclable material but is harmful to the environment, this can still affect the customer preferences in choosing the product, particularly due to the health risks. The usage of biodegradable material has also been identified from previous studies (Dangelico & Pujari, 2010; Fowler et al., 2006; Mohanty et al., 2002; Narayan, 2006; Song et al., 2009; Veleva & Ellenbecker, 2001) as one of the green product characteristics to reduce the environmental contamination. Another characteristic of green product is the energy efficiency (Clark et al., 2009; Masui et al., 2003; Vinodh & Rathod, 2010; Ljungberg, 2007; Manzini & Vezzoli, 2003). The current issue involving the environment which has caught the attention of public legislations and manufacturers is the global warming. In order to increase the customer preferences and participate in the global warming reduction, the manufacturers are trying to promote the products with energy efficiency characteristics during the consumption and production phases.

Finally, eco-label (Bratt et al., 2011; D'Souza 2004; Houe & Grabot, 2009; Nilsson et al., 2004) has also been identified as a green product characteristic, which can be useful to inform the customers regarding the environmental benefit of the product (D'Souza, 2004), especially to those with very little understanding of the issue. A compilation of the green product characteristics is described in Table 2.5.

Table 2.5: Common green product characteristics found in the literature

Green product characteristics	References
Resources efficiency	Bevilacqua et al.(2007); Deniz (2006); Luttrupp and Lagerstedt (2006).
Size and weight reduction	Souza and Pereira (2006); Vinodh and Rathod (2010); Junfeng et al.(2010).
Using harmless material	Byggeth et al. (2007); Junfeng et al. (2010); Vinodh and Rathod (2010).
Using recyclable material	Thurston et al. (1994); Bras (1997); Brown and Buranakarn (2003).
Easy to reuse	Chiu and Chu (2012); Dickinson and Caudill (2003); Fuller and Ottman (2004).
Using recycled material	Gehin et al. (2008); Ljungberg (2007).
Easy to maintain	Ajukumar and Gandhi (2013); Lee et al. (2011); Goffin and New (2001).
Providing product service	Ljungberg (2007); Maxwell (2003); Maxwell et al. (2006); Chiu and Chu (2012); De Coster and Bateman (2012); Manzini and Vezzoli (2003); Roy (2000).
Eco-label	Bratt et al.(2011); Grundey (2009); Houe and Grabot (2009)
Using biodegradable material	Thurston et al. (1994); Mohanty et al. (2002).
Easy to upgrade	Williams (2007); Hanks et al. (2008), Rondinelli and Berry, (2000); Thierry et al. (1995).

According to Table 2.5, the following subsections are presented to describe each green product characteristics that relate to the customer preferences.

2.3.1 Resources efficiency

The consideration of resources efficiency during the production and consumption phases has become an important strategy to reduce the environmental impact while supporting a sustainable development of the resources (Bevilacqua et al., 2007; Deniz, 2006; Luttrupp & Lagerstedt, 2006; European commission, 2017). However, there are different

perspectives in the current literature in describing the resources efficiency. Most of previous studies were concerned with the issues related to the energy consumption efficiency, which include the usage of electricity (Tasdoven et al., 2012; Yoo & Lee, 2010; Young et al., 2010), water consumption efficiency (Hu et al., 2006; Young et al., 2010) and material efficiency (Allwood et al., 2011; Rashid, 2009). In terms of green product, the resources efficiency should be considered throughout the whole life cycle of the product, i.e. starting from the raw material, production, consumption, and after use phases. However, it has been known that the customers might pay less attention on how much resources were spent during the production phase, as more attention was given to the payment of bills for the consumption of the resources (Byggeth et al., 2007; Junfeng et al., 2010; Vinodh & Rathod, 2010). For example, there are a lot of electrical household products in the market that promote energy saving. By referring to the label containing stars that indicate different rate of energy consumption, the customer preferences may be increased for the product with better energy consumption and thus, are more cost-efficient.

2.3.2 Size and weight reduction

Most products contain different types of material. The products with larger size and weight may increase the usage of natural resources, which eventually contribute to the depletion of the resources. Therefore, to support a sustainable development of the resources, a product designed with lesser material variety and a reduction in its size or weight, is highly encouraged (Souza & Pereira, 2006; Vinodh & Rathod, 2010). Multifunction product can be used as an alternative, in order to reduce the usage of natural resources (Deniz, 2006; Almeida & Barros, 2006), since several functions can be embedded into a single product. Examples of multifunction products include: printers with scanner and photocopy functions; and smartphones with email, clock, calendar,

calculator etc. This additional functions can be used as a strategy to enhance the customer preferences and reduce the usage of natural resources. A single function product can also be designed with a reduction in its size and weight. However, a problem may arise on how the customers perceived the product with this characteristic. The customer preferences may be affected due to the quality of the product when this characteristic is being implemented. Therefore, to increase the customer preferences, it is important to maintain the quality and performance of the product, when the weight reduction is being applied.

2.3.3 Using non-toxic material

A product can be made from a number of materials. Some materials may need specific treatments during or after use, if they consist of substances which are harmful to the environment (Ljungberg, 2007). Normally, the customers would prefer to buy a product with non-toxic materials, rather than the toxic ones. Although, the product has good performance, appearance and functionality, the customer preferences will still be affected if the product contains harmful materials. Therefore, to reduce the environmental impact and protect the customer's health, designers should only implement non-toxic materials into a product (Byggeth et al., 2007; Junfeng, et al., 2010; Vinodh & Rathod, 2010).

2.3.4 Recyclable material

One the objectives of sustainable development was to ensure the availability of the natural resources, for the future generations. In the product design, this objective can be achieved by reducing the virgin material usage in a product (Gungor & Gupta, 1999; Mohanty et al., 2002; Thurston et al., 1994). Products using recyclable materials are allowed to be recycled for many times and transform into another product, until the actual lifetime of the materials ended.

2.3.5 Using recycled material

The application of recycled materials on a product can also be used as a strategy to reduce the usage of natural resources (Gehin et al., 2008; Ljungberg, 2007). However, customers may have different preferences on the product that uses this characteristic, particularly due to its quality. Although the product that uses recycled materials is purposed to support the reduction in the environmental impact, the quality of the product should be clearly evaluated. The product with high quality recycled materials may enhance the customer preferences on green products.

2.3.6 Easy to reuse

Many products are designed to be discarded and have limited usability. A designer may design a product so it can be reused, to avoid the discarding stage up until its actual function is finished. This attribute can save the customer's money, by preventing them from buying a new product with similar function. For instance, refillable water bottle, reusable bags, fabric baby nappies, etc. (Chiu & Chu, 2012; Dickinson & Caudill, 2003; Fuller & Ottman, 2004).

2.3.7 Easy to maintain

The incorporation of the easy to maintain characteristic in developing the design of the green products, allows self-maintenance to be performed by the customers. The environmental related objective of this characteristic was to extend the lifetime of the product, therefore eliminating the disposal stage (Ajukumar & Gandhi, 2013; Lee et al., 2011; Goffin & New, 2001). A guideline to perform the self-maintenance is crucial, and should be clearly presented. Easy to disassemble and availability of the product's spare-

part should also be included as additional characteristics, to support the maintenance process of the product.

2.3.8 Providing product service

In order to extend the lifetime of a product, and to reduce of the environmental impact, the manufacturers must provide product services to the customers (Ljungberg, 2007). By applying this characteristic, the manufacturer can easily identify what the customers prefer, and get the feedback regarding their product. By providing good service, the relationship between customers and manufactures can also be maintained. As a result, the customer satisfaction can be achieved. The example of services which can be provided include; service for maintenance, product warranty, product rental, service for dematerialisation, service to remanufacturing, design for substituting, replacement etc. (Ljungberg, 2007; Maxwell, 2003; Maxwell et al., 2006; Chiu & Chu, 2012; De Coster & Bateman, 2012; Manzini & Vezzoli, 2003; Roy, 2000).

2.3.9 Eco-label

Not many customers can really understand the purpose of green products in the market (D'Souza, 2004). The purpose of embedding the eco-label characteristic was not only to inform regarding the environmental benefit, but also indirectly to increase the customer's desirability towards the product advantages, which they will get when choosing the product (D'Souza, 2004; Rashid, 2009). Providing relevant information through eco-labels can increase the customer preferences in buying the green product (Carlson et al., 1993). The customers will also feel more confident, because the eco-label product was found to be more convincing than the ones without the eco-label (Rashid, 2009). Several approaches of eco-labelling can be considered, which include:

- 1) The verbal and visual features of the eco-label should be designed appropriately, to avoid any misinterpretation (Tang et al., 2004).
- 2) A trusted eco-label is important to ensure the credibility of the product in supporting the environmental protection. Therefore, a government certification is preferred over a self-declaration (Rashid, 2009).

2.3.10 Biodegradable material

Not many customers have the awareness and habit of throwing a product's waste into the correct bin. In order to support the environmental protection, the usage of biodegradable materials in a product has been increasingly implemented. By using a biodegradable material with organic composition, the product waste can be naturally decomposed by microorganisms, in a short amount of time (Song et al., 2009). For example, products packaged using polymeric substances will require a significant amount of time to be naturally decomposed, as compared with the product with organic packaging, e.g. soya-based material (González & Igarzabal, 2013).

2.3.11 Easy to upgrade

Easy to upgrade characteristic can also be used as a key strategy to reduce the waste generation and material usage (Williams, 2007; Hanks et al., 2008; Rondinelli & Berry, 2000; Thierry et al., 1995). Product lifetime can be extended, as the customers can easily increase the product's performance through an upgrade procedure. Customers have an opportunity to meet their product preferences, if the product can be upgraded. Easy to disassemble and availability of spare part, are important considerations when applying this characteristic (Umeda et al., 2005).

There are several possible strategies which can be applied to justify the customer preferences on the green products, as compiled in Table 2.6.

University of Malaya

Table 2.6: Strategies related to the customer preferences on green product characteristics

Green product characteristic	Strategies	References
Eco-label	- Provide relevant information and state main objective of eco-label to avoid misinterpretation.	D'Souza (2004); Rashid (2009); Gallastegui (2002)
	- Use a certified eco-label from legislation (government) rather than self-declaration.	Bratt et al. (2011); Rashid (2009); Andrea Blengini and Shields (2010); Dekhili and Akli Achabou (2014); Leire and Thidell (2005)
	- The eco-label symbols used can be easily understood by consumers.	D'Souza (2004); D'Souza et al. (2007); Gallastegui (2002); Sammer and Wüstenhagen (2006)
Resources efficiency	- Maximise efficiency of water consumption.	Birch et al. (2012); Ljungberg (2007)
	- Maximise efficiency of material used.	Birch et al. (2012); Dangelico and Pujari (2010), Ljungberg (2007)
	- Reduce emission and waste produced during usage.	Ljungberg (2007); Zhang et al. (2011)
	- Provide information to consumers, such as prediction on how much resources they are using within a month, year, etc. (e.g. water, energy, material).	Ljungberg (2007)
Harmless material/non-toxic material	- Eliminate toxic material to decrease environmental impact and customer health contamination.	Becker et al. (2010); Braungart et al. (2007); Durif et al. (2010); Ottman et al. (2006)
	- Consider material substitution to more superior materials in terms of sustainability.	Ljungberg (2007)
	- Assures that non-recyclable parts or materials can be disposed in an ecological way.	Ljungberg (2007)
	- Although using non-toxic material, the quality and durability of the product should be ensured.	Araji and Shakour (2013); Braungart et al. (2007); Roy (2000)
	- If unavoidable, use of toxic material only when necessary.	Berkel et al. (1997); Byggeth and Hochschorner (2006); Charter (1998); Roy (2000)
Product services	- In the purchasing phase: provide product advice or briefing to explain the various details and functions of product.	Aurich et al. (2006); Mont (2002)
	- Using phase: provide regular maintenance, upgrades, spare parts availability and responsive customer complain.	Aurich et al. (2006); Maxwell (2003); Zeithaml et al. (1996)
	- In the disposal stage: retrieval and refurbishing should be practiced to reduce landfill waste.	Aurich et al. (2006); Baines et al. (2007)
	- Offer rental of product rather than purchasing, so the producer can retrieve product at the end of life cycle of the product.	Armstrong et al. (2015); Hirschl et al. (2003); Rajkumar Roy et al. (2009); Yang et al. (2009)

Table 2.6, continued

Green product characteristic	Strategies	References
Easily maintained	- Easy to disassemble or replace for self-repairing or upgraded.	Umeda et al. (2005); Dufrou et al. (2008); Masui (2013); Masui et al. (2003); Shimomura et al. (1999); Vinodh and Rathod (2010)
	- Make the function independent (design by module).	Shimomura et al. (1999); Umeda et al. (2005); Umemori et al. (2001)
	- Spare part availability for reasonable duration of time.	Huiskonen (2001); Markeset and Kumar (2003); Niggeschmidt et al. (2010)
Reducing size or weight	- Minimise material used and combination, the more material combination the more energy required in production line.	Ljungberg (2007)
	- Should not interfere with flexibility, impact strength or functional properties.	Hauschild et al. (2004)
	- Keep the performance of product by using high quality and durable material.	Fuller and Ottman (2004); Nasr and Thurston (2006); Singh and Pandey (2012) Byggeth et al. (2007); Dangelico and Pujari (2010)
Using recyclable material	- Focuses on maximum recycle-ability and a high content of recycled material in the product.	Ljungberg (2007)
Using biodegradable material	- Use natural organic material; the product waste should be easy to decompose naturally.	Ljungberg (2007); Song et al. (2009); Dangelico and Pujari (2010)
	- Product resulted have high durability.	Dangelico and Pujari (2010)
	- Eliminate hazardous material, if unavoidable used when necessary and minimise it as much as possible.	Veleva and Ellenbecker (2001)
Using recycled material	- Eliminate the harm contained in recycled material.	Hamzaoui Essoussi and Linton (2010)
	- Increase product quality using recycled material.	Bei and Simpson (1995); Hamzaoui Essoussi and Linton (2010)
	- Should not reduce the functionality properties of the product.	Hamzaoui Essoussi and Linton (2010)
Easily reused	- Design proper quality assurance of used part of product.	Klausner et al. (1998)
	- Easy to disassemble to access problem parts.	Klausner et al. (1998)
Easy to upgrade	- Easy to disassemble design.	Umeda et al. (2005); Dufrou et al. (2008); Masui (2013); Masui et al. (2003); Shimomura et al. (1999); Vinodh and Rathod (2010)
	- Consider modular design and minimising the changing of product function by making it structurally independent.	Shimomura et al. (1999); Umeda et al. (2005); Umemori et al. (2001)
	- Consider modular design and allowing additional function to the product without changing the structure of the product.	Umeda et al. (2005); Umemori et al. (2001)

As shown in Table 2.6, there are several strategies that can be used to design the green products. However, as explained earlier, the customer preferences on the green product characteristics can be differently expressed. Details of the customer preferences on green product is described in Section 2.4.

2.4 Customers preferences on green product

Designers should relate to the customer preferences to develop a successful green product in the market. Ulrich and Eppinger (2008) explained that the consideration of customer preferences is very important to be evaluated, before continuing to a later phase of the product development. This is because, mistakes in identifying the customer preferences can consequently lead to technical issues in the product design. Similarly, determining the characteristics of a green product that suit the customer preferences has been a challenge to the designers, since customers may have different viewpoints on the embedded characteristics of the green product. The characteristics may be perceived and valued as either positively or negatively, depending on the preferences of the individual consumers (Luchs et al., 2010).

Previous studies have presented the identification of customer preferences on green product. Vinodh and Rathod (2010) examined the customer preferences on green product using Environmentally Conscious Quality Function Deployment (ECQFD) and Life Cycle Assessment (LCA) approaches, by considering the green characteristics of less material usage, less energy consumption, easy to transport, harmless to the living environment and easy to disassemble. Luchs et al. (2010) identified customer preferences on green products by looking at the ethical attributes, such as gentleness and strength-related attributes. This study highlighted that the customer preferences on green product nowadays are getting more popular in the market. Masui et al. (2003) applied Quality Function Deployment (QFD) technique to design a green product for the identification of

green preferences. This study focused on green characteristics, such as less material usage, easy to clean, less energy consumption, possible to dispose, and high durability. The consideration of environmental issues has also been rising in the South-East Asian countries, such as Malaysia and Indonesia. In order to support a sustainable development, the government in both countries have always encouraging the manufacturers to get involve with the environmental issues, in both production and consumption phases. Based on the report by the Malaysia Productivity Corporation (MPC), the industries have been participating in the production of products with consideration on the environmental aspects (MPC, 2010). For example, Panasonic Malaysia has declared 'eco-idea' in their household products, i.e. by minimising air pollution and reducing the energy consumption. Other than that, Toyota has assembled their services in a similar manner, by being involved in the effort to protect the environment in Malaysia. By using the concept of "cradle to cradle", Toyota has incorporated the environmental concern in the entire life cycle of their products (MPC, 2010).

The increase in demand for green products has also been emerging in Indonesia. The population of Indonesia has been increased by more than 90 % since 1971 to 2010 (from 119 million to 237.6 million) and is expected to continue for the next 10 years (Statistics Indonesia, 2017). The increase of population may result in the increase of products in the market, to fulfil the needs of the customers. As a consequence, this can give effect to the increase in waste generation, pollution and degradation of natural resources. Thus, to anticipate on these issues, the Indonesian Ministry of Environment and Ministry of Industry have also encouraging the manufacturers to produce product considering the impact to the environment, during both the production and consumption phases (Kemenperin, 2017).

The various green characteristics embedded into the product may provide positive or negative influences to the customer purchasing decision (Luchs et al., 2010). In addition,

many brands have tried to claim their products without really getting a proper certification, to prove that their products provide benefits to the environment (D'Souza, 2004). This can result in the increase of uncertainty of the customer purchasing the green products. The difference in perception can be influenced by many factors, such as the level of knowledge, financial strength, peer influences and cultural values (Şener & Hazer, 2008; Young et al., 2010). In the current literature, there are many studies which reported that the cultural values of the customers provide significant influences to their preferences on a product. However, there is a lack of study to identify the influences of culture values to the customer preferences towards green products, especially those involving the developing countries, such as Malaysia and Indonesia. Thus, in order to increase the understanding on cultural issues, the following section includes the description on the definition of culture, the dimensions and characters of the cultural values. The cultural index of Indonesia and Malaysia along with a review on relevant studies related to the customer preferences and cultural influences, are also presented in the following section.

2.5 Cultural value

2.5.1 Definition of culture

Culture can be defined as the natural setting of a social relation, i.e. how the civilisation may arrange their habits in the group (Hofstede et al., 2002; Moalosi et al., 2010). Hofstede (1993) pointed out that culture is a combination of mind programming, which distinguishes between a group of people from one another. Birukou et al. (2009) described culture as a collection of ordinary behaviours which has been naturally formed for a particular concern. Kroeber and Kluckhohn (1952) described that culture has more than one aspect, which can be determined as a pattern, behaviour achievement and translated by a character. Based on different perspectives on culture definition, researchers

underlined that culture is a collective natural mind-set that shows a pattern of characters, which has been formed within a duration of time, in a nature that can differentiate between one group to another. The dimensions of culture are being described in the following subsection.

2.5.2 Cultural dimension

Cultural dimension is the preference of an independent character, that differs between one location, state or country to the other (Hofstede, 2017). There are broad aspects of culture in the literature, such as norm, belief, value, attitude, behaviour, goal, ritual, tradition etc. (Bloch, 1995; Salmi & Sharafutdinova, 2008; Leonard et al., 2012; Valencia et al., 2010). A number of previous studies described these aspects of culture in different point of view, since culture is revealed by the natural setting of human actions (Moalosi et al., 2010). Hofstede (1980) as one of the pioneer of cultural studies, categorised the cultural aspects into four cultural dimensions, i.e. individualism-collectivism, masculinity-femininity, uncertainty avoidance, and power distance. In 1993, Hofstede added one more culture dimension, i.e. long-short term oriented, where this dimension was tested in 23 countries (Hofstede, 2017). The five cultural dimensions by Hofstede are being illustrated in Figure 2.6, and the descriptions on each dimension are elaborated in Subsection 2.5.2.1 until 2.5.2.5.

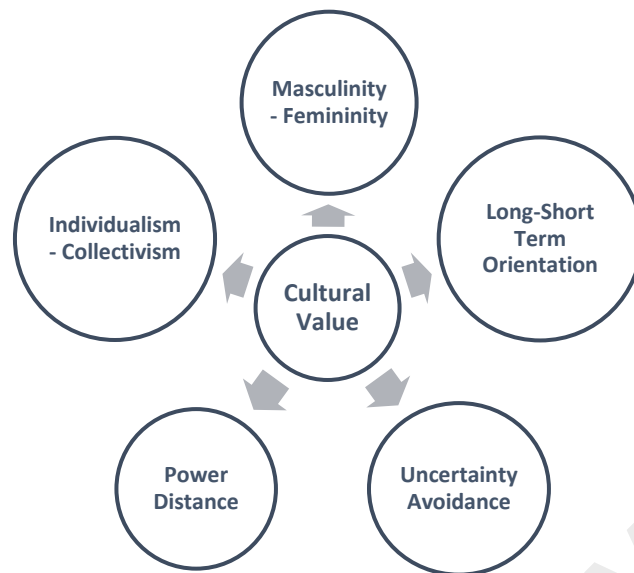


Figure 2.6: Five cultural dimensions (Hofstede, 1993)

2.5.2.1 Individualism-collectivism

Individualism can be described as being self-sufficient and having low level of concern for not being a member of a group (Triandis et al., 1988). Individualism is a type of character, for people who has more concern on his own interest than that of a group. Hofstede (1980) described individualists as those who believe with their own intention for decision making. The opposite of individualism is collectivism, which are those who view themselves as part of a larger group (Hofstede, 1997). Unlike individualism, a collectivistic person has more concern on the group result. For example, customer decision when purchasing famous or trendy product in the market. This type of customer tends to be collectivistic, as the customer wants himself to belong to the group of people. Davis et al. (2008) conducted a research to know the customer preferences and behaviours when buying a product using the online system. Davis et al. (2008) used the Hofstede cultural dimension, i.e. individualism-collectivism, by performing cross-cultural study between China and America. The study showed that the customer preferences using this cultural dimension produced different results between collectivist and individualist

country. This study inform that in a collectivist culture is more focus on arousal and pleasure about the content of web design when using online purchasing. Different with collectivist, individualist consumers is not directly affected by pleasure for web design. However, the character of the customer cannot be determined just by using a single dimension, because the character of customer can be affected by many aspects. Therefore, consideration for the other four dimensions are more preferred, as it can contribute a more detail insight to identify the characters of the customer towards a product in the market.

2.5.2.2 Masculinity-femininity

Masculinity is referred to as the level of social characters, which is more oriented towards the values of achievement, ferociousness and the acquirement of an asset (Hofstede, 1980). Hofstede and Bond (1984) also explained that masculinity was considered as the level to which culture is explained by power. It was also underlined that a high degree of masculinity leads a person towards the purpose, performance, task and achievement, success, competition and assertiveness (Hofstede, 1993). Opposite to masculinity is femininity, which is a character that focused on the quality of life, care to the societies, solidarity, harmony and maintaining warm personal relationship (Hofstede, 1993).

2.5.2.3 High-low uncertainty avoidance

Uncertainty avoidance is a character of a person who deals with an unclear, unpredictable and unstructured conditions (Hofstede, 1984; Nakata & Sivakumar, 1996). The culture traits with high uncertainty avoidance include: aggressive, emotional, security-seeking and intolerant; while the traits with low uncertainty avoidance include: less aggressive, relatively tolerant and contemplative. Razzaghi et al. (2009) explained that the uncertainty avoidance refers to the extent to which people feel threatened by uncertainty and ambiguity, and thus will try to avoid these situations.

2.5.2.4 High-low power distance

Power distance is the extent to which the less powerful members of an organisation or institution, accept and expect that power has been delivered unequally (Hofstede & Bond, 1984). High power distance involved hierarchy or existential inequality, i.e. latent conflicts may exist between the powerful and those who are less superior, cooperation among them will be difficult to attain, superiors are inaccessible, and power holders are entitled to privileges (Hofstede, 1980). Moon et al. (2008) explained that an individual with a high level of power distance is less innovative, tends to be more conservative, and may have an uncontrollable behaviour. This dimension reflects the consequences of power inequality and authority relations in the society. It also influences hierarchy and dependent relationships in the contexts of society, family and organisation. Low level power distance shows that inequality within a society can be minimised, hierarchy is established for convenience and that all people should be interdependent (Hofstede, 1980).

2.5.2.5 Long-short term oriented

Long-term orientated culture has more concern on the future condition, such as saving and persistence behaviour, while the short-term oriented culture focused more on the past and current conditions, and less consideration for the future (Hofstede, 1993). Short-term characters are usually more focused on the immediate result, belief certainty and goal achievement for the present time. Marcus and Gould (2000) conducted a research to analyse the user needs for a website interface, using the five Hofstede cultural values. Cross-cultural study was conducted in the USA, China, Pakistan and Japan. The results showed that the long-term orientation provides significant influence to the user

preferences. A more detail explanation of all the character's dimensions is described in Table 2.7.

2.5.3 Indonesia and Malaysia cultural index

Hofstede conducted a cultural study on more than 70 countries around the world (Hofstede, 2017). The culture was identified differently for each country, including Indonesia and Malaysia. As developing countries in Asia, Indonesia and Malaysia were geographically located at almost similar locations. The index for Indonesian and Malaysian cultures, are presented in Figure 2.7.

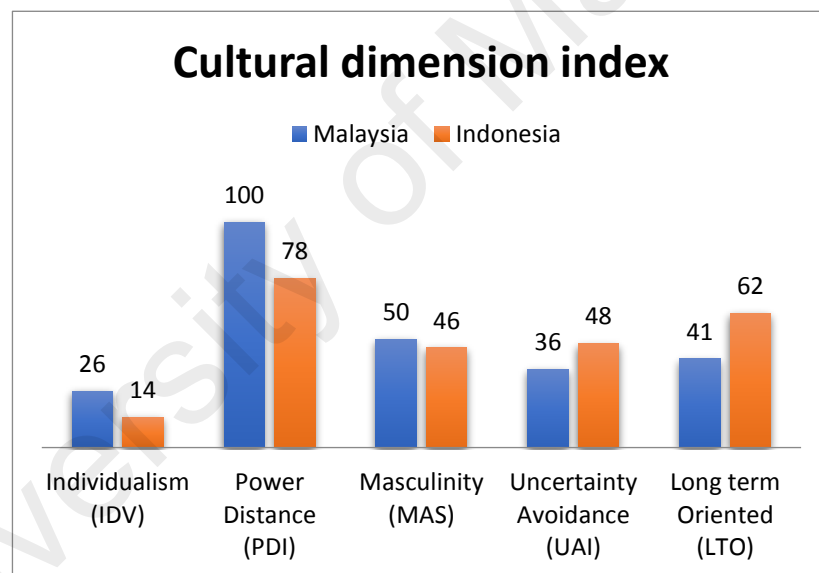


Figure 2.7: Cultural dimensions index for Malaysia and Indonesia (Hofstede, 2017)

According to the cultural dimensions index by Hofstede (2017), Malaysia and Indonesia have slightly different cultural index. As shown in Figure 2.7, Indonesia and Malaysia are identified as collectivistic societies. Power distance is extremely high for Malaysia, but mildly high for Indonesia. Indonesia was indexed as a feminine country, whereas for Malaysia no classification can be declared for this dimension, as masculinity and femininity have an equal index value (Hofstede, 2017). For uncertainty avoidance,

Indonesia and Malaysia have equally low index. Finally, Indonesia and Malaysia have slightly different index for the long-term oriented dimension. Malaysia was indexed to have low level of long-term oriented, whereas Indonesia scored a slightly lower index value. Based on these explanation on cultural dimensions, it can be reflected that each dimension poses different characters. The society in one local area may have different characters to one another.

University of Malaya

Table 2.7: The characters of cultural dimensions (Hofstede, 1980)

Cultural dimensions	Explained characters	
Collectivism-Individualism	Collectivism	Individualism
	“We” consciousness holds sway.	“I” consciousness holds sway.
	Identity is based on the social system.	Identity is based on the individual.
	Belief is placed in group decisions.	Belief is placed in individual decisions.
	Expertise, order, duty and security are provided by organisation or clan.	Autonomy, variety, pleasure and individual financial security are sought in the system.
	Friendships are predetermined by stable social relationships, but there is a need for prestige within these relationships.	The need is for specific friendships.
Masculinity-Femininity	Masculinity	Femininity
	Men should be assertive, women should be nurturing.	Men need not be assertive, but can also assume nurturing roles.
	Sex roles in society are clearly differentiated.	Sex roles in society are more fluid.
	Men should dominate in society.	There should be equality between the sexes.
	Performance is what counts.	Quality of life is important.
	You live in order to work.	You work in order to live.
	Money and things are important.	People and environment are important.
	Independence is ideal.	Interdependence is ideal.
	Ambition provides the drive.	Service provides the motivation.
	One admires the successful achiever.	One sympathises with the unfortunate.
	Big and fast are beautiful.	Small and slow are beautiful.
	Ostentatious manliness is appreciated.	Unisex and androgyny are ideal.

Table 2.7, continued

Uncertainty Avoidance	High uncertainty avoidance	Low uncertainty avoidance
	The uncertainty inherent in life is felt as a continuous threat that must be fought.	The uncertainty inherent in life is more easily accepted and each day is taken as it comes.
	Higher anxiety and stress are experienced.	Ease and lower stress are experienced.
	Time is money.	Time is free.
	There is an inner urge to work hard.	Hard work, as such, is not a virtue.
	Aggressive behaviour of self and others are accepted.	Aggressive behaviour is frowned upon.
	More showing of emotions is preferred.	Less showing of emotions is preferred.
	Conflict and competition can unleash aggression and should therefore be avoided.	Conflict and competition can be contained on the level of fair play and used constructively.
	A strong need for consensus is involved.	More acceptance of dissent is entailed.
	Deviant persons and ideas are dangerous; intolerance holds sway.	Deviation is not considered threatening; greater tolerance is shown.
	Nationalism is pervasive.	The ambience is one of less nationalism.
	Younger people are suspect.	More positive feeling towards younger people are seen.
	There is great concern with security in life.	There is more willingness to take risk in life.
	There is a need for written rules and regulations.	There should be as few rules as possible.
Power distance	High power distance	Low power distance
	There should be an order of inequality in this world in which everybody has a right-full place; high and low are protected by this order.	Inequality in society should be minimised.
	A few people should be independent; most should be dependent.	All people should be interdependent.
	Hierarchy means existential inequality.	Hierarchy means an inequality of roles, established for convenience.
	Superiors consider subordinates to be a different kind of people.	Superiors consider subordinates to be “people like me”.
	Subordinates consider superiors as different kind of people.	Subordinates consider superiors to be “people like me”.
	Superiors are inaccessible.	Superiors are accessible.

Table 2.7, continued

Power distance	High power distance	Low power distance
	Power is a basic fact of society that ante-dates good or evil. Its legitimacy is irrelevant.	The use of power should be legitimate and is subject to the judgment as to whether it is good or evil.
	Power-holders are entitled to privileges.	All should have equal rights.
	Latent conflicts exist between the powerful and the powerless.	Latent harmony exists between the powerful and the powerless.
	Cooperation among the powerless is difficult to attain because of their loss-faith in people norm.	Cooperation among powerless can be based on solidarity.
Long-short term oriented	Long-term oriented	Short-term oriented
	Attaching more importance to the future.	Values promoted are related to the past and present, including steadiness.
	Foster pragmatic values oriented towards rewards .	Respect for tradition.
	Persistence.	Preservation of one's face.
	Saving (thrift).	Reciprocation.
	Capacity for adaptation.	Fulfilling social obligations.

Based on Table 2.7, it can be seen that the explanation of each dimension has unique characters. These characters may provide different influences to the customer preferences. It can either be positive, negative or no significant influence at all. In the next section, a review on the cultural trait consideration that influences the customer purchasing preferences from previous studies are presented. Research gaps and chapter conclusions are also provided in the last section.

2.6 Culture and customer preferences

Culture is the collective programming of mind, which distinguishes the members of one human group from another (Hofstede, 1993). Based on the personal and situational aspects of human life, customer preferences on a product may also be influenced by cultural values (Bloch, 1995; Crilly et al., 2004; Salmi & Sharafutdinova, 2008). Salmi and Sharafutdinova (2008) pointed out that cultural value is like a “lens” to the customers, when they view a particular product and can influence their purchasing decisions. Bloch (1995) showed that the individual preferences on a product can be influenced by cultural values. This study underlined that the customer preferences (inclusive of cultural values) can influence the process of product design development, especially to determine the product form. The models of customer preferences considering the cultural influences in designing a product by Bloch (1995) and Salmi and Sharafutdinova (2008), are illustrated in Figure 2.8 and 2.9.

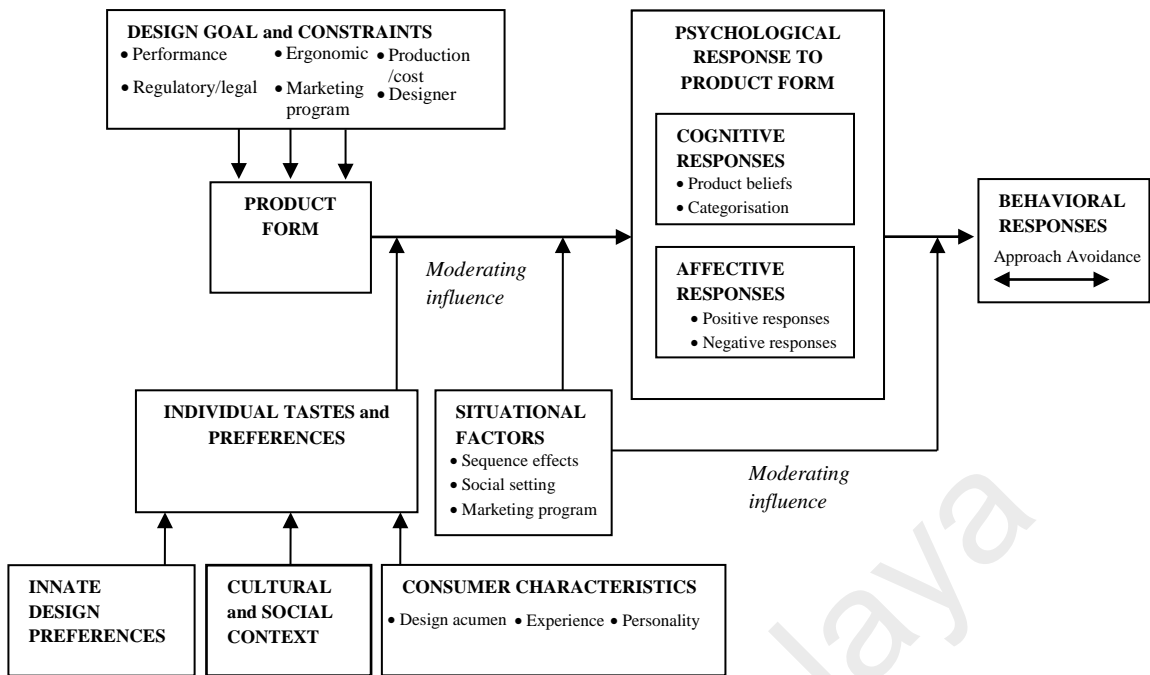


Figure 2.8: Consumer responses model (Bloch, 1995)

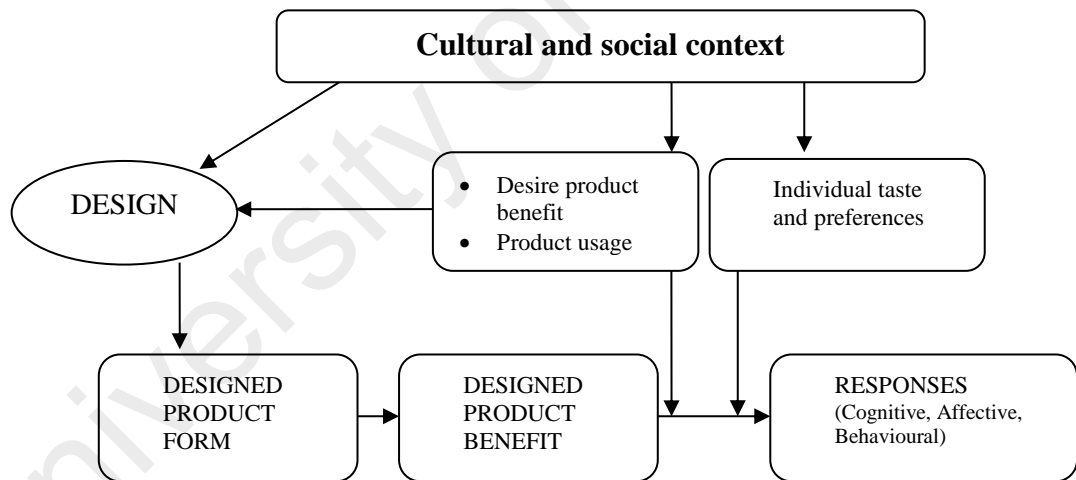


Figure 2.9: The integration of cultural value into the product design (Salmi & Sharafutdinova, 2008)

As illustrated in Figure 2.8 and 2.9, it is shown that the cultural values have been identified to have an influence on the customer preferences. However, both studies only focused on the cultural influence to the customer preferences, based on conventional product attributes. There is a lack of studies to investigate the cultural influence in developing the green products. Because of this, it is important to provide a valuable

insight to the designer, to decide the most suitable green product characteristics in their design, based on the cultural influences.

2.7 Conceptual model development

2.7.1 Hypotheses and preferences evaluation

Two established conceptual frameworks from the literature were highlighted, to evaluate the customer preferences and cultural value influences. For example, Bloch (1995), and Salmi and Sharafutdinova (2008) described that cultural values can be used to identify the customer preferences on a specific product. However, the objective of these studies was only limited to the identification of the customer preferences on the conventional product attributes. There is a lack of study in identifying the influences of cultural value to the customer preferences on the green product. Thus, this study proposes to extend the investigation on the influences of cultural values, towards the customer preferences on green product attributes.

As identified in the literature section, there are different viewpoints to describe the meaning and characters of culture. However, a study by Hofstede have identified a theory to describe the characters of cultural values. This theory has been established and validated in several research areas, such as marketing, organisation, individual, group and national level. Hofstede theory consists of five cultural dimensions, i.e. collectivism-individualism, masculinity-femininity, high-low uncertainty avoidance, long-short term oriented, and high-low power distance.

For the attributes of customer preferences on green product, a theory has been briefly identified, since there are different perspectives to explain the green product. In the literature section, it was indicated that the customer preferences were mostly influenced by appearance, functionality and price. Thus, to identify the preferences on green product,

the preferences attributes need to be extended to the attributes or characteristics of the green product. The framework to evaluate the cultural value influences on green product preferences in this study, is illustrated in Figure 2.10.

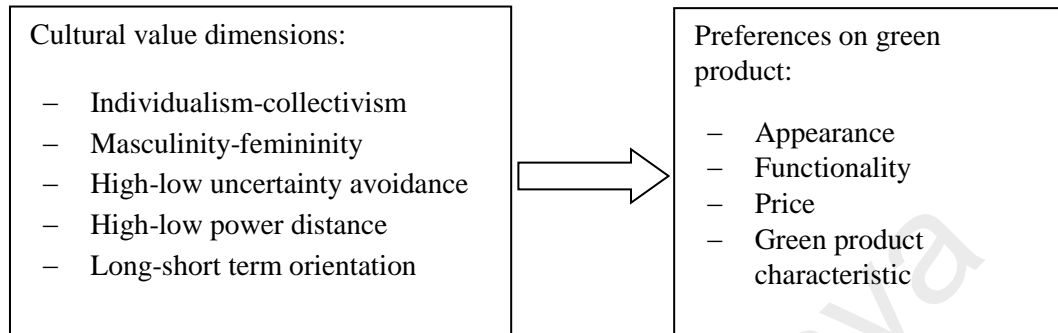


Figure 2.10: Framework to identify cultural value influences on green product preferences

The elaboration of cultural value influences towards the customer preferences on green product and the generated research hypotheses, are provided in Subsection 2.7.1.1 until 2.7.1.5.

2.7.1.1 Collectivism-individualism

Collectivism refers to the sense of belonging to a group which looks out for the subject's interests in exchange for loyalty, instead of being alone. The opposite of collectivism is individualism which is described as the subject's intention to only look after themselves, independent of social interactions (Hofstede, 1980). Malaysia is indexed with a high level of collectivism (Hofstede, 2001). However, this finding is different from the results of Huff and Kelley (2005), who examined these dimensions in a specific segment. Huff and Kelley (2005) assessed the influence of collectivism-individualism on an organisational trust and customer orientations in seven countries, including Malaysia. The results showed that Malaysian customers are more affected by individualism, rather than

collectivism, in terms of organisational trust. Frost et al. (2010) assessed the influence of collectivism-individualism on the online purchasing intention. The results revealed that online customers are more influenced by the individualistic characters. Both of these studies showed that dimension of collectivism-individualism can be used to identify the customer's purchasing preferences at the individual level. Collectivism-individualism may also influence the customer preferences towards green products. Nowadays, the increase in the environmental awareness, have influenced the customer's willingness to purchase the green products (Yu et al., 2016). This awareness can be affected by the collectivistic or individualistic characters. Collectivist-oriented customers prefer green products, because they wanted to participate in the environmental protection. This may also be caused by the group's influence to purchase the green products, and the tendency to follow the current trend. On the other hand, individualist-oriented customers purchase green products due to their own self-interest, and are not affected by other people or a group's intention. In other words, they are drawn to protect the environment, motivated by their own self-preferences. However, the influence of collectivism on the customer preferences has yet to be empirically investigated in Malaysia and Indonesia. Therefore, to identify the influence of collectivism on customer preferences towards green products, the following hypotheses are proposed:

H1: Collectivism has a significant influence towards the customer preferences on green products in Indonesia.

H2: Collectivism has a significant influence towards the customer preferences on green products in Malaysia.

2.7.1.2 Masculinity-femininity

Masculinity and femininity are the representations of gender role distinction. The masculine society is more concerned with the assertiveness, acquisition of wealth, achievements and success. In contrast, the feminine society is more concerned with care for others, lifestyle and improving the quality of life (Hofstede, 1993). This dimension has been used in several studies to evaluate the characters of the customers' purchasing intention. Moon et al. (2008) evaluated the influence of masculinity on the purchasing intention of the customers towards personalised products. Srite (1999) tested a model to determine the influence of four Hofstede cultural dimensions, on customer acceptance towards perceived ease of use and usefulness of a product. They found that only the masculinity-femininity dimension has a significant influence towards the two product characteristics. Hence, this dimension can also be used to evaluate the customer preferences towards green products. For instance, in order to reduce the usage of materials, green products are designed with embedded environmental characteristics (e.g. reusable and recycled materials), which can influence the quality and durability of the products. This in turn can influence the customer preferences. In addition, green products can affect the appearance of the products.

Customers with high masculinity are likely to be more concerned with the performance of the product, such as functionality and quality. Thus, the customers may compare green products with the conventional ones. If they find that the green product is of an inferior quality, this can reduce their preferences towards it, since the product quality is crucial to increase the customer preferences (Ophuis and Trijp, 1995). Masculinity character can also affect the customer preferences towards appearances. For example, customers may prefer to select a product with a black colour, as they feel more confident with the bolder look of the product, rather than selecting pink which mostly associated with femininity. The selection of green products may be solely influenced by the fact that the products can

reduce the environmental impact, rather than caring for the condition of the environment. Unlike masculinity, customers with high femininity may be drawn to the product appearance, such as colour, texture and shape, as they prefer a product that looks modest and pretty. The product quality comes in second after the product appearance. The willingness to pay for green products may be due to the care for the condition of the environment. However, this depends on the personal character of the customers. Although companies can produce green products with high quality and good appearance, the customers may still perceive green products differently, as they may have masculinity or femininity characters when selecting the green products. Thus, in order to evaluate the influence of this dimension towards the customer preferences on the green products, the following hypotheses are proposed:

H3: Masculinity has a significant influence towards the customer preferences on green products in Indonesia.

H4: Masculinity has a significant influence towards the customer preferences on green products in Malaysia.

2.7.1.3 Uncertainty avoidance

Uncertainty avoidance refers to the extent to which people feel threatened by the uncertainty and ambiguity, hence will try to avoid these situations (Hofstede, 1993). Despite the numerous studies available which strongly advocate on protecting the environment, uncertainty is still one of the common factors that influence the customers' willingness to pay for green products (Chen, 2001). It should be highlighted that not all individuals can be considered as 'green buyers', who have better understanding on the green products compared to 'non-green buyers' (Gupta & Ogden, 2009). Sometimes green and non-green buyers have negative perceptions on the businesses advertising of the

green products (Zinkhan & Carlson, 1995). This may be due to the uncertainty towards green products, which influence the customer preferences. For example, green products can be made from recycled, harmless or recyclable materials, which can influence the performance of the product, in terms of the quality and texture. Uncertainty may influence the customer preferences due to their perceptions that green products may have lower quality than that of the conventional products that were made from virgin materials. Thus, this affects the customers' willingness to pay for the green products (Mainieri et al., 1997). In order to reduce this uncertainty, the customers may ask the other customers who have experience in using the green products, to get more information on the products (Pickett-Baker & Ozaki, 2008). Therefore, to identify whether uncertainty avoidance has a significant influence towards the customer preferences on green products, the following hypotheses are proposed:

H5: Uncertainty avoidance has a significant influence towards the customer preferences on green products in Indonesia.

H6: Uncertainty avoidance has a significant influence towards the customer preferences on green products in Malaysia.

2.7.1.4 Power distance

Power distance is "the extent to which fewer powerful members of the organisations and institutions accept and expect that power has been delivered unequally" (Hofstede & Bond, 1984). High power distance shows that the relationship among the powerless is difficult to be managed, since hierarchy means inequality, and latent conflict may exist between the powerful and the powerless (Hofstede, 1980). Since the authority is centralised and lacks in autonomy, the power and wealth will foster inequalities. In contrast, lower power distance shows harmony between the powerful and the powerless,

whereas cooperation among the powerless can be based on solidarity and accessibility to the superiors (Hofstede, 1980). Malaysia and Indonesia were indexed as extremely and mildly high on power distances, respectively (Hofstede, 2017). The power distance may play a vital role on the decision of the customer's choice on the green product. For example, the gaps of customer understanding or knowledge on the green product. Not all customers can understand what green product is in the market, and what benefits they will get if they purchase the product. In addition, power distances can also be interpreted as purchasing ability. The lower level of customer may have fewer preferences to the green product, compared to those of the higher level, due to the unacceptable price. Furrer et al. (2000) suggested that customers with high power distance find reliability and responsiveness as less important. Matilla (1999) identified that high power distance customers in five-star hotels affected a weaker service from the employees. However, the identification of cultural value influence on the environmental choices, especially in Malaysia and Indonesia, have not been investigated. Thus, this study proposes that high power distance character in the society provides significant influence towards the customer preferences on the green products, in Malaysia and Indonesia. Hence, the proposed hypotheses are as follows:

H7: Power distance has a significant influence towards the customer preferences on green products in Indonesia.

H8: Power distance has a significant influence towards the customer preferences on green products in Malaysia.

2.7.1.5 Long-short term orientation

Finally, long-term orientation stands for 'fostering of virtues orientation towards the future rewards, in particular, perseverance and thrift' (Hofstede, 1993). One of the

important aspects in purchasing a particular product is its performance and quality. Green products reduce the usage of natural resources and energy consumption. Several studies on green products highlighted that there are several characteristics of green products that are related to the long-term orientation of the customers. For example, some customers are willing to pay more for a product that consumes less energy, since it can save their money from a long-term perspective. Another characteristic is providing product services. Product services, such as providing regular maintenance may have a positive effect on the long-term orientation of the customers, since the lifetime of the product can be extended. Therefore, customers with long-term orientation characteristic are more concerned on the future usage of the products. For green products, high product quality and durability, as well as the environmental protection, may have a significant influence towards the customer preferences. Therefore, to identify whether long-term orientation has a significant influence towards the customer preferences on green products, the following hypotheses are proposed:

H9: Long-term orientation has a significant influence towards the customer preferences on green products in Indonesia.

H10: Long-term orientation has a significant influence towards the customer preferences on green products in Malaysia.

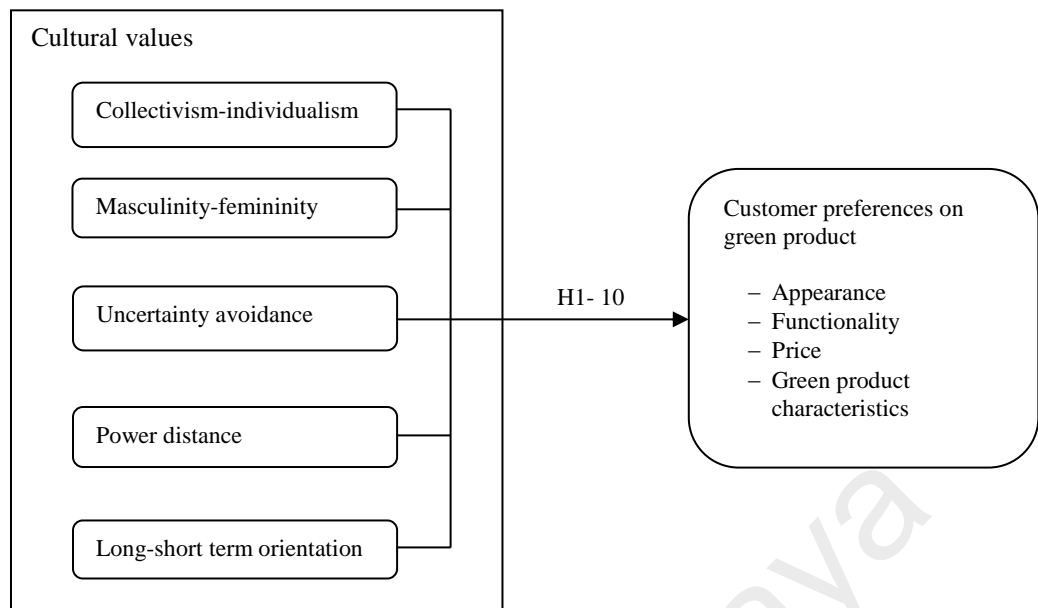


Figure 2.11: Hypotheses evaluation

As illustrated in Figure 2.11, ten hypotheses have been generated in order to identify the cultural value influences towards the customer preferences on green products. The hypotheses are generated by separating between Indonesia and Malaysia, as the case study. The ten generated hypotheses that should be confirmed in this study are compiled into Table 2.8.

Table 2.8: Hypotheses of the research

Hypotheses	Indonesia	Malaysia
Collectivism	H1: Collectivism has a significant influence towards the customer preferences on green products in Indonesia.	H2: Collectivism has a significant influence towards the customer preferences on green products in Malaysia.
Masculinity	H3: Masculinity has a significant influence towards the customer preferences on green products in Indonesia.	H4: Masculinity has a significant influence towards the customer preferences on green products in Malaysia.
Uncertainty avoidance	H5: Uncertainty avoidance has a significant influence towards the customer preferences on green products in Indonesia.	H6: Uncertainty avoidance has a significant influence towards the customer preferences on green products in Malaysia.
Power distance	H7: Power distance has a significant influence towards the customer preferences on green products in Indonesia.	H8: Power distance has a significant influence towards the customer preferences on green products in Malaysia.
Long-term orientation	H9: Long-term orientation has a significant influence towards the customer preferences on green products in Indonesia.	H10: Long-term orientation has a significant influence towards the customer preferences on green products in Malaysia.

As illustrated in Figure 2.8, ten hypotheses are developed to identify the influence of cultural values towards the customer preferences on green products in Indonesia and Malaysia. The arrows of five cultural dimensions are constructed pointing out to the customer preferences on the green products' construct. On the left side of the framework, the construct of the cultural values consists of five cultural dimensions, i.e. collectivism, masculinity, uncertainty avoidance, power distance and long-term orientation. On the right side, the construct of customer preferences on the green products consists of appearance, functionality, price and green product characteristics. These ten hypotheses need to be evaluated using appropriate research method. After the hypotheses are confirmed, the next step is to evaluate the customer preferences on the green products,

considering the cultural value influences. The customer preferences can be identified based on the output of weight, calculated for the green product characteristics construct.

2.7.2 Designers perspective consideration

The aim of this study was to develop a guideline to assist the designers to incorporate cultural values consideration into the design of the green product. Therefore, the data required to achieve this aim were obtained not only from the customer's perspective, but also from the designer's perspective. The designer's perspective in designing the green products is important, based on a practical viewpoint. The perspectives that need to be obtained from the designers include: (1) perspective on cultural values consideration in designing the green products; (2) perspective on green product characteristics in the design; and (3) perspective on the method to design the green products.

2.7.3 Literature supporting sources

Literature obtained for this study was used to explore in more detail the possible sub-strategies, with respect to the design strategies from the designer's perspective. This is important since the strategies which were provided by the designers are too general, and can possibly be elaborated using the literature. It would be useful to provide a more detail information and support the designers decision in developing the green product.

2.8 Guideline development

A guideline is developed in order to assist the designer in incorporating the cultural values consideration into the design of the green product. The guideline consists of strategies to evaluate suitable green product characteristics, with consideration on the cultural value

influences. The strategies were generated based on the data that were collected from the customers' and designers' perspectives. In addition, this study also refers to the literature, to confirm the relevance of the generated strategies used in the guideline, with the existing theories. This has been briefly explained in Table 2.6, in previous chapter.

2.9 Guideline validation

Once, the guideline development has been completed, the next step is to perform a validation for the guideline. The objective of the validation was to identify the applicability and practicality of the guideline. Therefore, the design experts, such as the designers, are used to evaluate the guideline.

After describing the approach to incorporate the cultural values consideration in designing the green product, there is a need to conceptualise all the process of the research into a specific model. The conceptual model to incorporate the cultural values consideration in designing the green product is illustrated in Figure 2.12

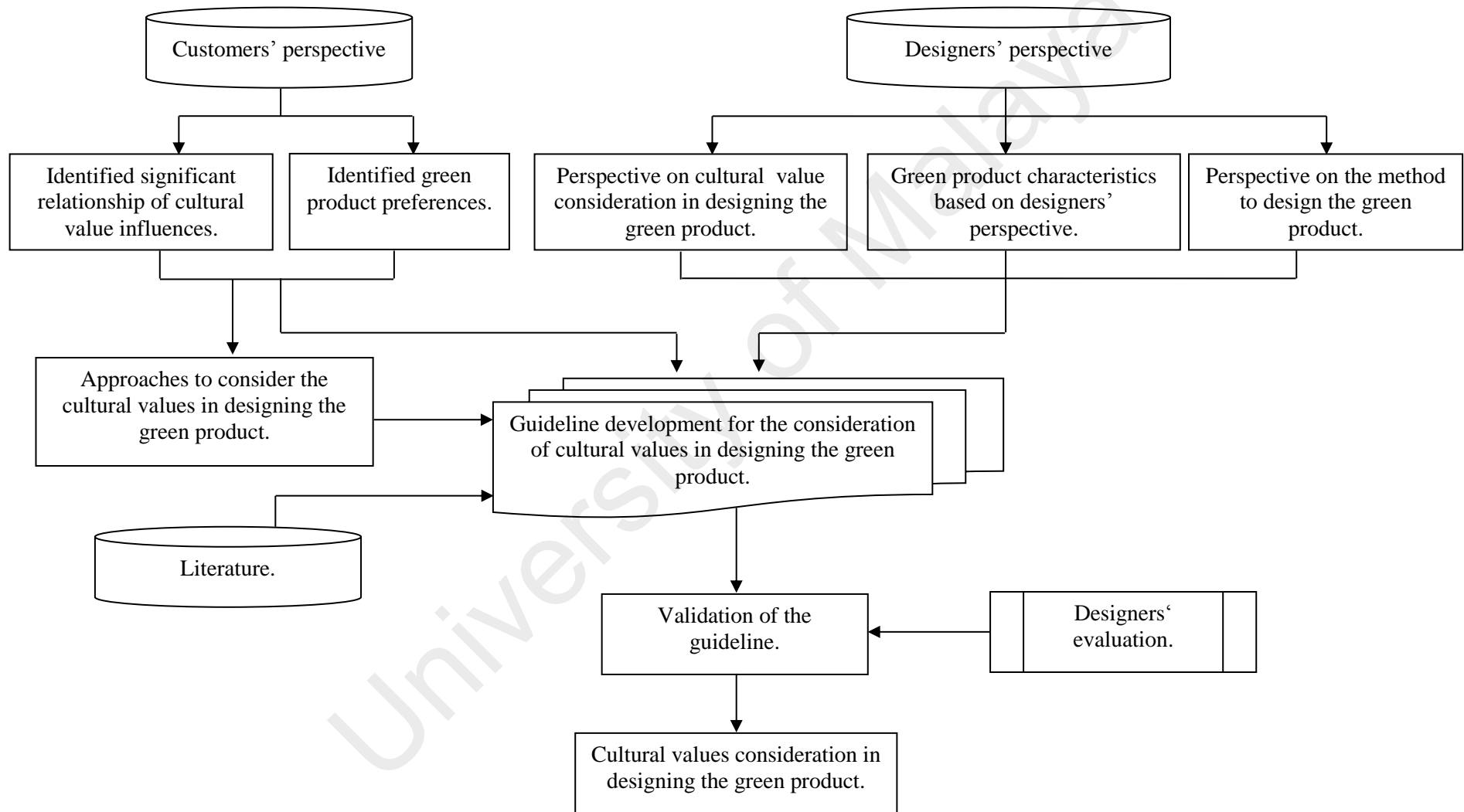


Figure 2.12: Conceptual model for the incorporation of cultural values consideration into the design of the green product

As illustrated in Figure 2.12, the data of the customers' and designers' perspectives should first be identified. This includes the identification of the cultural values that would influence the green product preferences, the green product preferences with consideration on the cultural value influences, designers' perspectives on the cultural values consideration in designing the green product, perspectives on the green product characteristics, and the method to design the green product. The next step is to develop and validate the proposed guideline.

2.10 Research gaps discussion

Reviews on customer preferences, product design, green product and cultural values have been performed. It has been found that cultural values have significant influence on the customer preferences. However, this was mostly focused on the elaboration of customer preferences on the product appearance, functionality and prices.

The awareness on the environmental impact nowadays has encouraged the manufacturers to produce product with the consideration on environmental impact. It includes in Malaysia and Indonesia.

Green product is designed not only based on the product appearance, functionality and price, but also embedded with additional environmental product characteristics. As an abstract impression, customers may have different perspectives to each characteristics. This situation becomes more challenging for the designers, to determine which characteristics could attract the customers to buy their products. The cultural influences on the customer preferences for green products are given minor consideration by previous studies. The cultural values of the customers may also provide significant influence to the preferences on sustainable product. To fill this gap, the investigation on cultural value

influences towards the customer preferences on the green product is thus required. The research gap is illustrated in Figure 2.13.

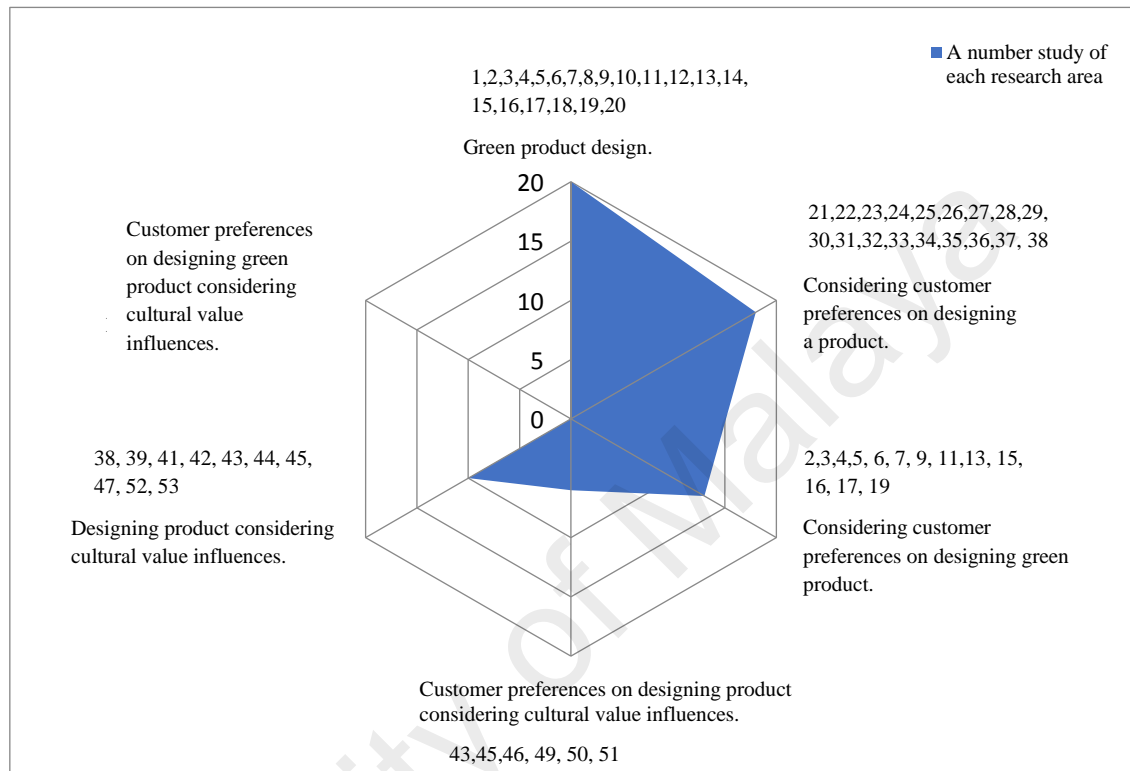


Figure 2.13: Research gap

1. Research on green product and design.

(1) Allione et al., 2011; (2) Byggeth et al., 2007; (3) Clark et al., 2009; (4) Fuller and Ottman, 2004; (5) Geum and Park, 2011; (6) Hegger et al., 2011; (7) Hoffmann, 2007; (8) Howarth and Hadfield, 2006; (9) Hu and Bidanda, 2009; (10) Inoue et al., 2012; (11) Junfeng et al., 2010; (12) Kasarda et al., 2007; (13) Ljungberg, 2007; (14) Marwah et al., 2011; (15) Maxwell, 2003; (16) Maxwell et al., 2006; (17) Petala et al., 2010; (18) Wang et al., 2009; (19) Young et al., 2010; (20) Zaccai, 2008.

2. Research considering customer preferences in designing a product.

(21) Ahmadov, 2008; (22) Claret et al., 2012; (23) Cyr et al., 2005; (24) Hansmann et al., 2006; (25) Haverila, 2011; (26) Hsu, 2012; (27) Jiang et al., 2006; (28) Li et al., 2012; (29) Lihra et al., 2012; (30) Liu and Shih, 2005; (31) Muthitacharoen et al., 2006; (32) Sethuraman et al., 2005; (33) Simonson, 1999; (34) Tano et al., 2003; (35) Vag, 2007; (36) van der Pol and Ryan, 1996; (37) Wang and Tseng, 2008.

3. Research on customer preferences in designing the green product.

(2) Byggeth et al., 2007; (3) Clark et al., 2009; (4) Fuller and Ottman, 2004; (5) Geum and Park, 2011; (6) Hegger et al., 2011; (7) Hoffmann, 2007; (9) Hu and Bidanda, 2009; (11) Junfeng et al., 2010; (15) Maxwell, 2003; (16) Maxwell et al., 2006; (17) Petala et al., 2010; (19) Young et al., 2010.

4. Research on customer preferences in designing product considering cultural value influences.

(43) Kotro and Pantzar, 2002; (44) Liangjun et al., 2008; (45) Lodge, 2007; (46) McCracken, 1986; (49) Moon et al., 2008; (50) Salmi and Sharafutdinova, 2008; (51) Shen et al., 2006.

5. Research on designing product considering cultural value influences.

(38) Bloch, 1995; (39) Calabretta et al., 2008; (40) Crabtree et al., 2003; (41) Dwyer et al., 2005; (42) Garrett et al., 2006; (43) Kotro and Pantzar, 2002; (44) Liangjun et al., 2008; (45) Lodge, 2007; (46) McCracken, 1986; (47) Moalosi et al., 2010; (48) Moalosi et al., 2004; (49) Moon et al., 2008; (50) Salmi and Sharafutdinova, 2008; (51) Shen et al., 2006; (52) Valencia et al., 2010; (53) Wu and Na, 2006.

Based on Figure 2.13, it can be seen that there is a small number of research which focused on the green product, i.e. customer preferences on product design, customer preferences on green product design, cultural influence to the customer preferences on product design. Researcher identify that there is a lack of consideration for cultural value influences to the customer preferences on green product. It is also identified that guideline to assist the designers for involving cultural influences in designing the green product based on customer preferences, has not been performed by previous studies. More detail evidence used to identify the research gaps, strength and limitation from related studies is presented in Table 2.9.

Table 2.9: Previous studies on customer preferences

Author	Research focus	Strength	Limitation
Salmi and Sharafutdinova (2008)	Identifying the influence of culture to the customer preferences in the process of designing product.	Considering customer preferences, culture was proved to have significant influence on product design.	This research explained the preferences of customer on the conventional attribute, but have not consider the characteristics of green product.
Luchs et al. (2010)	Identifying customer preferences on green product using product attribute ethicality, such as gentleness–related and strength–related attributes.	Explained that the preferences of customer on green product be influenced by many factors. It was identified that the character of gentleness–related attribute provide significant influence on green product preferences.	This research has no consideration on the cultural aspects of customer preferences in green product design. Guideline to assist designers for designing product considering cultural influences has not been explained.
Cao et al. (2011)	Developing model to identify the customer preferences using ontology analysis in product development.	Explained clearly the preferences of customer on general product attributes, such as appearance, functionality, price and performance.	Lack of explanation on green product and cultural influences in designing green product.
Moalosi et al. (2010)	Considering cultural value influences in designing interface of product.	Proved that cultural value influence can be involved in designing product.	Developed model which was constructed by using three main domains, i.e. cultural, product and designer domains. This research has not explained the cultural influences on green product.
Noble and Kumar (2008)	Created model to identify customer preferences using emotional perspectives. The model was developed using three main aspects, i.e. utilitarian, visual and kinaesthetic designs, to identify the customer satisfaction.	The explanation on designing product clearly described.	The model developed is relevant to improve the understanding of customer preferences, but this research does not consider the green and cultural aspects as the important factors in developing new product design.

Based on Table 2.9, each study has their own strength and limitation. For example, Salmi and Sharafutdinova (2008) proposed the influence of cultural values to the context of customer preferences on conventional attributes of a product. This study has a limitation on the explanation of green product. In similar manner, Luchs et al. (2010) performed a study related to customer preferences on green product, but has limitation on the inclusion

of cultural value influences. In addition, the guideline to design a green product considering cultural value influences has not been performed as well. Noble and Kumar (2008) conducted a study concerning customer preferences on conventional product, but less consideration of the cultural value influences and green product characteristics in the product design. It can be seen that there is a lack of studies to investigate the influences of cultural value to the customer preferences on green product, based on the current literature. After the review of previous studies on customer preferences, green product and cultural values, the research position that should be addressed are illustrated in Table 2.10.

Table 2.10: Research position to consider the influence of cultural values to the customer preferences on green product

Author	Detail explanation of green product	Customer preferences consideration on developing green product	Guideline/tool to support green product development	Consideration of cultural value influences to customer preferences on green product
Gehin et al. (2008)	√	√	√	
Vinodh and Girubha (2011)	√		√	
Zhou et al. (2009)	√		√	
Luchs et al. (2010)	√	√		
Gmelin and Seuring (2014)	√	√	√	
Fuller and Ottman (2004)	√	√		
Kara et al. (2014)	√	√	√	
Devanathan et al. (2010)	√	√	√	
Research position	√	√	√	√

As illustrated in Figure 2.13, Table 2.9 and 2.10, an extensive review on previous studies concerning customer preferences, green product and cultural value influences, three research gaps have been identified, which include:

1. There is lack of consideration from previous studies in identifying customer preferences on green product considering cultural value influences.
2. A guideline for considering cultural value influences in designing green product has still not been developed by previous studies.
3. The influences of cultural value to the customer preferences on green product in Malaysia and Indonesia have not been investigated.

To fill the research gaps, the aim of this study is to develop a guideline that contributes to the designers to incorporate the consideration of cultural value influences in the design of green product. To achieve this aim, there are four research objectives that should be achieved:

1. To develop a conceptual model to incorporate the consideration of cultural value influences in designing the green product. (To fill research gap 1)
2. To identify the significant relationship of cultural value influences on customer preferences on green product. (To fill research gap 1, 2 and 3)
3. To develop a guideline for considering cultural value influences in designing green product for Malaysia and Indonesia. (To fill research gap 2)
4. To validate the guideline of cultural value influences in designing the green product. (To fill research gap 2)

The reviewing process on customer preferences, green product and cultural value influences have been described. Three research gaps have been identified. The research aim and objectives have also been generated, with respect to fill the research gaps. Thus, to conclude this chapter, the conclusion of this review is described in Section 2.11.

2.11 Summary

A review on customer preferences, green product and its characteristics, and cultural value influences, based on previous studies have been presented. There were differences in the viewpoint in describing each aspect, which depends on the purpose of each study. It has been underlined that the identification of customer preferences in the initial phase of the product design is prominent, to support the designers in the further stages, such as in determining the product specification. It was found that the customer preferences can be influenced by the cultural values. However, based on previous studies, very little consideration was made in the identification of cultural values related to the customer preferences on the green product. Most of the literature were concerned with the identification of cultural value influences towards the conventional attributes, such as appearance, functionality and price. Therefore, the consideration of cultural values towards the customer preferences on green product is important to be investigated, as it can support the designers' decision to generate suitable green product specifications. In Chapter 3, a conceptual model for the incorporation of cultural values in designing the green product is elaborated. A compilation of the research gaps, aim and objectives are presented in Figure 2.14.

Literature review

1. Customer preferences, product design and their attributes.
2. Green product and its characteristics.
3. Preferences of customers on green product.
4. Cultural values, dimensions and described characters.

Research gaps

1. There is a lack of studies to identify customer preferences on green product, while considering the cultural value influences.
2. A guideline for the design of green product considering the cultural value influences, has yet to be developed by previous studies.
3. The cultural value influences towards the customer preferences on green product in Malaysia and Indonesia, have not been investigated.

Research aim

To develop a guideline that contributes to the designers to incorporate the consideration of cultural value influences in designing the green product.

Research objectives

Four research objectives have been formulated to achieve the research aim:

1. To develop a conceptual model to incorporate the consideration of cultural value influences in designing the green product. (To fill research gap 1)
2. To identify the significant relationship of cultural value influences towards customer preferences on green product. (To fill research gap 1, 2 and 3)
3. To develop a guideline to consider cultural value influences in designing green product for Malaysia and Indonesia. (To fill research gap 2)
4. To validate the guideline of cultural value influences in designing the green product. (To fill research gap 2)

Figure 2.14: Compilation of research gaps, aim and objectives

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the overall research methodology used in this study, which has been classified into four major phases. In the first phase, the study was focused to identify the influences of cultural values towards the customer preferences on the green product. The data for this phase was collected from the customers, based on their cultural orientation and preferences on the green product. In the second phase, data from the designers was required. The objective of the data collected from the designers was to know their perspectives on the cultural values consideration in designing the green product. In the third phase, this study used the secondary data from the literature, in order to extract the green design strategies. It is important to support the design strategies from the designers, which are probably limited to their own designed product. Once the data collection and analysis from the customers and designers were completed, the last section was done to develop the guideline of the cultural values consideration in designing the green product. The guideline was developed based on three input data from the customers' and designers' perspectives, and the literature. In the last section, a validation on the proposed guideline was conducted to confirm the usefulness of the proposed guideline in designing the green product.

3.2 Research design

A research is a mechanism to develop a logical knowledge based on the observations, to support the understanding on the explanation of a phenomenon (Jonker & Pennink, 2010). Thus, to address the research objectives and achieve the research aim, researchers need to identify an appropriate method to answer the research questions and explain the phenomenon, based on scientific and systematic approaches (Cresswell, 2002). A

research method is a way to achieve the research objectives, or more specifically, to explain the process of data collections, analysis and their interpretations (Creswell, 2009). These consist of the details of the research approaches, that should be accomplished and executed in a certain order, to achieve some certain objectives (Jonkerand & Pennink, 2010). There are three types of research methods that were mostly explained in the literature, i.e. quantitative, qualitative and combination of both quantitative and qualitative.

Quantitative research is an approach to attain the research aim by testing the hypotheses and probing the relationship between the variables (Creswell, 2009). According to Creswell (2009), quantitative can be divided into experimental and non-experimental, such as survey. Experimental research is focused to determine the specific outcome, by testing several treatments that influence the outcome. Meanwhile, a survey research is more focused on providing the numeric data, such as trend, behaviour and opinion of the population, by taking a sample from the population. Quantitative research can be broadly divided into two types, i.e. relational and prediction studies (Walliman, 2005). Relational studies are focused to investigate the relationships between the phenomena, for both established or not yet established. It has been more of a concern to explore these relationships, with less or no previous studies performed. Prediction studies are concern to confirm the correlations which have been previously known by other researchers, and hence predict the outcomes (Walliman, 2005). The type of data mostly explained was by number and statistical predictions. Quantitative study usually uses questionnaires or structured interview for data collection, with the intent of generalisation from a sample to a population (Dawson, 2007). The data analysis can be of descriptive statistics, inferential statistics, and parametric or non-parametric test (Singh, 2006).

Qualitative research is a way to know, investigate or understand the meaning of some individuals or a group, in relation to some social problems (Creswell, 2009). This type of

research is mostly framed using words or text, and cannot be described by numbers, such as maximum and minimum values or percentages, since it has more concerned in describing a phenomena (Jonker & Pennink, 2010; Walliman, 2005). This method is more appropriate for investigating individual or group phenomena, that involve the emotion, motivation and empathy, which cannot be fully captured by numbers from a quantitative study (Chua, 2012). Paradigm or assumptions of a qualitative method is more intended on subjectivism, interpretivism, and constructivism. The differences between quantitative and qualitative method are described, in Table 3.1.

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Table 3.1: Differences between quantitative and qualitative methodologies, as adapted from Cresswell (2009) and Chua (2010)

Criteria	Quantitative	Qualitative
Method	<p>Experimental: Researcher is focused to determine the specific outcome by testing several treatments that influence an outcome.</p> <p>Non-experimental: Researcher is focused on providing numeric data, such as trend, behaviour, and opinion of population, by taking a sample from the population.</p>	<p>Ethnography: an approach of examining the natural setting during some period of time by collecting primarily, observational and interview data.</p> <p>Grounded theory: the researcher obtains a broad, intangible theory of method, action or dealings grounded in the analysis of participants.</p> <p>Case studies: the researcher is focused on exploration on an event, activity, depth of a program, and process.</p> <p>Phenomenological research: researcher wants to know the phenomenon of human experiences, as described by respondent or participants.</p>
Objective	<p>Researcher tests the theory and hypotheses, build fact, predict behaviour, and explain an event statistically.</p>	<p>Researcher looks for broad patterns, generalisations or theories from themes or categories.</p>
Item in research instrument	<p>Many items can be used; the items contain suggestions for selection.</p>	<p>Few items, no suggested answers and open-ended questions.</p>
Data collection	<p>Data can be collected by using questionnaire, structure observation and interview.</p> <p>Mostly explained by number and quantity, measurement scale or computation.</p>	<p>Used non-structured observation, interview and documentation.</p> <p>Descriptive, verbal notes, recording of observation or interview, documented material and transcript.</p>
Data analysis	<p>It can be descriptive statistics, inferential statistics, parametric and non-parametric test.</p>	<p>There are several methods for data analysis, e.g. domain analysis, taxonomy analysis, hermeneutical analysis, coding.</p>

Mixed method research is a research strategy that joins both quantitative and qualitative approaches, when the researcher feels that one of the approach is less adequate (Creswell, 2009). Thus, this involved collecting and analysing both the qualitative and quantitative data. Mixed method can also be used if the researcher feels that both approaches are insufficient to achieve the research aim.

There are several criteria to be considered in deciding the appropriate method, between quantitative, qualitative or mixed methods. The consideration should be referred back to the research problems and the achievement of research objectives. The first objective in this study was to develop a model in incorporating the consideration of cultural value influences in designing the green product. The purpose of the model development was to conceptualise all procedures, that should be undertake to incorporate the cultural values consideration in designing the green product.

The second objective was to identify the significant relationship between cultural value influences on the green product preferences. This objective can be achieved by evaluating the developed hypotheses using statistical approaches. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) are used to extract the critical threshold of a research. Once the critical threshold of EFA and CFA have been achieved, the next step is to confirm the hypotheses using the approach of structural equation modeling (SEM). Referring to Table 3.1, the quantitative method is a more suitable method to achieve this research objective.

The third objective was to develop a guideline for considering the cultural value influences in designing the green product. The guideline consists of strategies on cultural values consideration in designing the green product. Thus, to achieve this objective, there are two inputs that should be considered in the model. The first input data was obtained from the customers' perspective (the achievement of objective 1), while the second input

data was obtained from the designers' perspectives. Data from designers' perspectives was obtained by performing a semi structured interview. This data is important to explore how the designers perceive green products and cultural values consideration in the design. In addition, this study also looked at the literature, in order to support the strategies for the incorporation of cultural value influences in designing the green product. The information from the literature is also important to increase the understanding on the strategies in designing the green product while considering the cultural value influences. Referring to Table 3.1, the qualitative method is a more suitable method to achieve this objective. *The last* objective was to validate the proposed guideline using case studies. Designers from different profiles were asked to evaluate the applicability of the proposed guideline.

Based on the explanation in achieving research objectives 1 to 4, this research was more suitable to be performed by adopting both the quantitative and qualitative research designs. This is because, to calculate the strength of the relationship between the cultural value influences and the green product preferences, the statistical analysis needs to be applied. The weight of the preferences on the green product characteristics with the consideration on the cultural value influences was predicted using the statistical analysis. The qualitative research design was also selected since interviews were required for this study, in order to identify the green strategies and cultural values consideration, based on the designers' perspectives. The overall flow of the research method used in this study is illustrated in Figure 3.1

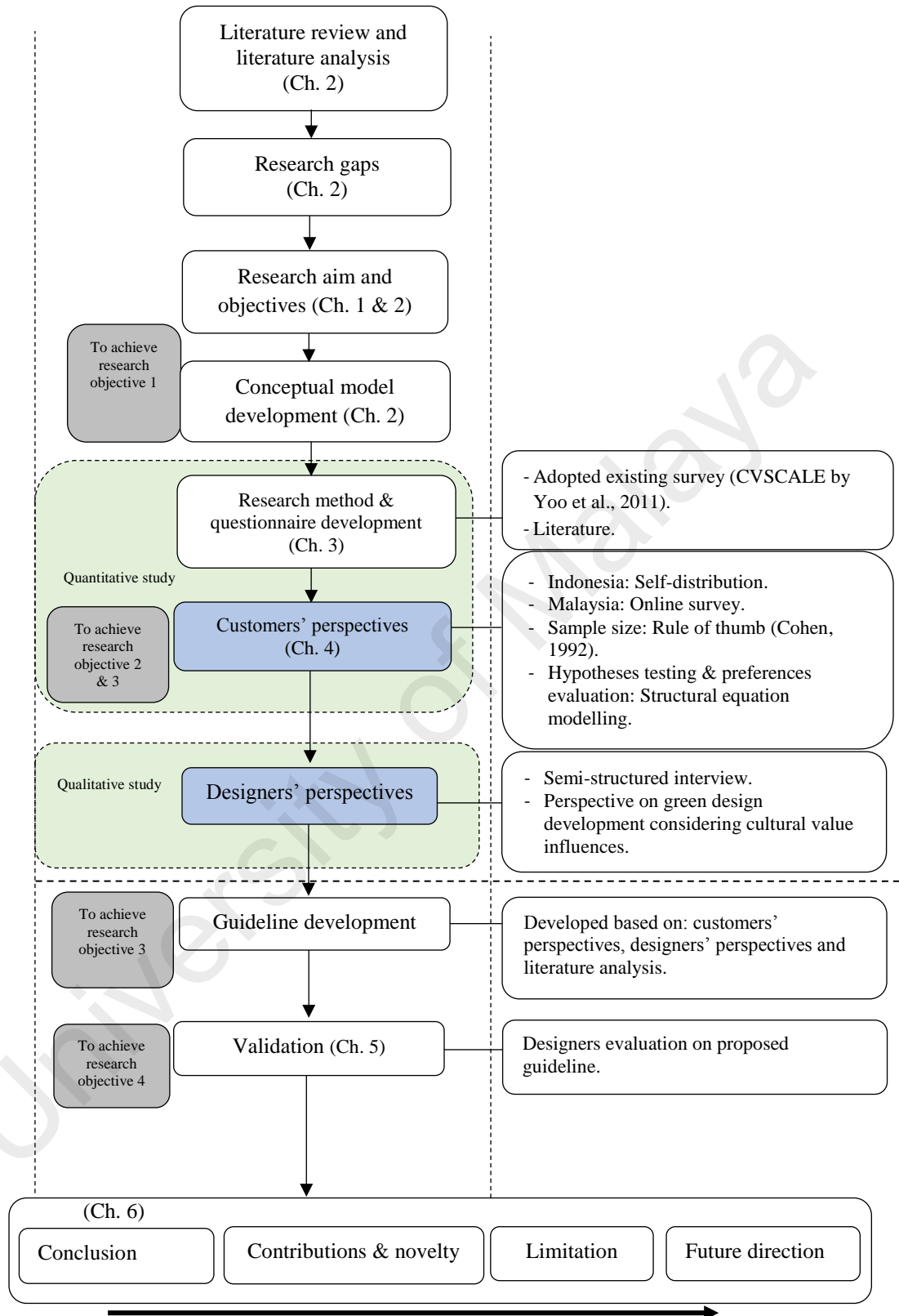


Figure 3.1: The research methodology used in this study

3.3 Data collection

The consideration to decide which suitable method to be used for the data collection, can be established after the researcher has clearly identifies the research problems (Kothari, 2004). Before the researcher performs the data collection, there is a need to indicate what types of data will be needed and the suitable methods that should be used for the data collection. According to Kothari (2004) there are two types of data that can be used in a research, i.e. primary and secondary data. Primary data is the data that is collected afresh, i.e. the data that was firstly collected by the researcher and consists of original values. On the other hand, the secondary data is the information obtained from the sources that already exist and analysis by other previous studies (Sekaran & Bougie, 2010). According to Sekarand and Bougie (2010), the data collection method for primary data can be classified into several methods, such as observation, interview, using questionnaires, using schedules etc. Meanwhile, for secondary data, the data collection can be obtained from statistical report, databases, annual report of companies, census data, government publications of economic indicators etc. (Sekaran & Bougie, 2010). Kothari (2004) described that the secondary data is the data which has been collected, tested and evaluated by someone or other researchers.

The primary data required for this study was obtained from two sources, i.e. from the customers and designers. Firstly, the data from the customers was used to identify the significant relationship between the cultural value influences and the green product preferences, and identify the preferences on green product characteristics with consideration on the cultural value influences. Secondly, the data obtained from the designers was used to identify their perspectives on the green product design and cultural values consideration on the green product development. The secondary data used in this study was obtained from the literature. This data is useful to support the green product design strategies that were obtained from the designers' perspectives. The data obtained

from the customers, designers, and literature were used as the input for the development of the proposed guideline. In the following section, the method for the data collection and data analysis of this study will be elaborated.

3.3.1 Data collection on customers

3.3.1.1 Questionnaire development

Questionnaire was used to collect the data on customers preferences in this study. A questionnaire is a pre-formulated written set of questions, to which the respondents record their answers (Kothari, 2009; Sekaran & Bougie 2010). In order to get a good performance on the data collection, the researcher needs to clearly determine how to design the questionnaire. In addition, a pre-testing of the questionnaire needs to be performed, to identify the comprehensibility of the questions to be answered by the respondents. The design of the questionnaire, the scale used in the questionnaire, translation of the questionnaire and the pre-testing of the questionnaire, are presented in the next sub-sections.

3.3.1.2 Design of the questionnaire

A questionnaire for a survey should be suitable to the level of readiness of the respondents, which consisted of a systematically arranged questions and should also consists of clear instructions (Balnaves & Caputi, 2001). A questionnaire should be simple, accurate and easy to be understood by the respondents (Kitchenham & Pfleeger, 2002). The question in the questionnaire should also be goodly organised with appropriate spacing, as it is important to minimise the eyestrain of the respondents. The words for each question should not exceed the limit of 20 words, to make it easier for the respondent to grab the main idea of the questions (Oppenheim, 2000).

In this study, the questionnaire contains of five sections. The first section consists of the items related to the demographic information of the respondents. The other four sections consist of the items related to the construct used in the model. The descriptions for each section are described as follows:

1) Section A

This section consists of five questions asking about age, gender, marital status, education level and salary range. The respondents were asked to tick any of the choices for each question. This section provides important data to be used in the discussion and analysis.

2) Section B

This section includes twenty five items which reflect the five cultural dimensions. It was classified into six items of collectivism, four items of masculinity, and five items each for uncertainty avoidance, power distance and long-term orientation. The definitions of each cultural dimension were shortly described in the survey, to reduce the confusion of the respondents on the terms related to the cultural dimensions used in the questionnaire.

The items used in this study utilised a set of pre-existing questions named as 'CVSCALE', which was established by Yoo et al. (2011) (as described in the Appendix A). According to Yoo et al. (2011) CVSCALE is very adequate to identify the cultural values of the customers, with specific segmentations at the individual level. In contrast, the Hofstede's instrument is more general, since it identifies the characters at the national level. The usage of the established items have two advantages, i.e. the instruments or items have already been confirmed for its validity and reliability, and the researchers can compare and discuss their findings with the results obtained from previous studies (Kitchenham & Pfleeger, 2002).

3) Section C

This section consists of three attributes of a conventional product, i.e. appearance, functionality and price. The items of each attribute were generated from an extensive literature review. The section consists of seven items of appearances, five items of functionality and two items of price. The respondents were asked to decide on the answers of each question based on the importance level, by giving a tick in the provided columns.

4) Section D

This section includes eleven items of the green product characteristics. These characteristics were also generated based on the literature review. Most of the studies differently described the term ‘green product’, as it is also known as environmentally friendly product. However, the used of this term refers to the same purpose, which was aiming to give less impact to the environment. A compilation of the operationalised items in the questionnaire is described in Table 3.2.

Table 3.2: Constructs and items in the questionnaire

Construct	Number of items	Sources
Collectivism	6 items	CVSCALE; Yoo et al. (2011).
Masculinity	4 items	
Uncertainty avoidance	5 items	
Power distance	5 items	
Long-term orientation	5 items	
Appearance	7 items	Literature review as described in Table 2.2
Functionality	5 items	Literature review as described in Table 2.3
Price	2 items	Literature review as described in Table 2.4
Green product characteristics	11 items	Literature review as described in Table 2.5
Total		50 items

On the front page of the questionnaire, a cover letter was included which consists of a guideline for the questionnaires and the purpose of distributing the survey.

3.3.1.3 Scale of the questionnaire

A scale is a tool to measure the concept which was formed by combining several scores with a set of questions (Saunders, 2011). This study was focused on identifying the

influences of cultural values to the customer preferences on the green product. In this study, a likert scale was selected to measure the responses of the respondents on the items, as it can be easily managed, answered by respondents and consists of a higher reliability, compared to the other scales (Chua, 2012). Likert scale of 0 to 10 was used to reduce the respondents' errors and increase the reliability of the data (Dawes, 2002; Scherpenzeel, 2002). The scale value of 0 was denoted as 'strongly disagree', while 10 was denoted as 'strongly agree', for the cultural values statements in Section B. For Sections C and D, 0 was denoted as 'strongly unimportant', while 10 was denoted as 'strongly important'. The full questionnaire is presented in Appendix B.

3.3.1.4 Translation of the questionnaire

The questionnaire was prepared in two languages, i.e. English and Bahasa Indonesia, to anticipate the respondents who have limitation with the English language. For international study, the preparation of the translated questionnaire intended for the respondents who are fluent in different languages is very important (Saunders, 2011). This is because, some of the respondents may prefer to answer the questionnaire using their own native languages. However, the content of the translated questionnaires should have the same meaning and easy to be understood by the respondents (Saunders, 2011). An expert on Bahasa Indonesia was invited to translate the questionnaire from English to Bahasa Indonesia, as it is important to keep the relevancies of the material in the questionnaire. Once the the translation has been completed, the next step was to perform the pre-test and pilot study. The translated questionnaire is presented in Appendix C.

3.3.1.5 Pre-test and pilot study

A pre-test is a test of understandability and appropriateness of the questions planned to be included in a regular survey, for a small number of respondents (Sekaran & Bougie, 2010). In this study, the pre-test was performed to ensure that the respondents have no issue in answering the questions. The questionnaire was directly delivered to the respondents, to identify whether the respondents have any difficulties to fill in the questionnaire. Once the pre-test has been completed, the questionnaire was then distributed for a pilot test. Chua (2012) explained that a pilot test is a small scale study (generally about 30 respondents), which is conducted before the actual research is being carried out. This step is also performed to eliminate any unclear and ambiguous words in the questionnaire, as it can help to improve the validity and reliability of the measurement (Churchill, 1979).

The pilot questionnaire was distributed to 40 respondents in this study, where the researcher left the questionnaire to be answered by the respondents, and recollect it on the following day. Any comments from the respondents were then noted as an input to increase the understandability of the questionnaire. The reliability was tested based on the result of the Cronbach's alpha calculation. The reliability should be the first measurement to be considered in assessing the quality of the instrument (Churchill, 1979). Hair et al. (2006) suggested that the critical threshold to evaluate the reliability testing is 0.6 to 0.7 of the Cronbach's alpha result. The flow of the questionnaire development is illustrated in Figure 3.2.

Descriptions

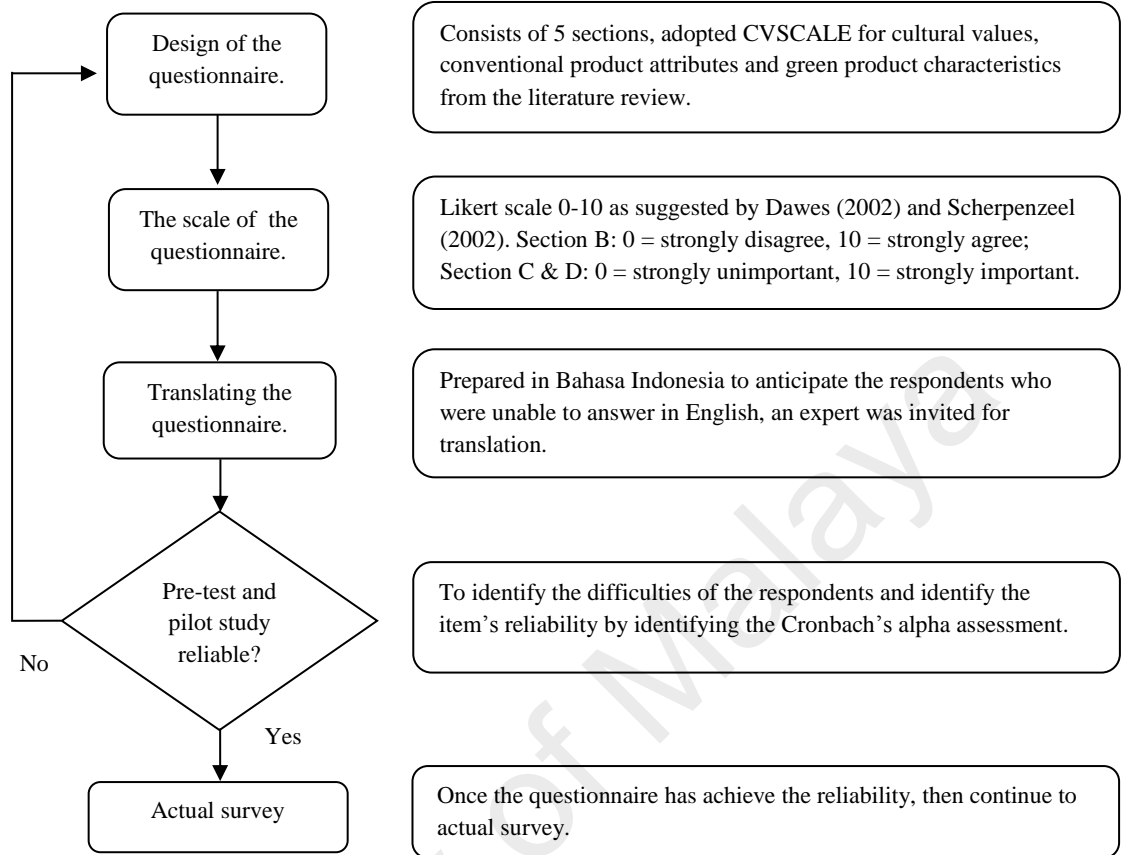


Figure 3.2: Flow of questionnaire development

The purpose of the pre-test and pilot study was to confirm that the respondents have no issues when filling in the questionnaire. Once these have been completed and the respondents have no problem to answer the questionnaires, then the actual survey can be performed. The results of the test for all the items are described in Table 3.3.

Table 3.3: Sample adequacy and reliability test

Measurement	Malaysia	Indonesia
Cronbach's alpha	0.785	0.863

Cronbach's alpha > 0.7

As shown in Table 3.3, it can be seen that the values of the Cronbach's alpha were higher than the critical threshold of 0.7. Based on this result, the reliability of the pilot study is

acceptable. Therefore, the items used in the questionnaire can be used for the actual survey. The following section is presented to describe the sampling procedure of the data collection for the actual survey.

3.4 Sampling procedure

3.4.1 Sample frame

Since the population of this study was undetermined, the sample used consists of ordinary people who can be considered as potential customers. Indonesia and Malaysia were selected as the location of the data collection. The reason for choosing these two countries was due to that the geography, countour and languages are almost the same. Based on the Hofstede national cultural index, Indonesia and Malaysia have slightly different cultures. Thus, this study wanted to prove whether similar cultures will provide similar preferences or vice versa, in terms of the green product preferences.

To ensure a data reliability, a preliminary screening process was conducted to ensure that the recruited respondents only consisted of those who were aware of the environmental issues. This means that, the respondents who were found to have little knowledge on the green product will be removed for the analysis.

3.4.2 Sample size

The minimum sample size required was calculated based on the rule of thumb, as suggested by Cohen (1992). The minimum sample size was determined (with 80 % statistical power) based on the maximum number of the arrowheads that point to the construct of the model which has been developed. In this study, there were nine arrowheads that point to the construct, i.e. five from the cultural dimensions and four from the green product preferences, i.e. appearance, functionality, price and green characteristics. For these nine pointing arrowheads, the minimum sample size required

were 247 samples with the minimum R^2 of 0.10. A total of 1256 questionnaires from both countries were collected, i.e. 641 from Indonesia and 615 from Malaysia. A total of 208 questionnaires were not included as the answers were incomplete. Thus, the number of sample size was satisfactory for the measurement, as the amount exceeds the threshold requirement.

3.4.3 Access to sample

According to Sekaran and Bougie (2010) there are two ways of questionnaire's distribution, i.e. personally administered questionnaire and mail or electronically distributed questionnaire. Both methods have their own benefits and limitations. The differences in the questionnaire distribution methods are describe in Table 3.4.

Table 3.4: Types of questionnaire distribution (Sekaran & Bougie, 2010, pp 197-198)

Personally administered questionnaire	Mail or electronically distributed questionnaire
The main advantage is that the researcher can collect all the completed responses within a short period of time.	The main advantage of mail questionnaire is that a wide geographical area can be covered in the survey. The return rates of mail questionnaire are typically low. 30 % response rate is considered acceptable.
A doubt of respondent can be clarified on the spot.	If any doubt happens when the respondent answers the questionnaire, it can be difficult to be clarified.
The researcher is also afforded the opportunity to introduce the research topic and motivate the respondents to offer their frank answers.	The researcher does not have the opportunity to explain in more detail about the questions and convince the respondent to answer frankly.
Costly, however the data gathered is more reliable.	Less expensive, the data gathered is not quite good in reliability, since the researcher cannot explain if the respondent has some doubt to answer the questions.

Since this study was performed in different countries, both the personally administered and electronically distributed methods were implemented. In Indonesia, the sample was collected using the self-administered survey. A credible statistical team was hired from a private university in Indonesia to assist in delivering the questionnaires. A technical

meeting was conducted to explain the purpose of the study, and each section of the questionnaire was briefly explained. In Malaysia, the data was collected through online survey, as it can be more appropriate to improve the response rate of the questionnaire.

3.5 Data analysis

In this study, the data analysis to identify the cultural value influences on the green product preferences was classified into three steps. In the first step, analysis on the data adequacy and reliability were performed. This is important to ensure that the collected data and its reliability, exceed the critical threshold. Once this has been completed, the next step is to extract the items used by performing the EFA. The Statistical Package for Social Science (IBM SPSS) (version 22, IBM, NY, USA) was used to evaluate all the calculations involved in the first step. In the second step, after all the critical threshold for the data reliability, sampling adequacy and factor analysis were evaluated, the next step was to confirm the validity items used by performing the CFA. Once the validity has been confirmed, the final step was to evaluate the developed hypotheses. The partial least square-structural equation modeling (PLS-SEM) approach was applied to assess the developed hypotheses. SmartPLS (version 3, SmartPLS GmbH, Bönningstedt, Germany) was used as a tool to evaluate all the validation of the items in the CFA and hypotheses development. A more detail explanation of these three steps is discussed in the following section.

3.5.1 Sampling adequacy and reliability test

In order to ensure that the data obtained is adequate and reliable for further analysis, the data adequacy and reliability tests are required. For data adequacy analysis, the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity should be performed, while the Cronbach's alpha test was conducted to evaluate the data reliability. For the analyses to

be accepted, the critical threshold for the KMO should be > 0.5 , the Bartlett's test of sphericity should be < 0.001 , and the Cronbach's alpha should be > 0.7 (Hair et al., 2006).

3.5.2 Missing value treatment

In the data collection, some of the respondents may skipped or ignored some questions in the questionnaire. Hair et al. (2016) explained that the missing values should be less than 5 % of the questionnaire. This can still be treated by using either one of the several methods available, such as the mean replacement, expectation-maximization (EM) algorithm and nearest neighbour algorithm. However, if the missing values can decrease the variation of the data or may introduce biases, deleting the indicator from the group of data is preferable.

3.5.3 Exploratory factor analysis

According to Thompson (2004), the application of factor analysis can be divided into three purposes. First, the focus of EFA is to inform the evaluations of score validity, when a measurement has been developed. Second, the factor analysis is used to develop a theory based on the nature of constructs. In theory development, numerous measurements are delivered to different samples. Factor analysis can be used to specify the construct dimensions in more detail. Third, factor analysis can be applied to compile the relationships for a set of factor scores, for subsequent analysis. In this study, the EFA was required to validate the items used due to the following reasons. First, although the CVSCALE has been tested and validated by previous studies, the CVSCALE used in this study was applied in different countries, i.e. Indonesia and Malaysia, in which may also provide different results. Second, the CVSCALE used has been translated into a different language, which was originally in English. Although the experts have translated the questionnaire, to ensure that the content validity of the items used, the EFA needs to be

performed. Third, the items for the product appearance, functionality, price and green product characteristics, have been developed based on the review of various studies, which should be validated. In this study, the factor analysis was performed by evaluating the output of the calculation from the principle component and the varimax rotation method. A testing of the rotated loading component of each item was suppressed to be > 0.3 , and the communality should be > 0.5 (Hair et al., 2006).

3.5.4 Confirmatory factor analysis

For evaluating the hypotheses of the conceptual framework that has been developed, this study applied the SEM. SEM is the second generation of statistical analysis technique, which was developed for analysing the interrelationships among multiple variables in a model. The interrelationships among variables can be expressed in a series of a single or multiple regression equation (Hair et al., 2014). Prior to performing the SEM, several layers of validations need to be performed in the CFA. CFA is a type of SEM that deals specifically with the measurement models, i.e. the relationships between the observed measures or indicators (e.g. test items, test scores, behavioral observation ratings), and latent variables or the factors (Brown, 2015).

Hair et al. (2014) explained that SEM can be classified into two categories, i.e. PLS-SEM and covariance based SEM (CB-SEM). The PLS-SEM is suitable for the purpose of exploring the theory, whereas CB-SEM is suitable to confirm the theory. A more detail explanation of the differences between the PLS-SEM and CB-SEM can be seen in Table 3.5.

Table 3.5: Consideration of choosing PLS-SEM and CB-SEM (Hair et al., 2014)

PLS-SEM	CB-SEM
The goal is predicting key target constructs.	The goal is theory testing, theory confirmation, or the comparison of alternative theories.
Formatively measured constructs are part of the structural model. Note that formative measures can also be used with CB-SEM, but doing so requires construct specification and modifications (e.g. the construct must include both formative and reflective indicators to meet the identification requirements).	Error terms require additional specification, such as the covariation based.
No distributional assumptions and nonparametric method.	The structural model has non-recursive relationships.
The structural model is complex (many constructs and indicators).	The research requires a global goodness-of-fit criterion.
No issues on the sample size; small sample size can still achieve high level of statistical power, while larger sample size can increase consistencies.	
The plan is to use latent variable scores in subsequent analyses.	

3.5.4.1 Justification using PLS-SEM

The PLS-SEM approach was adopted in this study to test the hypotheses in the research framework. A complex relationship may appear in the proposed model. There were ten constructs and many indicators exist in the proposed conceptual framework. There were five cultural dimensions which consist of twenty five indicators that were pointed to the customer preferences on the green product. The construct of the customer preferences on the green product has two layers which consists of four constructs, i.e. appearance, price, functionality and green product characteristics. The construct also consists of twenty five indicators. Therefore, it has been considered that the best approach was to adopt the PLS-SEM, as it did not limit the number of variables. Many subcriteria can be considered under each criterion. The significances of the criteria, as well as the subcriteria can be identified. The descriptions on the number of constructs and indicators used in this study, is illustrated in Figure 3.3.

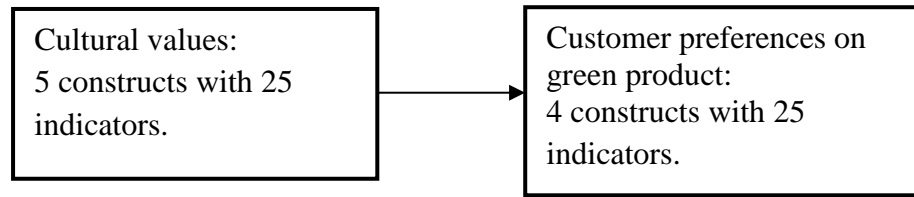


Figure 3.3: Construct and indicators in the proposed model

In addition, the aim of the study was to investigate the influence of the cultural values construct towards the customer preferences on the green product construct. The population of the green product customers, in Malaysia and Indonesia are uncounted. Hair et al. (2016) explained that the PLS-SEM is independent of the sample size, as small sample size can still provide high level of statistical power and larger sample size can provide better consistency in the analysis. The outer weight obtained from the SEM has higher validity, as there are several layers of data validation, and that the measurement error was being considered when analysing the data. The PLS-SEM was capable for estimating or assessing the measurement error, since it can incorporate both the observed and unobserved measures or latent variables. Therefore, the results of the PLS-SEM can be used for future research, such as in calculating the outer weight of indicators as a prediction of the customer preferences.

3.5.4.2 Specifying measurement model

There are three terms that should be underlined to evaluate the research framework, i.e. construct, indicator and measurement model. A construct (also called as latent variable) is defined as the measurement of concepts that are abstract, complex and cannot be directly observed by means of multiple items (Hair et al., 2016). Constructs are represented in path models as circles or ovals. Indicators are directly measured observation (raw data), generally referred to as either the items or manifest variables, and

being represented in path models as rectangles. They are also available data (e.g. responses to survey questions or collected from company databases) used in the measurement models to measure the latent variables. In SEM, the indicators are often called as manifest variables (Hair et al., 2016). A measurement model is an element of a path model that consists of indicators and their relationships with the constructs, and is also called as the outer model in the PLS-SEM.

Cultural values has five dimensions. These dimensions were considered as the constructs or latent variables which should be measured in this study. Each dimension consists of indicators that reflect the meaning of each dimension. It consists of collectivism, masculinity, power distance, uncertainty avoidance and long-term orientation. The indicators in the analysis should be denoted by a code to differentiate and simplify the indicators used in the analysis process. The indicators and the assigned constructs are described in Table 3.6 to 3.10.

Table 3.6: The indicators of collectivism construct

Collectivism indicators	Code
Individuals should sacrifice self-interest for the group that they belong to.	Coll1
The group's welfare is more important than individual rewards.	Coll2
The group's success is more important than individual success.	Coll3
Individuals should pursue their goals after considering the welfare of the group.	Coll4
Group loyalty should be encouraged even if the individual's goals suffer.	Coll5
Individuals should stick with the group even through harsh difficulties	Coll6

Table 3.7: The indicators of masculinity construct

Masculinity indicators	Code
It is more important for men to have a professional career than it is for women.	Mas1
Men usually solve problems with logical analysis; women usually solve problems with intuition.	Mas2
Solving difficult problems usually requires an active forcible approach which is typical of men.	Mas3
There are some jobs that a man can always do better than a woman.	Mas4

Table 3.8: The indicators of uncertainty avoidance construct

Uncertainty avoidance indicators	Code
It is important to have instructions spelt out in detail so that I always know what I'm expected to do.	Uai1
It is important to closely follow instructions and procedures.	Uai2
Standardised work procedures are helpful.	Uai3
Rules/regulations are important because they inform of what is expected of me.	Uai4
Instructions for operations are important.	Uai5

Table 3.9: The indicators of power distance construct

Power distance indicators	Code
People in higher positions should make most decisions without consulting the people in lower positions.	Pdi1
People in higher positions should not ask the opinions of people in lower positions too frequently.	Pdi2
People in higher positions should avoid social interactions with people in lower positions.	Pdi3
People in higher positions should not delegate important tasks to people in lower positions.	Pdi4
People in lower positions should not disagree with decisions made by people in higher positions.	Pdi5

Table 3.10: The indicators of long-term orientation construct

Long-term orientation indicators	Code
Careful management of money (Thrift).	Lto1
Going on resolutely in spite of opposition (persistence).	Lto2
Personal steadiness and stability.	Lto3
Long-term planning.	Lto4
Working hard for success in the future.	Lto5

The preferences on green product consist of four constructs. These constructs represent both conventional and green product attributes, i.e. appearance, functionality, price and the newly investigated construct of green product characteristics. The indicators of each construct and code for analysis are described in Table 3.11 to 3.14.

Table 3.11: The indicators of appearance construct

Appearance indicators	Code
The colour of product.	App 1
Shape of product.	App 2
Size of product.	App 3
Texture of product.	App 4
Style of product.	App 5
Brand of the product.	App 6
Packaging appearance.	App 7

Table 3.12: The indicators of functionality construct

Functionality indicators	Code
The easiness in using the product.	Funct1
Additional function (multi-function).	Funct2
Safety when using the product.	Funct3
Usefulness of the product function.	Funct4
Clear information on how to use the product.	Funct5

Table 3.13: The indicators of price construct

Price indicators	Code
The fairness between price and product quality.	Price1
Sacrifice by paying higher price to get branded products.	Price2

Table 3.14: The indicators of green product characteristics construct

Green product characteristics indicators	Code
Energy efficiency.	Gpc1
Reduction in size and weight of the product.	Gpc2
Eliminate or reduce harmful material.	Gpc3
Using recyclable material.	Gpc4
Easy to reuse.	Gpc5
Using recycled material.	Gpc6
Easy to maintain.	Gpc7
Providing product service.	Gpc8
Eco-label.	Gpc9
Using biodegradable material.	Gpc10
Easy to upgrade.	Gpc11

To identify the influence of cultural values towards the customer preferences on the green product, the measurement model of each construct should be clearly justified. The measurement can either be reflective or formative. Hair et al. (2014) explained that the decision on whether to use the reflective or formative measurements, is depended on the constructs conceptualisation and the objectives of the study. This decision is not clear-cut, still under debate in a variety of disciplines and has not been fully resolved (Hair et al., 2014). The consideration in deciding between the formative or reflective measurements is described in Table 3.15.

Table 3.15: The consideration for using formative or reflective measurements (Hair et al., 2014)

Formative	Reflective
The indicators are viewed as defining characteristics of the construct.	Direction of causality is from the construct to be measured.
Change in the indicators are expected to cause change in the construct.	Indicators are expected to be correlated.
Change in the construct are not expected to cause changes in the indicators.	Dropping an indicator from measurement model does not alter the meaning of the construct.
The indicators do not necessarily share a common theme.	Takes measurement error into account at the item level.
Eliminating an indicator may alter the conceptual domain of the construct.	Similar to factor analysis.
A change in the value of one of the indicators is not necessarily expected to be associated with a change in all of the other indicators.	Typical for management and social science researches.
The indicators are not expected to have the same antecedents and consequences.	

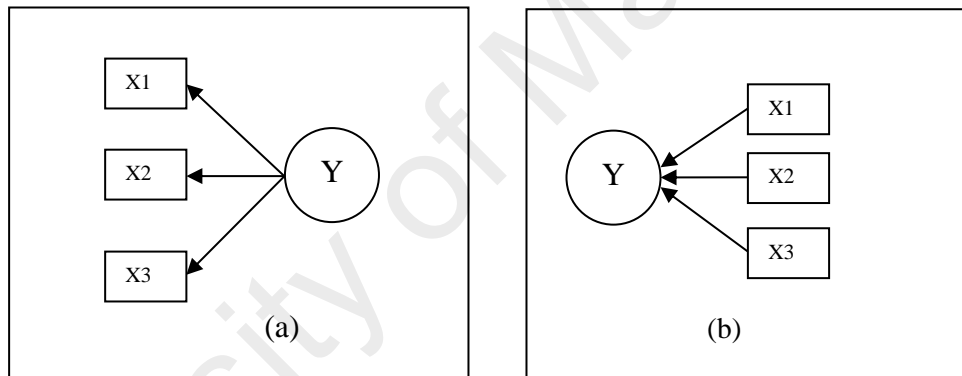


Figure 3.4: The (a) reflective and (b) formative measurement models

As illustrated in Figure 3.4, there are differences between the arrowheads of the construct in the reflective and formative measurement models. For reflective measurement, the arrowheads point out from the construct to the indicators, whereas for formative measurement, the arrowheads point in from the indicators to the construct. The following section describes the procedure to evaluate the reflective and formative measurements.

3.5.4.3 Assessing reflective measurement

There were three procedures to assess the reflective measurement model. The first procedure was to identify the internal consistency. This includes the Cronbach's alpha and composite reliability (CR). The critical threshold of 0.6 to 0.7 is acceptable for exploratory research. However, the value of 0.7 to 0.9 is preferable for advance research. The CR must be higher than 0.6, so to identify the consistency reliability.

The second procedure was to evaluate the convergent validity. In convergent validity, the indicator reliability and average variance extracted (AVE) should be assessed. In order to identify the indicator reliability, the outer loading should be higher than 0.7. However, the value between 0.4 and 0.7 is considered to be retained in the analysis, if deletion of the indicators do not increase the CR and AVE scores, where AVE should be higher than 0.5. The procedure to perform the convergent validity is illustrated in Figure 3.5.

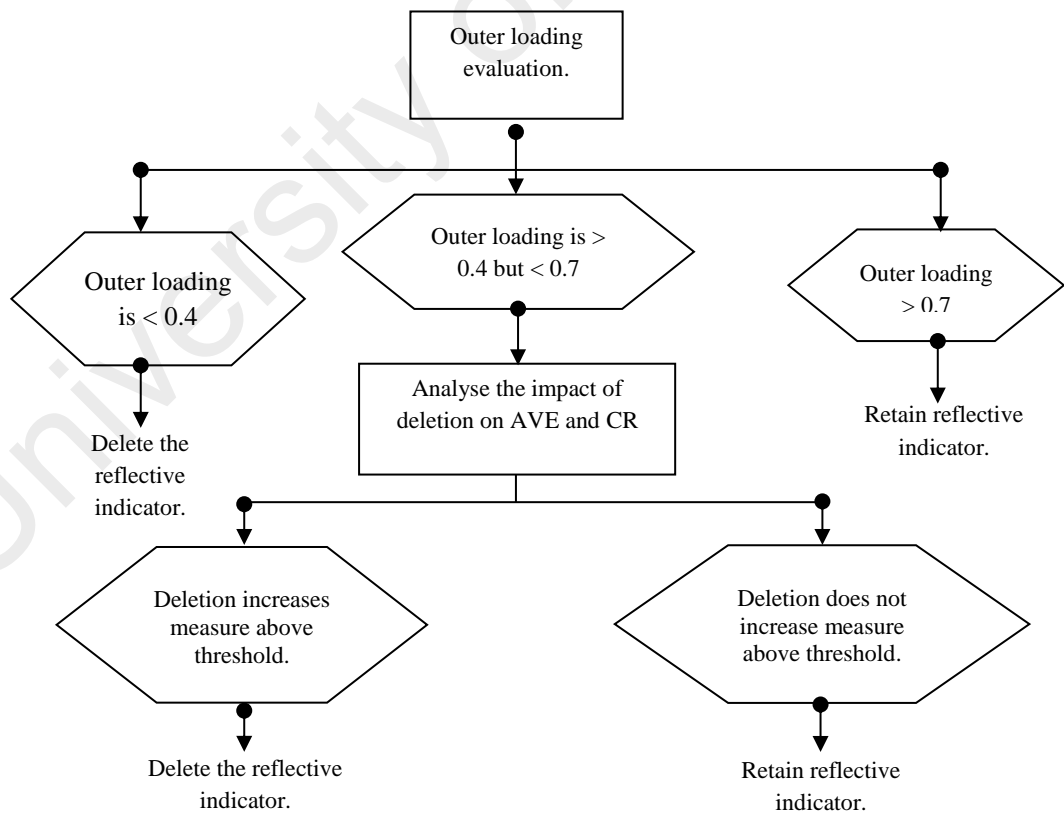


Figure 3.5: Flow of procedure to evaluate the convergent validity (Hair et al., 2016)

The final procedure was to evaluate the discriminant validity. Discriminant validity is the extent to which a construct is truly distinct from the other constructs, by empirical standards. The heterotrait-monotrait ratio (HTMT) approach was used to evaluate the discriminant validity in this study. The value of HTMT should be below 0.85. A value higher than 0.85 indicates a lack of discriminant validity (Hair et al., 2016). The criteria for reflective measurement model is described in Table 3.16.

Table 3.16: The assessments in reflective measurement model (Hair et al., 2016)

Measurement	Purpose	Critical threshold
Internal consistency	To determine whether the items measuring a construct are similar in their score.	Cronbach's alpha should be 0.6-0.9; Consistency ratio (CR) must be higher than 0.6
Convergent validity	To identify the measurement correlated positively with alternative measures of the same construct.	Outer loading should be between 0.4 and 0.7 or higher. AVE > 0.5
Discriminant validity	To confirm that a construct is truly distinct from the other constructs by empirical standards.	HTMT score should be < 0.85

3.5.4.4 Assessing formative measurement

Hair et al. (2016) described that there were three procedures to assess the formative measurement model. The first was to evaluate the convergent validity of the formative measurement. The outer weight should be significant, so its interpretation can be used. However, the outer loading of the formative measurement should be evaluated, if the outer weight was found to be non-significant. Different with the reflective measurement, the critical threshold loading of the formative measurement should be higher than 0.5. The procedure to evaluate the formative measurement model is illustrated in Figure 3.6.

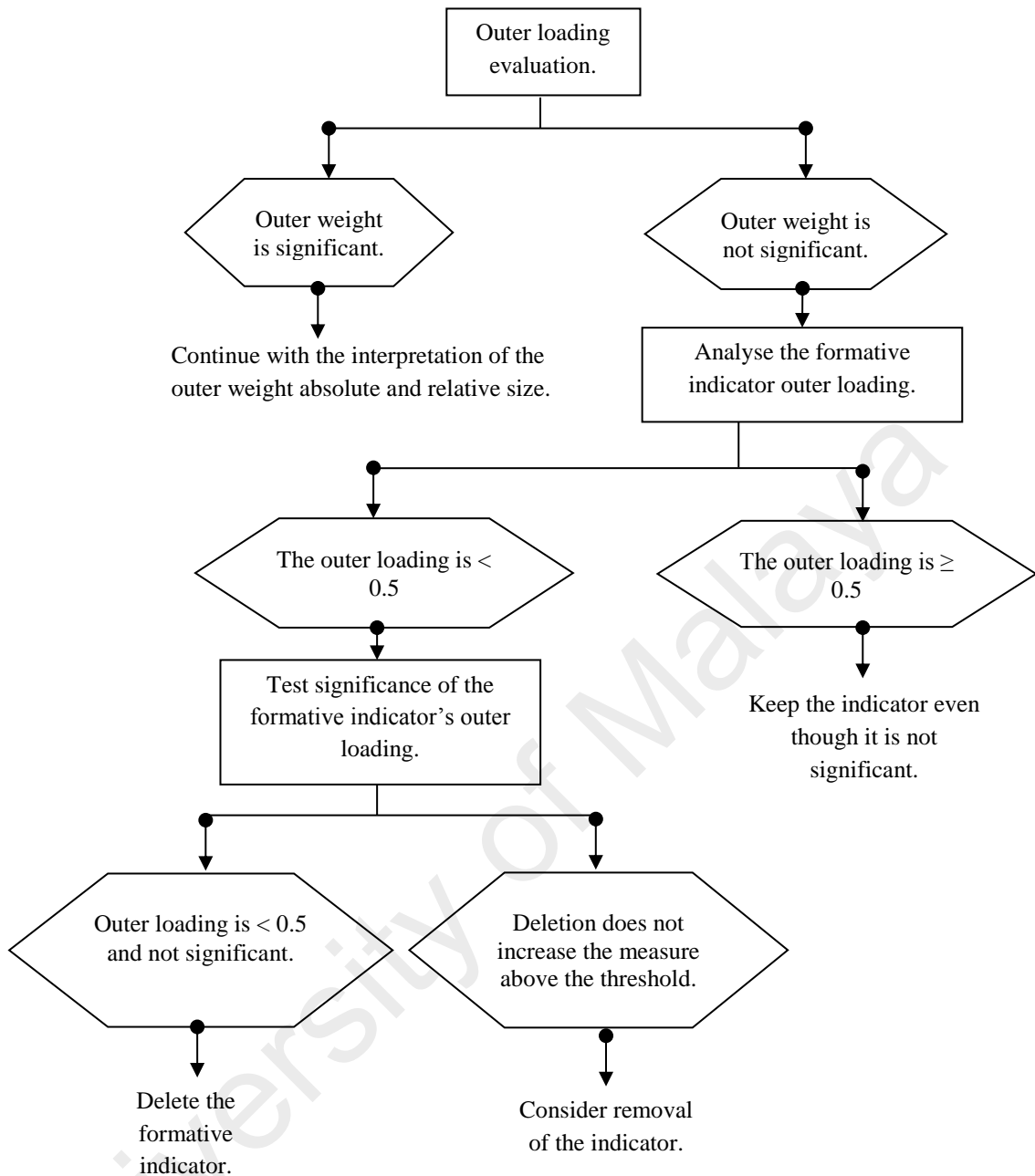


Figure 3.6: Convergent validity procedure for the formative measurement model (Hair et al., 2016)

The second procedure of the formative measurement model was to identify the collinearity issues. Unlike the reflective indicators, high correlations between two formative indicators can prove to be problematic, from the methodological and interpretational standpoints. Thus, to identify the collinearity issues in the formative measurement model, the value of variance inflation factor (VIF) should be less than 5.

The final procedure was to assess the significances and relevancies of the formative indicators. The significances can be identified by running the bootstrapping procedure. If the indicator shows statistical significance of 1 %, 5 %, and 10 % with scores of 2.57, 1.96, and 1.65, respectively, and the loading is higher than 0.5, thus the indicator should be retained. The procedure for assessing the formative measurement model is illustrated in Figure 3.7.

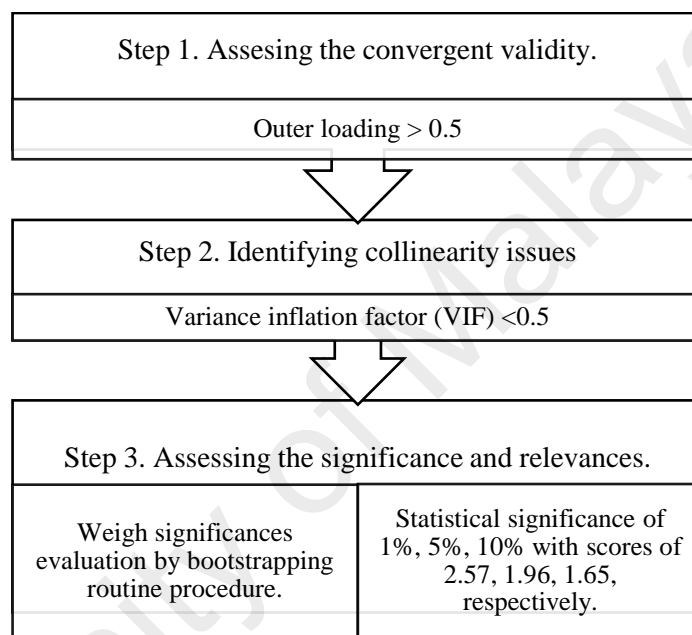


Figure 3.7: Procedure for assessing formative measurement model (Hair et al., 2016)

3.5.5 Assessing structural model

After identifying all the critical thresholds for both the reflective and formative measurements, the final procedure was to confirm the hypotheses development, through structural modeling assessment. There were six steps to evaluate the structural model. The first step was to assess the structural model for the collinearity issues. Similar with the formative measurement, collinearity issues can be identified by looking at the critical threshold of the tolerance value or VIF value, which should be below 0.2 or above 5, respectively.

The second step was to assess the significances of the path coefficient. Path coefficient is the estimated path relationships between constructs in a structural model. They correspond to standardised beta in a regression analysis. This step can be performed by running the bootstrapping routine. In order to get a precise calculation, it was suggested that 5000 bootstrap samples should be performed. The significance level of the path coefficient should be 1 %, 5 %, and 10 % with scores of 2.57, 1.96, and 1.65, respectively. The third step was to test the coefficient of determination (R^2), which is a measure of proportion of an endogenous construct variance that is explained by its predictor constructs. The value of R^2 is dependent on research discipline. The value can be 0.75, 0.50 and 0.25, which are denoted as substantial, moderate and weak, respectively. However, the value of 0.20 is considered as high, in the discipline of consumer behaviour prediction (Hair et al., 2016).

The fourth step was to assess the effect size (f^2) of the model. Effect size (f^2) is a measure to assess the relative impact of a predictor construct on an endogenous construct. The critical threshold of the effect size should be 0.02, 0.15 and 0.35, which are indicated as small, medium and large, respectively.

The fifth step was to evaluate the predictive relevance (Q^2). It is a measure of the model's predictor, to examine whether a model accurately predicts the data that was not used in the estimation of the model parameters. Q^2 values should be higher than 0. If below the critical threshold, the construct is considered as lack of predictive relevance. Q^2 values can be identify by running the blindfolding procedure in the SmartPLS software.

The final step was to evaluate the effect size (q^2). Effect size (q^2) is a measure to assess an exogenous construct's contribution to an endogenous latent variable's Q^2 . The relative predictive relevance for certain endogenous construct should be 0.02, 0.15 and 0.35, which are indicated as small, medium and large, respectively. The steps for evaluating the structural model is illustrated in Figure 3.8.

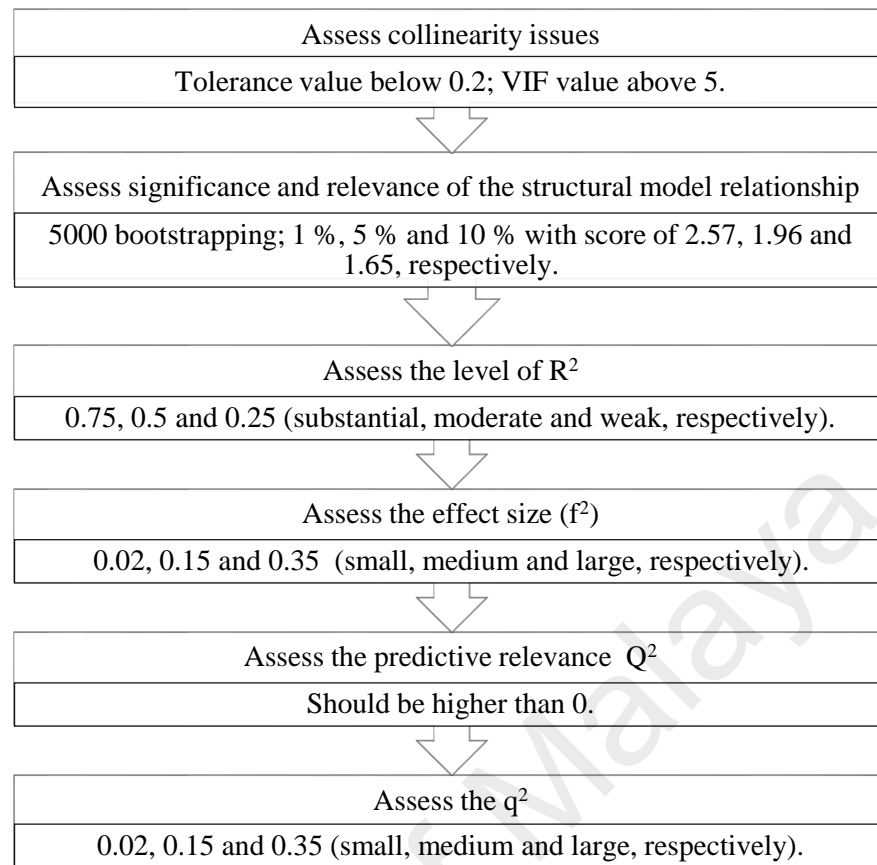


Figure 3.8: Steps to evaluate the proposed structural model (Hair et al., 2016)

Customer preferences can be influenced at different levels of abstraction. Specifically, the customer preferences can be influenced by numerous first-order constructs, as well as the second or higher-order constructs that capture separate attributes of the preferences. High-order or hierarchical component models (HCM) in the PLS-SEM were used in the measurement of the developed model. HCM is the higher-order structures (mostly considered as the second-order), that contain several layers of constructs and involve a higher level of abstraction (Hair et al., 2016). Hair et al. (2014) explained that by establishing the HCM, a researcher can reduce the number of relationships in the structural model, making path model in the PLS-SEM more parsimonious and easier to understand. HCM has two components, i.e. lower-order component (LOC) which captures the subdimensions of the abstract entity, and higher-order component (HOC) which represents the more abstract entity. In order to develop the HOC's measurement

model, all indicators from the LOC should be allocated to the HOC. This is called as the repeated indicator approach.

There are four types of HCM structures, i.e. reflective-reflective, reflective-formative, formative-reflective and formative-formative. The types of HCM are illustrated in Figure 3.9.

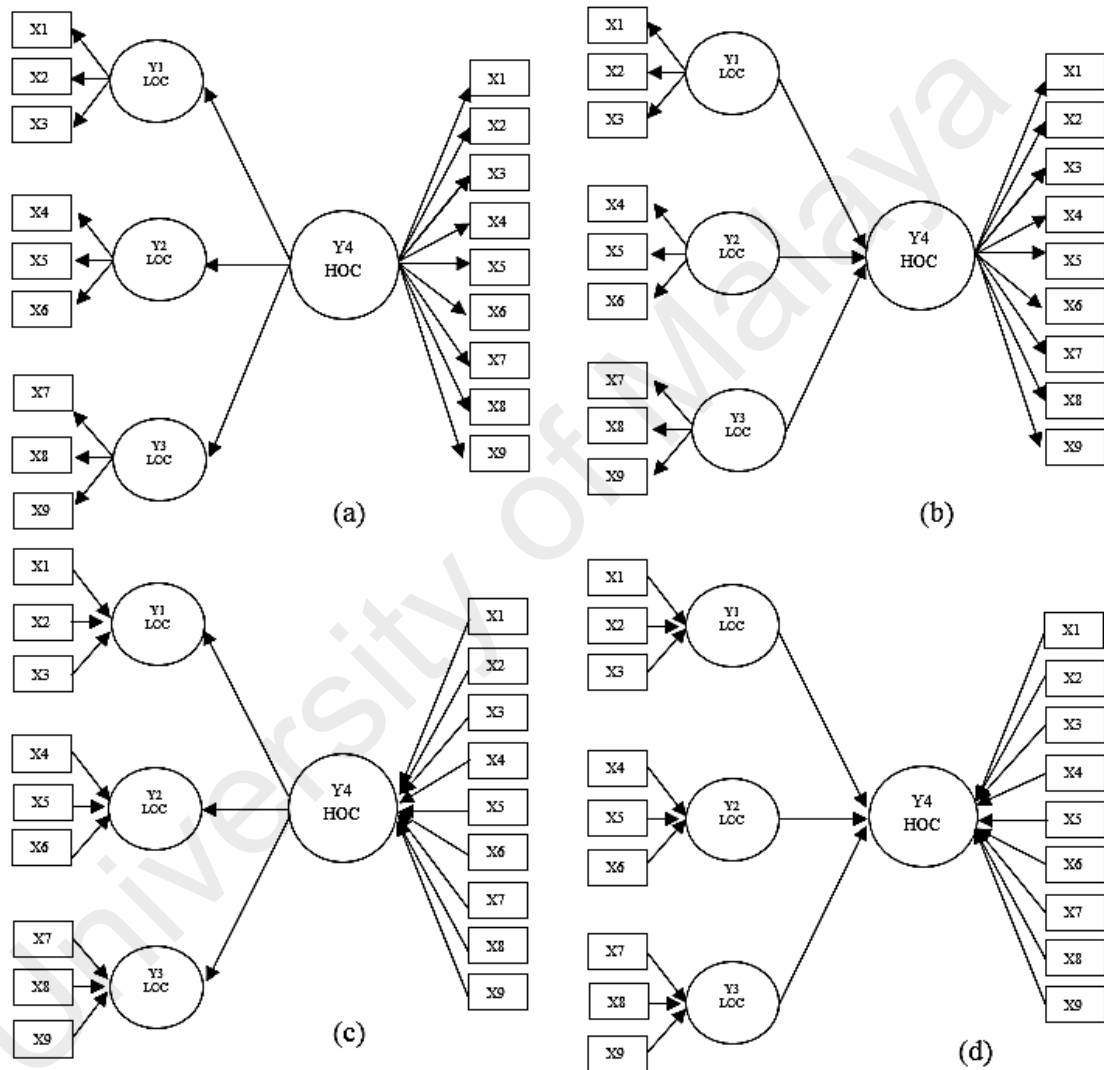


Figure 3.9: The types of hierarchical component model. (a) Reflective-reflective, (b) reflective-formative, (c) formative-reflective, and (d) formative-formative (Hair et al., 2016)

The other approach to simplify the relationship of structural model and path measurement for the HCM analysis was the two-stages approach (Hair et al., 2014). This approach uses

latent variable scores of constructs in the LOC, then applies it as the manifest indicators in the HOC. The two-stage analysis is illustrated in Figure 3.10.

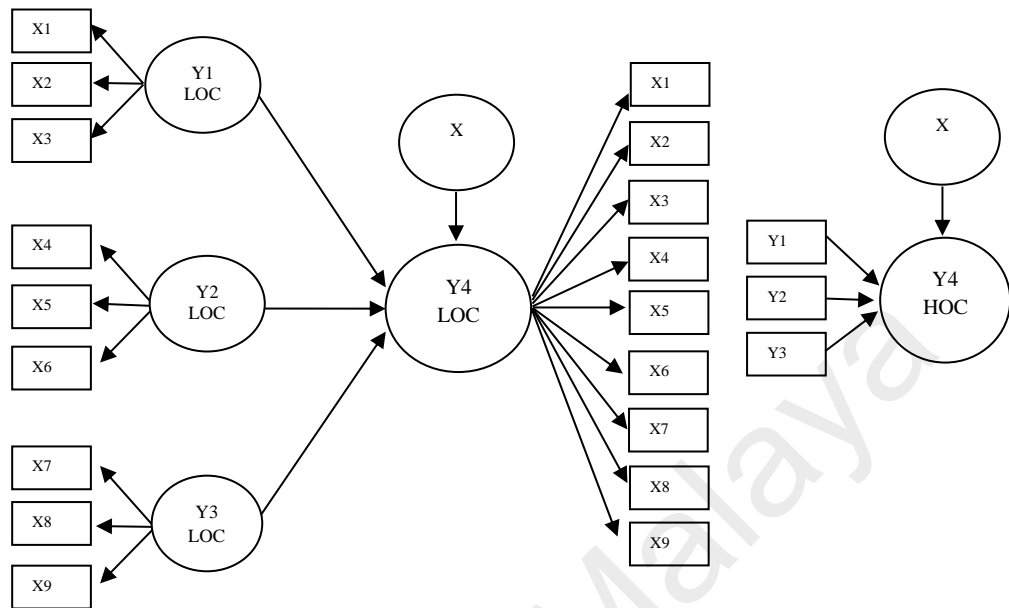


Figure 3.10: The two-stages approach for the HCM analysis (Hair et al., 2016)

In Figure 3.10, the constructs of Y1, Y2 and Y3 were simplified into new indicators, by extracting the calculation of the latent variable score. This approach was used to make the model easier to be understood.

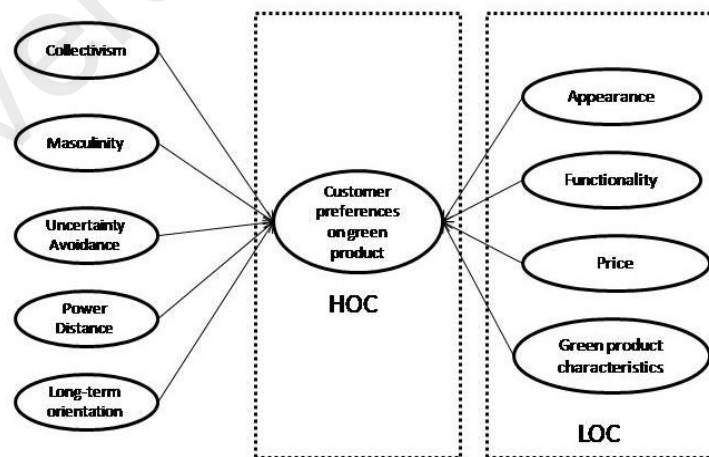


Figure 3.11: The HOC-LOC classification

As illustrated in Figure 3.11, there is one construct which is considered as the second-order construct, i.e. customer preferences on green product. This construct was identified as the second or higher-order construct (HOC), since the customer preferences still have one layer of subconstruct or lower-order construct (LOC). The LOC of the customer preferences consist of product appearance, functionality, price and green product characteristics. Thus, to identify the relationship between the LOC and HOC, all indicators of the LOC were manifested as the indicator in the HOC. This is also called as the repeated indicators in the HCM. Before calculating the measurement model, it should be clearly evaluated whether the measurement model criteria was formative or reflective. This is because, many other researchers have incorrectly applied the reflective measurement model to evaluate the quality of the developed model (Hair et al., 2014). Reflective-formative measurement model was used to analyse the cultural value and customer preferences constructs. The indicators for the five cultural dimensions were classified as reflective measurement model, since they were highly correlated to predict the cultural dimensions. Thus, changing and deleting the indicators did not significantly alter the meaning of the constructs of the cultural dimensions. The constructs of product appearance, functionality, price and green product characteristics, were considered as LOC, while customer preferences on green construct was considered as HOC. The classification of construct measurement is illustrated in Figure 3.12.

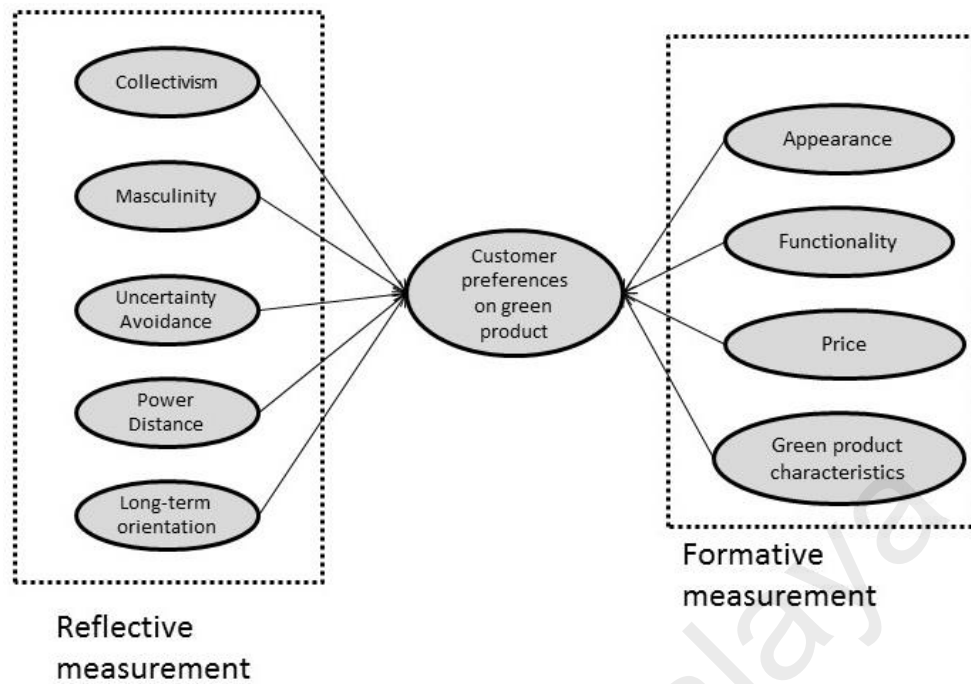


Figure 3.12: The classification of construct measurement

The indicators of appearance, functionality, price and green product characteristics were classified as formative measurement model, since they were not expected to be highly correlated. Thus, deleting the indicators will alter the meaning of the constructs. The output of formative indicators, such as appearance, functionality, price and green product characteristics were expected as the weight of indicator in the measurement.

3.5.6 Identifying the customer preferences

In SEM, the outer weight is used to indicate the absolute contribution of an indicator to the assigned construct (Hair et al., 2014). The outer weight from the SEM was considered to be more valid rather than using the mean of questionnaire or average approach. The relationships between indicators and constructs, and among constructs, can be analysed simultaneously, while the measurement error can be identified and the result of the SEM can be used for future research. Some studies, e.g. Punniyamoorthy et al. (2012), Jakhar

and Barua (2013), and Maitra and Dominic (2012), used the outer weight from the SEM to identify a specific rank of characteristics that they wanted to evaluate.

In this study, the preferences on green product considering the cultural value influence, was identified based on the calculation of the outer weight in the indicator of the green product characteristics construct. However, to ensure the accuracy of the provided outer weight, all validation criteria of the structural model evaluation must first fulfil the requirement of the critical threshold.

3.6 Data collection on designers

In order to develop a guideline for cultural influences consideration in designing the green product, the data collection and validation of the applicability of the proposed guideline from the designers should be performed. This is because, the influence of cultural values not only proved to have significant influence towards the customer preferences, but can also influence the process of designing the product (Salmi & Sharafutdinova, 2008). The customer preferences was considered as an important aspect, which should be determined in the early stage of the product design (Ulrich & Eppinger, 2008).

A qualitative study was performed in order to identify the strategies and cultural consideration in the development of the green product. A qualitative study is a research strategy that usually emphasizes the words, rather than quantification in the collection and analysis of the data (Bryman & Bell, 2012). A semi-structured interview was performed on the designers, to get their perspectives regarding the strategies and cultural consideration in designing the green product. A semi-structured interview allows flexibility for the interviewer, when asking the questions. The questions can be modified when conducting the interview, in a manner that fits the perspectives of the interviewer, so as to achieve the research objectives (Walliman, 2005). The questions was prepared in two main sections, i.e. perception on green product strategies, and perception on cultural

consideration in designing the green product. The questions for the interviews are presented in Table 3.17.

Table 3.17: Questions for the interview

Questions
Green product section
1. What is your opinion about green product?
2. What are green characteristics that should be considered in your design?
3. In your opinion, what are possible strategies that can be used to incorporate those green characteristics?
Culture section
4. Do you think cultural values can influence customers' choice on green product?
5. Will cultural value be useful to support the development of green product? Why?
6. Do you use any techniques to capture cultural values when designing the green product? If yes, please explain.
7. Do you think that techniques incorporating cultural values need to be developed to support green product development?
8. In your opinion, how can cultural values be included in designing the green product?
9. In which phase should cultural values be incorporated to support the green product development? Why?

There were two methods to conduct the interview, i.e. face-to-face and telephone interviews (Sekaran & Bougie, 2010). Both of these methods have their own advantages and disadvantages. The advantages and disadvantages of the face-to-face and telephone interviews are described in Table 3.18.

Table 3.18: The advantages and disadvantages of the face-to-face and telephone interviews (Sekaran & Bougie, 2010)

Face-to-face interview	Telephone interview
<p>Advantages</p> <ul style="list-style-type: none"> • Doubt when answering the questions can be properly understood. • Non-verbal cues can be identified, such as discomfort or stress, body language when answering the questions. <p>Disadvantages</p> <ul style="list-style-type: none"> • Geographical limitation. • Costly. • Respondent might feel uneasy about anonymity. 	<p>Advantages</p> <ul style="list-style-type: none"> • A number of different people can be reached including across the country. • Short period of time. • Discomfort of respondent can be eliminated. <p>Disadvantages</p> <ul style="list-style-type: none"> • Respondent can easily terminate the interview without warning. • Interviewer cannot achieve non-verbal communication.

Telephone interview was selected to obtain the designers' perspectives. This is because, the designers as professional engineers, have limited time to be directly interviewed. In addition, the designers can decide when is the best time to give their answers, by doing the interview in their free time, without compromising their productive time. Five designers from different profiles were interviewed. This number was determined based on the saturation of the answers that were given by the designers. Saturation is achieved when the answers from the respondents have reached a similar pattern, and no longer offer any new perspectives (Dworkin, 2012). Appointments were made in order to know when the designers have time and ready to be interviewed. The interview was conducted about 20 to 30 minutes on the average, for each designer. According to Walliman (2005), the duration of about 20 to 30 minutes is accepted, as the maximum duration of the interviews.

3.6.1 Analysis for interview data

A content analysis was adopted to evaluate the data obtained from the designers. Content analysis is an approach to analyse the documents and texts, which may either be visual or printed (Bryman & Bell, 2012). According to Bryman and Bell (2012), the content

analysis is useful to seek and quantify the content, in terms of predetermined categories, and in a systematic and replicable manner. The content analysis was focused on several categories variables, i.e. green product characteristics that were explained by the designers, green product characteristics implemented in their design, and cultural consideration in designing the green product. Once the pattern of answers has been indicated, the next step was to conclude the green product characteristics that were suggested by the designers and the approaches for the incorporation of cultural value consideration in designing the green product. The data collected from the customers and designers were set as the input of the guideline. The development of guideline is presented in Section 3.6.2.

3.6.2 Guideline development

The purpose of the guideline was to help the designers in designing the green product that was appealing to the customers. Therefore, three sources of data were required for the development of the guideline, i.e. customers' perspectives, designers' perspectives and literature analysis. The input data from the customers' was the identified cultural value influences on the green product preferences, while the input data from the designers were the strategies in designing the green product and their perspectives on the cultural value consideration in designing the green product. The input from the literature was also needed to explore in more detail of the strategies which have been obtained from the designers. After the three data have been obtained, the next step was to generate the proposed approach and strategies to incorporate the cultural value influences into the design of the green product. The flow of guideline development is illustrated in Figure 3.13.

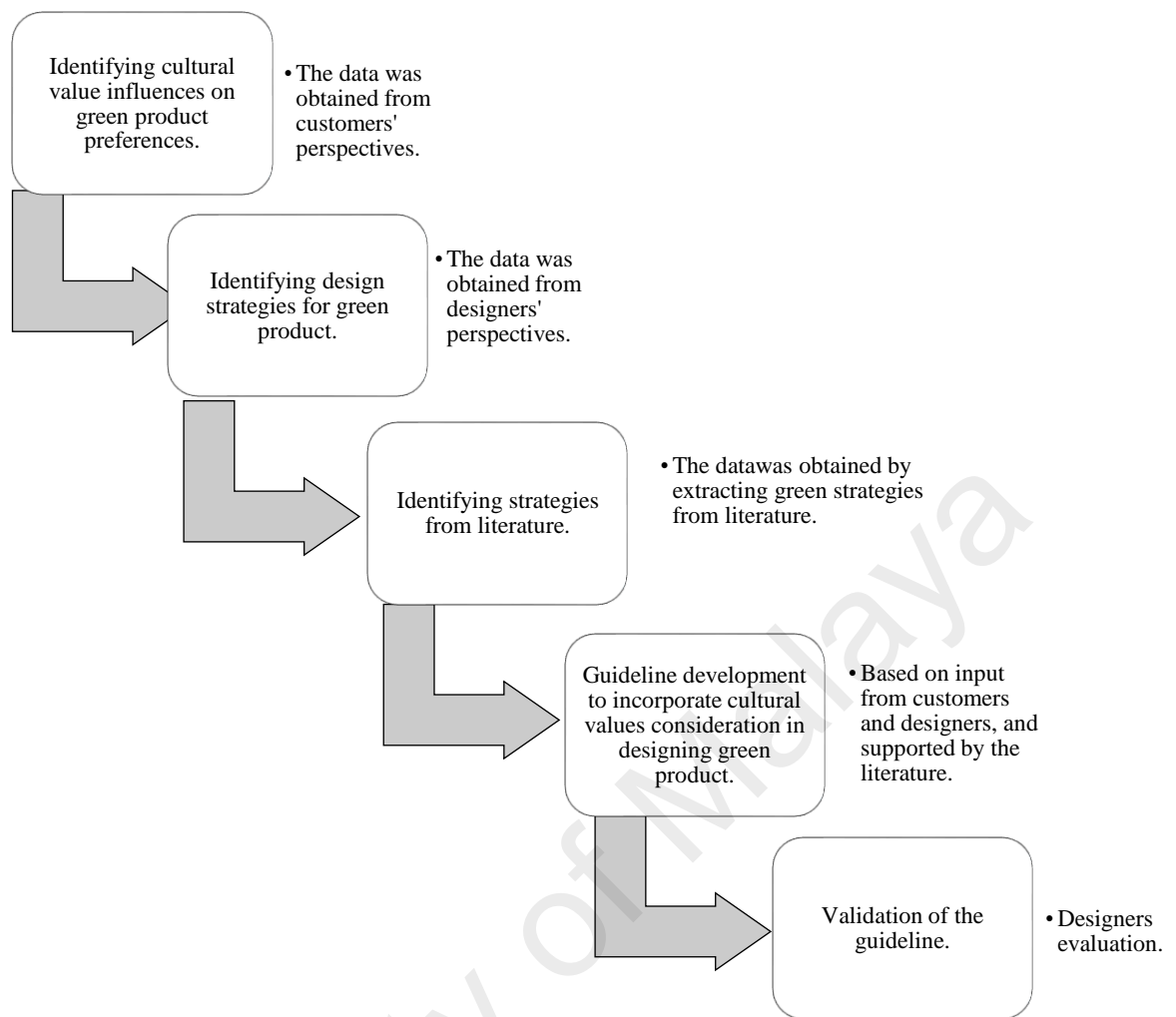


Figure 3.13: The flow of guideline development

Once the proposed guideline has been completed, the next step was to validate the applicability of the guideline. The procedure of guideline validation is presented in Section 3.6.3.

3.6.3 Validation of the guideline

The proposed guideline was developed based on the identified cultural value influences towards the green product preferences from the customers' perspectives data, green design strategies from the designers' perspectives data, and the literature analysis. However, the findings of the identified cultural value influences towards the green

product preferences were still considered as a prediction, which were statistically measured based on the SEM results. In addition, the strategies that were collected from the designers may also provide different perspectives to the other designers. Therefore, to confirm the applicability of the proposed guideline, a validation from the viewpoint of practices was required.

The validation of the proposed guideline was conducted by performing a case study to identify the applicability of the proposed design strategies that were provided in the guideline to the practices. According to Yin (2003), a case study was very useful to investigate the phenomenon within a real-life context, and which are not clearly evident. Some important considerations when implementing the case study are presented in Table 3.19.

Table 3.19: Important consideration in the case study method

Important consideration	Description
Focus	<ul style="list-style-type: none"> - Current phenomenon within a real-life context. - Boundaries between phenomenon and its context are not clearly evident.
Method	<ul style="list-style-type: none"> - Qualitative, quantitative or both.
Type of case studies	<ul style="list-style-type: none"> - Explanatory, exploratory and descriptive.
Designs	<ul style="list-style-type: none"> - Single or multiple case study.
Data sources	<ul style="list-style-type: none"> - Documents (letters, agendas, progress reports). - Archival records (service records, organizational charts, budgets etc.). - Interviews (typically open-ended, but focused, structured and surveys are possible). - Direct observations (formal or casual; useful to have multiple observers). - Participant observation (assuming a role in the situation and getting an inside view of the events). - Physical artefacts.

A survey through the distribution of questionnaire was chosen for the data collection in the case study. According to Chua (2012), the data collection for a research survey can be classified into two instruments, i.e. questionnaires and interviews. In this section, the objective was to validate the findings of the statistical calculation in the SEM, of the

guideline proposed for the design of the green product considering the cultural value influences. The evaluation of the guideline was obtained from the designers' consideration as the practices expert. The questionnaire was distributed through electronic mail (e-mail). This is because, the validation of the guideline was obtained from Indonesia and Malaysia as the location of the case study, and since the input of the guideline was also obtained from these two countries. According to Walliman (2005), the questionnaire survey using email was a useful approach to obtain the data for international subjects.

3.6.3.1 Design of questionnaire

The questionnaire was classified into two sections. The first section consists of a cover letter and profile of the respondent, which contains the company name, years of experience as a professional designer, types of designed product and target market, i.e. local, international or both. The second section consists of a list of questions to identify the strategies and substrategies in designing the green product, while considering the cultural value influences. A brief introduction of the study and a clear questionnaire instructions should be prominent in the questionnaire (Miller, 2010). A guideline on how to fill in the questionnaire and the definition of the identified cultural value dimensions were provided accordingly, in the preface of the second section.

The questions in the questionnaire can either be non-structured, semi-structured or structured (Walliman, 2005). This study used the structured questions to ease the designers in answering the provided questions. According to Yin (2001), the sources of data for the case study can be obtained by using a structured survey. The designers were required to pick either they 'agree' or 'disagree' with the statements in the questionnaire, and 'yes' or 'no' in the evaluation section. The designers can also include additional input containing their suggestion on each item, in the provided column. On the last part of this

section, the designers were asked to give their viewpoints to evaluate the proposed guideline. A question to evaluate the proposed guideline is described as follows:

Based on your experiences, do you think the national culture of the customers should be considered in designing the product?

The purpose of this question was to obtain the designers viewpoints on whether the cultural value influences were important or not in designing the green product. The designers were required to answer either 'yes' or 'no' in the provided column. The designers can also fill the provided column, with any additional comments regarding the question.

Do you think the developed guideline provide some valuable information to support the development of the green product?

This question was important to identify the applicability of the proposed guideline. Similar with question 1, the designers were required to answer either 'yes' or 'no' in the provided column. The designers can also fill the provided column for any additional comments regarding the question.

Based on your experiences, the guideline may be helpful in which design process?

You can choose more than one answer.

According to Ulrich and Eppinger (2008), there were six steps of product design and development. The steps include identifying the customer's needs, establishing a target specification, generating product concepts, selecting a product concept (alternative),

testing the product concept and setting the final specification. The objective of this question was to identify in which process the proposed guideline can be involved. The designers were allowed to select more than one answer.

Considering your experience as a designer, what are the things that can be improved in the guideline?

In order to increase the quality of the proposed guideline, feedbacks, e.g. comments or recommendations from the designers, were necessary to be obtained. This question was used to give the opportunity to the designers, for any comments or recommendations regarding the overall content of the proposed guideline. The full set of questionnaire used in the validation, is presented in Appendix D.

3.6.3.2 Participants

One of the expected contributions in this study was to assist the designers in evaluating their designs while considering the green characteristics and cultural value influences. Therefore, the data used in the validation process was collected from the designers who were considered as practice experts on product design and development. The criteria of a participant (designers) include: (1) working in a Malaysian or Indonesian company since the proposed guideline was generated, based on the customers in Malaysia and Indonesia; (2) should have several years of experience as professional designers; and (3) the market of product should at least be for Malaysia or Indonesia. A total of twelve professional designers from Malaysia and Indonesia with different background, were inquired to give their evaluations regarding the guideline development. According to Eisenhardt (1989), the number between four and ten respondents were adequate to be used in a case study.

3.6.3.3 Product stimuli

There was no specific product used as stimuli in this study. The validation phase was focused on the evaluation of the proposed guideline, which consist of the green product strategies with the consideration of cultural value influences. The designers were asked to fill in the guideline by referring to the product that was designed by them.

3.7 Research quality

In order to ensure the quality of a research, the researcher needs to clearly judge and justify that all process involved in the research should consider its standard accuracy (Singh, 2006). According to Yin (2009), the research design should be clearly decided by considering the quality of the logical statement of any certain tests that have been adopted in the research. Thus, to achieve the research aim and objectives in this study, the research design was classified into quantitative and qualitative.

In order to achieve the research quality for a quantitative study, there were several factors that should be clearly considered by the researcher, i.e. reliability, validity, controllability, repeatability, relevancy or testability, accuracy and generalisability (Jonker & Pennink, 2010). The researcher needs to ensure that all the measurements were reliable and valid; however, the judgment of reliability and validity should be supported by a strong argument based on theory (Thomas, 2006). The quantitative study should also be controllable, where the transparency of procedures in the data collection should be conducted in a correct way, reliable and trustable. In addition, the researcher also need to make sure that the relevancies and accuracy of the data analysis, and for whom the contribution of the research findings can be relevant (Jonker & Pennink, 2010).

The quantitative study in this research was concerned to identify the customers' cultural orientation and their preferences on the green product characteristics. The data collection for this phase was conducted by delivering the questionnaire survey. In order to confirm

the reliability and validity of the questionnaire, both pre-test and pilot study of the questionnaire were performed before the real survey was conducted. The questionnaire was also prepared in Bahasa Indonesia to anticipate the respondents who prefer to use the language. An expert who has specialisation in Bahasa Indonesia was invited to ensure the relevancy and quality of the translated materials in the questionnaire. Sample frame, sample size and access to the samples were also clearly determined, to ensure the quality criteria for data collection were achieved. Several layers of validation by referring to the theory in statistical analysis, should be performed to ensure the validity and reliability of the data analysis. This includes the data adequacy and reliability test, missing value treatment, EFA, CFA and structural equation modeling. The findings of this quantitative study can be used as the input of the proposed guideline, to assist the designers in designing the green product while considering the cultural value influences.

A high quality qualitative study should also be performed in this study. The quality of a qualitative study can be indicated by evaluating the validity and reliability (Babbie, 2010). The quality in qualitative paradigm can be conceptualised by identifying the validity and reliability, to ensure the trustworthiness and authenticity of the findings (Golafshani, 2003). Qualitative validity also called as credibility, refers to the accuracy of the findings that a researcher should check, by conducting certain procedures, while qualitative reliability also called as dependability means that a particular approach was consistent across different researchers and projects (Babbie, 2010). There were eight strategies to enhance the ability of assessing the accuracy of the qualitative research findings, i.e. triangulation, member checking, thick description, clarifying the bias, presenting negative or discrepant information, spending prolonged time in the field, use peer debriefing and use an external auditor (Creswell, 2009).

Three out of eight strategies have been performed in this research to identify the accuracy of the findings, i.e. peer debriefing, member checking and clarifying the bias. Peer

debriefing and member checking strategies were used by asking another experienced qualitative researchers to check and evaluate all the approaches which have been applied in this study. The purpose of using member checking (also called as respondent validation) was to determine the accuracy of the findings, based on the evaluation of the other researchers with similar experiences or characteristics (Ritchie et al., 2013). In order to reduce the bias, the definition of cultural dimensions was briefly described, and the findings of the identified cultural orientation of customers on the green product were explained to the designers, before the main questions of the interview were given to them. Thus, to convey the findings of this research, this study proposed a guideline which focused on incorporating the cultural values consideration in designing the green product. Qualitative reliability means that a particular approach with a degree of consistency, were assigned to the same category, by different or same researchers, in a different time (Silverman, 2013). Checking the transcript and confirming that no obvious mistakes have been introduced during the transcription process, and makes memos or important notes about specific meaning of the codes, were two approaches to ensure the reliability of a qualitative study (Creswell, 2009). In this study, the answers that were given by the designers in terms of the strategies for designing the green product and cultural values consideration in designing the green product, were recorded and carefully listened. The recorded files that were obtained from the designers were transformed into a transcript. The recorded answers from the designers were repeatedly listened, to increase the understanding of the data. The content analysis was performed to evaluate the designers' perspectives on the green product design strategies and cultural values consideration in designing the green product.

3.8 Summary

The purpose of this chapter was to elaborate the overall method used in identifying the influence of cultural values towards the customer preferences on the green product. Thus, to achieve the aim and objectives of this research, this study was classified into two major sections. Firstly, the focus of the study was to identify both the relationships of the cultural value influence towards the customer preferences on the green product, and the customer preferences on the green product characteristics. The method used for the data collection and analysis have been clearly described. The identification of both the cultural value influences on the green product preferences and the preferences on green product characteristics while considering the cultural value influences, have indirectly resulted in the achievement of the third research objective. Secondly, the results of both the identified cultural value influences on the customer preferences for green product and preferences on the green product characteristics, were still considered as a prediction, which was generated from statistical computation. Therefore, these results were validated in order for it to be practiced. A guideline for considering the cultural value influences in designing the green product was developed based on the input of these two results. The designers were selected as experts to evaluate the proposed guideline. The achievement of this validation was focused to address the fourth research objective. The implementation of the methodology explained in this chapter, was described in Chapter 4.

CHAPTER 4: IDENTIFYING CULTURAL INFLUENCES

4.1 Introduction

This chapter was classified into two main sections. In the first section, the process analysis to identify the cultural value influences towards customer preferences on the green product characteristics were explained. The data collected from the customers' perspectives were used for this analyses. The analyses which were descriptive include, the profile of respondent, missing data treatment, sample adequacy, and evaluation of the data reliability. Once these analyses were sufficient, the next step was to evaluate the hypotheses. The influences of the five cultural dimensions, i.e. collectivism-individualism, masculinity-femininity, uncertainty avoidance, power distance, and long-short term orientation, towards the customer preferences on the green product were tested by looking at the critical threshold of significances level, as recommended for statistics calculation. The preferences on green product characteristics can be identified based on the calculation of the output of the outer weight for the green product characteristics construct. However, all critical thresholds for the structural model should first be confirmed and validated. In the second section, the analysis process for identifying the cultural value influences on the green product development were explained. The data was collected from the designers for this analysis. Designers of various profiles were interviewed, in order to identify their perspectives on the green product design, and the consideration of cultural value in designing the green product.

4.2 Customer perspective

4.2.1 Descriptive analysis

This study was conducted in Indonesia and Malaysia. The sample size was determined based on rule of thumb that was suggested by Cohen (1992), since the profile and population of respondents in both countries who prefer green product and were considered as customers were unknown. With 80 % statistical power, the minimum sample size required was determined based on the maximum number of arrowheads that point to the latent variables of the developed model. In this study, there were nine arrowheads that point to the latent variables; five from the cultural dimensions construct (i.e. collectivism, masculinity, power distance, uncertainty avoidance and long-term orientation), and four from the preferences on green product construct (i.e. appearance, functionality, price and green product characteristics). For these nine pointing arrowheads, the minimum sample size required was 247 samples with minimum of 0.10 R^2 . A total of 1256 questionnaires from both countries were collected, with 641 from Indonesia and 615 from Malaysia. A total of 208 respondents were deleted as the data were found to be incomplete. Thus, the number of sample size was satisfactory for the measurement, because the threshold requirement was exceeded.

The descriptive result for Indonesia showed that the respondents comprised of 373 males (58.2 %) and 268 females (52.8 %), 436 of the respondents (68.0 %) were in the age range of 16 to 24 years old, followed by 125 (19.5 %) in the age range of 25 to 34 years old, 48 (7.5 %) in the age range of 35 to 44 years old, 29 (4.5 %) in the age range of 45 to 54 years old, 2 (0.3 %) in the age range of 55 to 64 years old, and 1 (0.2 %) above the age of 65 years old.

For Malaysia, the respondents comprised of 206 males (33.5 %) and 409 females (66.5 %), 26.7 % of the respondents were in the age range of 16 to 24 years old, followed by

44.4 % in the age range of 25 to 34 years old, 21.6 % in the age range of 35 to 44 years old, 6.0 % in the age range of 45 to 54 years old, 1.1 % in the age range of 55 to 64 years old, and 0.2 % above the age of 65 years old. More details of the respondent profile, such as marital status, education level and income ranges are described in Table 4.1.

Table 4.1: Demographic profile of respondents

Demographic		Indonesia		Malaysia	
		Freq	%	Freq	%
Gender	Male	373	58.2	206	33.5
	Female	268	41.8	409	66.5
Age	16 – 24	436	68.0	164	26.7
	25 - 34	125	19.5	273	44.4
	35 - 44	48	7.5	133	21.6
	45 - 54	29	4.5	37	6.0
	55 – 64	2	0.3	7	1.1
	> 65	1	0.2	1	0.2
Marital Status	Single	486	75.8	351	57.1
	Married	155	24.2	264	42.9
Education Level	Elementary School	17	2.7	0	0.0
	Junior High School	42	6.6	1	6.6
	Senior High School	380	59.3	14	59.3
	University	202	31.5	600	31.5
Range Income Per Month	<Rp. 1.000.000 / < RM 999	424	66.1	193	31.4
	Rp. 1.100.000 - Rp. 2.000.000 / RM 1000 - RM 1999	105	16.4	71	11.5
	Rp. 2.100.000 - Rp. 3.000.000 / RM 2000 - RM 2999	35	5.5	101	16.4
	Rp. 3.100.000 - Rp. 4.000.000 / RM 3000 - RM 3999	21	3.3	77	12.5
	Rp. 4.100.000 - Rp. 5.000.000 / RM 4000 - RM 4999	9	1.4	55	8.9
	>Rp. 5.000.000 / > RM 5000	47	7.3	118	19.2

4.2.2 Research quality for quantitative: overview

In order to ensure the research quality of a quantitative study, especially to identify the influence of cultural values towards the customer preferences on green product, there were three important stages that a researcher should perform (i.e. EFA, CFA and structural model). Before conducting the CFA, the EFA should first be performed due to these three reasons. First, the items in Section 3 were general preferences, such as appearance, functionality and price, and in Section 4 were the items on green product characteristics. Second, the validated scale in Section B, was tested in different countries. Third, the CVSCALE was also translated into Bahasa Indonesia. These three conditions may affect the pattern of each item used in the questionnaire. A total of 641 questionnaires from Indonesia and 615 questionnaires from Malaysia have been clustered into two

groups, i.e. 320 for EFA and the remaining 321 for CFA for Indonesia, and 300 for EFA and the remaining 315 for CFA for Malaysia.

4.2.3 Missing value analysis

The missing values were indicated during computation. Missing values may reduce the precision of the calculated statistics, since there was less information than what was originally planned. Hair et al. (2016) explained that if the missing values exceeded 15 %, the researcher should consider a case-wise deletion, which involve removal of the observation from the data file. If the values were less than 15 %, the researcher can still consider to use the observation, by performing the missing value treatment. In this study, it was found that some respondents did not filled in some of the questions accordingly, however the missing values were less than 15 %. Missing value treatment by implementing expected maximization (EM) to solve the missing values has been performed in the analysis.

4.2.4 Sample adequacy and reliability analysis

Although the sample size was decided by following the rule of thumb that was suggested by Cohen (1992), large sample size may be possible to reduce the data reliability for further analysis. Therefore, to ensure the collected data was reliable and can be used for further analysis, the sample adequacy should be established. The result of the sample adequacy and reliability analyses are shown in Table 4.2.

Table 4.2: Sample adequacy and reliability test

Measurement		Indonesia	Malaysia
Keiser-Meyer-Olkin (KMO) of sampling adequacy		0.906	0.908
Bartlett's test of sphericity	Approx. Chi square	8308.13	10994.20
	Df	1225	1225
	Sig	0.000	0.000
Cronbach's alpha		0.880	0.923

KMO should be > 0.5; Bartlett's should be significant, $p < 0.001$, Cronbach's alpha > 0.7

The KMO of sampling adequacy was 0.906 for Indonesia, and 0.908 for Malaysia. The calculated Bartlett's test of sphericity were significant with the approximation of chi-square of 8308.13 ($df = 1225$, $p < 0.001$) for Indonesia, and 10994.20 ($df = 10994.202$, $p < 0.001$) for Malaysia. The Cronbach's alpha was 0.880 for Indonesia and 0.923 for Malaysia. Based on these calculations, the KMO, Bartlett's test of sphericity and Cronbach's alpha exceeded the critical threshold, where KMO should be > 0.5 , Bartlett's test sphericity should be significant which is < 0.001 , and Cronbach's alpha should be > 0.7 (Hair et al., 2006). Thus, the sampling used in Indonesia was indicated as a superb sampling adequacy (Field, 2009), while the Bartlett's test of sphericity and Cronbach's alpha specified that the correlations between the variables and data reliability were satisfactory for further analysis.

4.2.5 Exploratory factor analysis

Factor analysis was performed using the principle components and varimax rotation method. Testing of the rotated loading component of each item was suppressed above 0.3, and the communality should be > 0.5 (Hair et al., 2006). The following Table 4.3 is presented to show the factor loading of items for each construct.

Table 4.3: Factor analysis result

Construct	Items used in the questionnaire	Items	Factor Loading	
			Indonesia	Malaysia
Appearance	The colour of product (e.g. bright, dark colour oriented).	App1	0.77	0.821
	Shape of product (e.g. round oriented or rectangular oriented).	App2	0.78	0.832
	Size of product (e. g. small, medium or big size).	App3	0.83	0.761
	Texture of product (Smooth, rough).	App4	0.69	0.762
	Style of product (e.g. modern or classic).	App5	0.60	0.708
	Brand of the product.	App6	0.63	0.804
	Packaging appearance (e.g. information of the product features or specifications).	App7	0.62	0.435
Functionality	The easiness in using the product.	Funct1	0.72	0.730
	Additional functions embedded in the product (multifunction).	Funct2	0.65	0.475
	Safety when using the product.	Funct3	0.74	0.681
	Usefulness of the product functions.	Funct4	0.82	0.762
	Clear information on how to use the product.	Funct5	0.79	0.746
Price	The fairness between price and product quality.	Price1	0.59	0.677
	Sacrifice for paying higher price to get branded product.	Price2	0.85	0.730
Green product characteristics	Energy efficiency for energy-based product (e.g. Electricity, water, fuel consumption, etc.).	GPC1	0.61	0.609
	Reduction in size and weight of the product to conserve natural resources used in the manufacturing process.	GPC2	0.63	0.624
	Eliminate or reduce harmful material (e.g. Avoiding the use of toxic materials in the product).	GPC3	0.61	0.683
	Using recyclable material, the material can be recycled for many times (e.g. recyclable plastic, computer paper, etc.) to conserve natural resources.	GPC4	0.54	0.848
	Easy to reuse, the customer can sell the product as a second-hand product or used in other functions to reduce waste generation.	GPC5	0.45	0.758
	Using recycled material, to save natural resources and reduce waste into the environment.	GPC6	0.67	0.859
	Easy to maintain, customer can do self-maintenance, such as cleaning, repairing to extend product lifetime.	GPC7	0.55	0.738

Table 4.3, continued

Construct	Items used in the questionnaire	Items	Factor Loading	
			Indonesia	Malaysia
Green product characteristics	Providing product service from companies, such as repairing, replacement to maintain the product performance and extend product lifetime.	GPC8	0.67	0.671
	Eco-Label to inform the benefit of the products towards the environment (e.g. recyclable material label, CFC-free on fridges, energy star in electronic products).	GPC9	0.62	0.839
	Using biodegradable materials, where the material easily decomposes back into natural elements, hence reducing environmental contaminations.	GPC10	0.38	0.795
	Easy to upgrade, customers can modify the product and increase its performance to extend product lifetime.	GPC11	0.45	0.712

Although the CVSCALE has been tested and validated in several studies, such as by Yoo et al. (2011), these studies were performed in different locations. Moreover, the CVSCALE used in this study was translated into Bahasa Indonesia to get the understanding of the respondents in answering the questionnaire, particularly for the CVSCALE. A complete result of factor analysis of the CVSCALE is described in Table 4.4.

Table 4.4: CVSCALE factor analysis

Construct	Items used in questionnaire	Items	Factor loading	
			Indonesia	Malaysia
Cultural Value	Collectivism			
	Individuals should sacrifice self-interest for the group that they belong to.	Coll1	0.71	0.655
	Individuals should stick with the group even through with harsh difficulties.	Coll2	0.64	0.718
	The group's welfare is more important than individual rewards.	Coll3	0.82	0.836
	The group's success is more important than individual success.	Coll4	0.81	0.836
	Individuals should pursue their goals after considering the welfare of the group.	Coll5	0.79	0.739
	Group loyalty should be encouraged even if individual's goals suffer.	Coll6	0.78	0.774
	Masculinity			
	It is more important for men to have a professional career than it is for women.	Mas1	0.61	0.796
	Men usually solve problems with logical analysis; women usually solve problems with intuition.	Mas2	0.76	0.692
	Solving difficult problems usually requires an active forcible approach which is typical of men.	Mas3	0.79	0.691
	There are some jobs that a man can always do better than a woman.	Mas4	0.69	0.627
	High uncertainty avoidance			
	It is important to have instructions spelt out in detail so that I always know what I'm expected to do.	UAI1	0.57	0.535
	It is important to closely follow instructions and procedures.	UAI2	0.76	0.809
	Standardised work procedures are helpful.	UAI3	0.74	0.821
	Rules/regulations are important because they inform of what is expected of me.	UAI4	0.70	0.834
	Instructions for operations are important.	UAI5	0.76	0.762
	High power distance			
	People in higher positions should make most decisions without consulting the people in lower positions.	PDI1	0.79	0.746
	People in higher positions should not ask the opinions of people in lower positions too frequently.	PDI2	0.84	0.794
	People in higher positions should avoid social interactions with people in lower positions.	PDI3	0.80	0.766
	People in higher positions should not delegate important tasks to people in lower positions.	PDI4	0.62	0.810
	People in lower positions should not disagree with decisions made by people in higher positions.	PDI5	0.63	0.714
	Long-term Oriented			
Careful management of money (thrift).	LTO1	0.62	0.748	
Going on resolutely in spite of opposition (persistence).	LTO2	0.82	0.702	
Personal steadiness and stability.	LTO3	0.71	0.813	
Long-term planning.	LTO4	0.76	0.795	
Working hard for success in the future.	LTO5	0.77	0.664	

The factor analysis was performed. There was no item which has been dropped, as all the required threshold levels have been achieved. The next step was to perform the CFA using the remaining 324 questionnaires for Indonesia and 315 for Malaysia.

4.2.6 Confirmatory factor analysis

The Partial Least Squares (PLS) approach was used to perform the CFA. SmartPLS was applied as a statistical tool to analyse the data. The measurement model consists of both reflective and formative measures. HCM was applied to identify the relationships for the constructs (as the LOC) of appearance, functionality, price and green product characteristics, to the customer preferences on green product construct (as the HOC).

4.2.6.1 Convergent validity

The convergent validity should be performed to ensure the goodness of a reflective measurement model. Convergent validity requires the evaluation of factor loading, CR and AVE. It was recommended that the factor loadings should at least be 0.4 to 0.7 or higher, the AVE should be > 0.5 and the CR should be > 0.7 . Although the CR falls within the range of 0.6 to 0.7, it can still be considered acceptable for exploratory studies (Hair et al., 2014). However, if eliminating the certain factor loadings can increase the AVE and CR, then deleting the lowest items in the assigned construct would be preferable. The computation process of the convergent validity for the Indonesian and Malaysian data are presented in Figure 4.1 and 4.2.

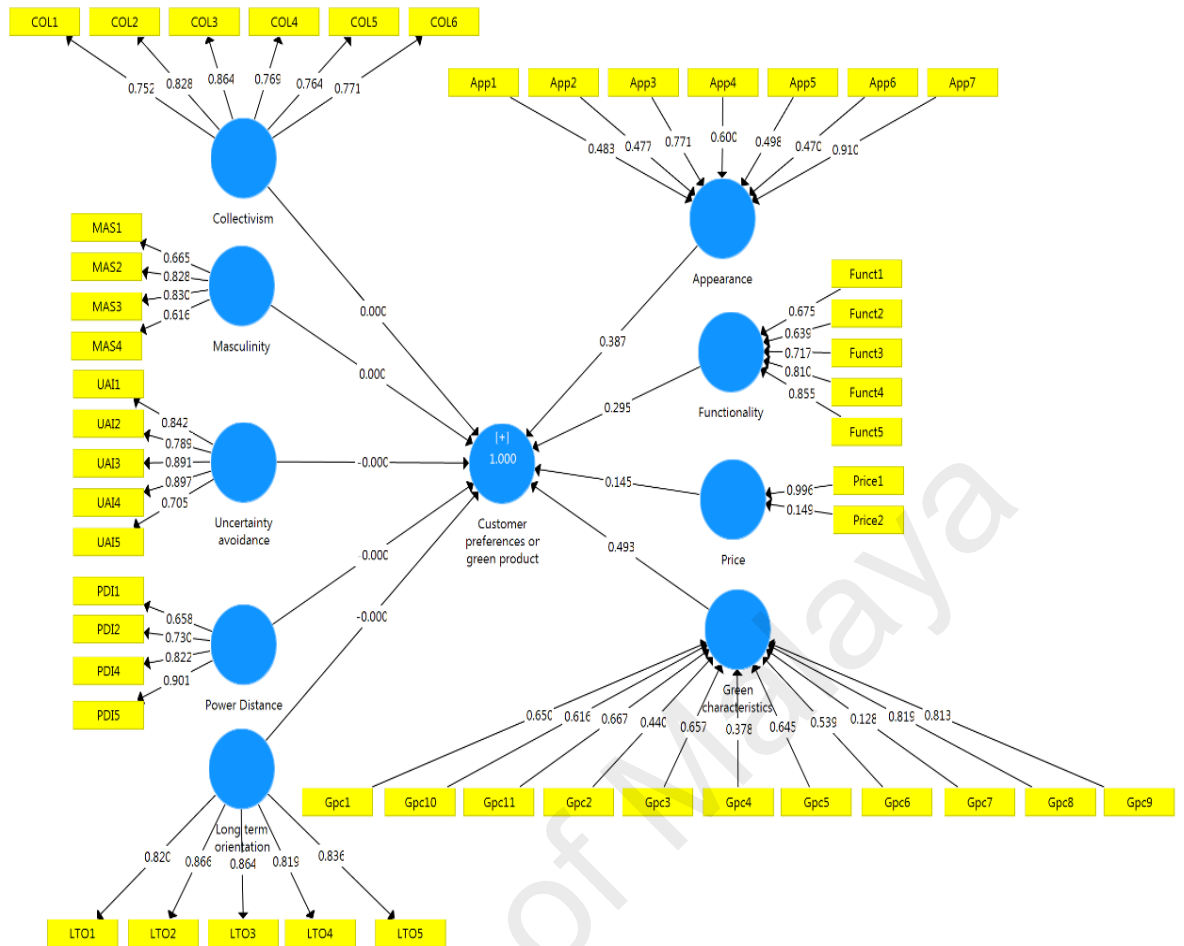


Figure 4.1: Outer loading computation (Indonesia)

Based on the calculation as presented in Figure 4.1, one item namely the ‘Power distance 3’ (PDI3) was dropped for Indonesia, since its loading was < 0.5 . This value would affect the values of AVE and CR for being less than the critical threshold. Deleting this item was preferred rather than retaining it. After the PDI3 deletion, the critical values of the AVE and CR satisfy the critical threshold, i.e. $AVE > 0.5$ and $CR > 0.7$. The calculation of the Malaysian data is illustrated in Figure 4.2.

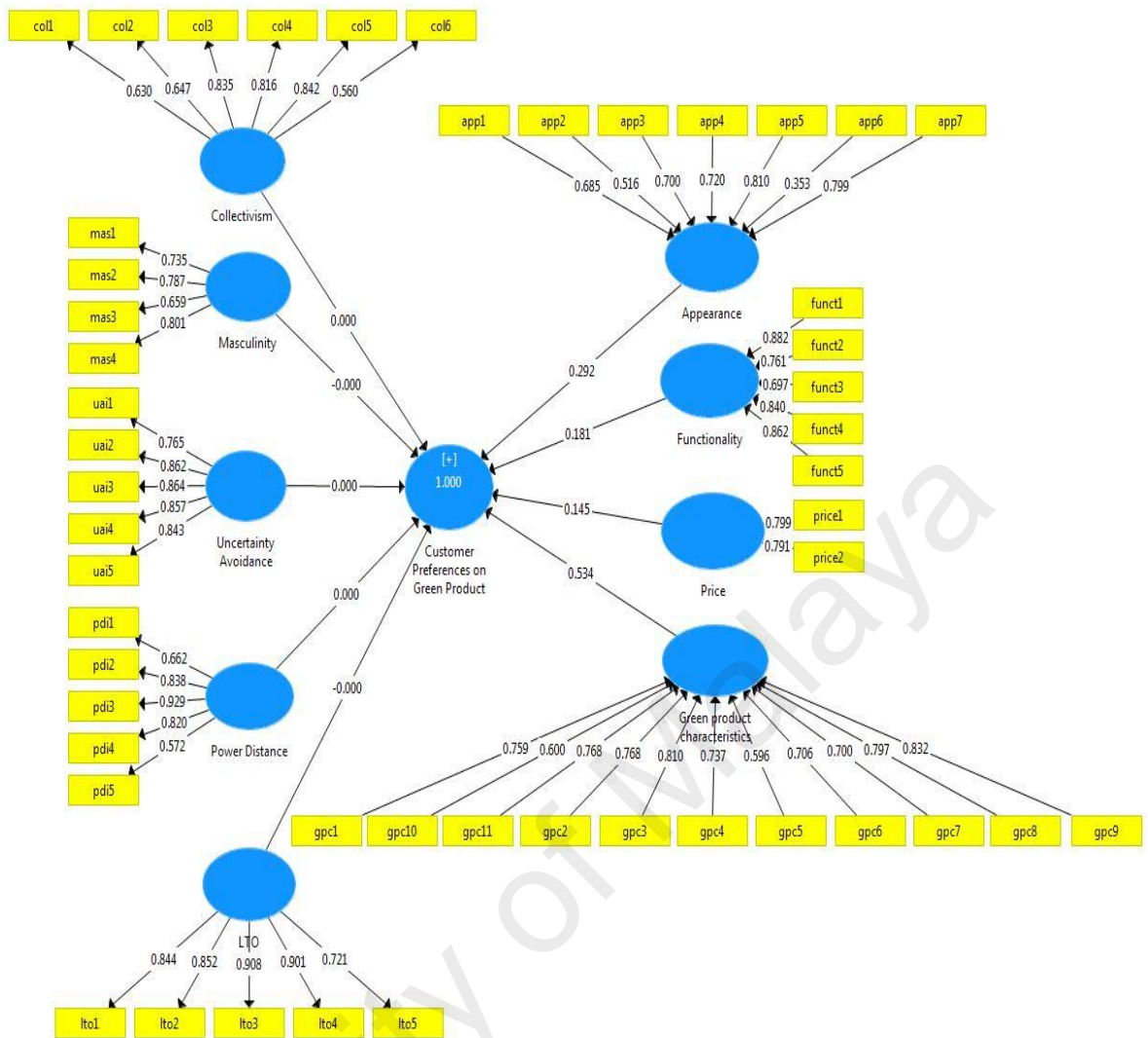


Figure 4.2: Outer loading computation (Malaysia)

The compilation of factor loading, AVE and CR calculations for Indonesia and Malaysia is described in Table 4.5.

Table 4.5: Compilation of factor loading, AVE and CR values for Indonesia and Malaysia

Cultural dimensions	Items	Factor loading		AVE		CR	
		Malaysia	Indonesia	Malaysia	Indonesia	Malaysia	Indonesia
Collectivism	Coll1	0.682	0.752	0.565	0.627	0.885	0.910
	Coll2	0.704	0.828				
	Coll3	0.860	0.864				
	Coll4	0.810	0.768				
	Coll5	0.789	0.764				
	Coll6	0.638	0.771				
Masculinity	Mas1	0.763	0.664	0.621	0.549	0.867	0.827
	Mas2	0.815	0.828				
	Mas3	0.746	0.830				
	Mas4	0.820	0.616				
Uncertainty avoidance	UAI1	0.778	0.842	0.778	0.686	0.946	0.915
	UAI2	0.891	0.788				
	UAI3	0.899	0.891				
	UAI4	0.927	0.897				
	UAI5	0.907	0.705				
Power distance	PDI1	0.573	0.658	0.560	0.772	0.861	0.862
	PDI2	0.762	0.730				
	PDI3	0.912	-				
	PDI4	0.761	0.821				
	PDI5	0.692	0.901				
Long-term orientation	LTO1	0.812	0.819	0.704	0.707	0.922	0.924
	LTO2	0.760	0.865				
	LTO3	0.904	0.863				
	LTO4	0.872	0.818				
	LTO5	0.840	0.836				

AVE is the average variance extracted (should be > 0.5)

CR is composite reliability (should be > 0.7; 0.60 to 0.70 is acceptable for exploratory study).

As shown in Table 4.5, the factor loading, AVE and CR values have achieved the critical thresholds. Thus, the convergent validity were confirmed and the computation can be continued to confirm the discriminant validity.

4.2.6.2 Discriminant validity

After convergent validity has been established, the next step was to confirm the discriminant validity. Discriminant validity is the extent to which a construct is truly distinct from the other constructs, by empirical standards (Hair et al., 2016). The discriminant validity was evaluated based on the critical threshold of HTMT, where it should be < 0.85 (Henseler, 2015). The results of the HTMT for Indonesia and Malaysia is presented in Table 4.6 and 4.7.

Table 4.6: Heterotrait-Monotrait Ratio (HTMT) for discriminant validity (Indonesia)

	Collectivism	Long-term orientation	Masculinity	Power distance	Uncertainty avoidance
Collectivism					
Long-term orientation	0.216				
Masculinity	0.424	0.354			
Power distance	0.121	0.097	0.397		
Uncertainty avoidance	0.332	0.739	0.328	0.113	

HTMT value should be < 0.85 to establish discriminant validity.

Table 4.7: Heterotrait-Monotrait Ratio (HTMT) for discriminant validity (Malaysia)

	Collectivism	Power distance	Uncertainty avoidance	Long-term Orientation	Masculinity
Collectivism					
Power distance	0.069				
Uncertainty avoidance	0.254	0.159			
Long-term orientation	0.233	0.345	0.590		
Masculinity	0.305	0.388	0.451	0.242	

HTMT value should be < 0.85 to establish discriminant validity.

Based on the calculated results as shown in Table 4.6 and Table 4.7, the HTMT value for Indonesia and Malaysia were found to be < 0.85. Therefore, it was confirmed that the critical threshold for the discriminant validity has been established. This means that the construct of cultural dimensions was truly distinct or different from each other.

4.2.6.3 Formative measurement model

Once the reflective measurements for convergent and discriminant validities have been completed, the next step was to evaluate the formative measurement model. Formative measurement in the model consist of four constructs, i.e. appearance, functionality, price and green product characteristics. In order to evaluate the formative measurement, the VIF and the outer loading should be evaluated. VIF should be < 5 and outer loading of formative measurement should be > 0.5 (Hair et al., 2016). The results of the VIF for Indonesian and Malaysian data are presented in Table 4.8 and 4.9.

Table 4.8: Variance inflation factor (VIF) for Indonesia

Appearance	VIF	Functionality	VIF	Price	VIF	Green product characteristics	VIF
App1	2.496	Funct1	1.906	Price1	1.004	Gpc1	1.780
App2	2.672	Funct2	1.285	Price2	1.004	Gpc2	1.532
App3	1.843	Funct3	2.057			Gpc3	1.985
App4	1.665	Funct4	1.721			Gpc4	1.784
App5	2.219	Funct5	1.705			Gpc5	1.905
App6	1.717					Gpc6	1.669
App7	1.334					Gpc7	1.120
						Gpc8	1.915
						Gpc9	2.350
						Gpc10	2.245
		Gpc11	2.594				

VIF > 5 indicates collinearity issue.

Table 4.9: Variance inflation factor (VIF) for Malaysia

Appearance	VIF	Functionality	VIF	Price	VIF	Green product characteristics	VIF
App1	2.374	Funct1	2.692	Price1	1.076	Gpc1	2.110
App2	2.696	Funct2	1.693	Price2	1.076	Gpc2	2.444
App3	2.425	Funct3	1.712			Gpc3	3.248
App4	2.106	Funct4	2.490			Gpc4	2.914
App5	2.173	Funct5	2.110			Gpc5	2.106
App6	1.470					Gpc6	3.196
App7	1.550					Gpc7	4.317
						Gpc8	2.248
						Gpc9	2.284
						Gpc10	1.790
		Gpc11	1.428				

VIF > 5 indicates collinearity issue.

As shown in Table 4.8 and 4.9, all values of VIF for the indicators of appearance, functionality, price and green product characteristic construct, were found to be < 5. This indicates that there was no collinearity issues for both the Indonesian and Malaysian data.

4.2.7 Structural modeling

After the VIF evaluations have been completed, the following step was to identify the relationships between the five cultural value dimensions constructs and the construct of customer preferences on green product. In the calculation, the outer loadings of the constructs of appearance, functionality, price and green product characteristics, and the relationships of the five cultural value dimensions for the Indonesian and Malaysian data

seems weak. These can be caused by the repeating indicators of the formative-formative measurements for the constructs of appearance, functionality, price and green product characteristics. Hair et al. (2016) mentioned that the formative-formative and reflective-formative measurements in the HCM may result in a small loading and significant relationship, and the R^2 may also reaches the value of 1 (see Figure 4.3 for loading of preferences on green product characteristics construct). In order to solve this issue, two-stages HCM analysis can be performed by extracting the values of latent variable scores of the construct measurements, and transform the constructs into new indicators (Hair et al., 2016).

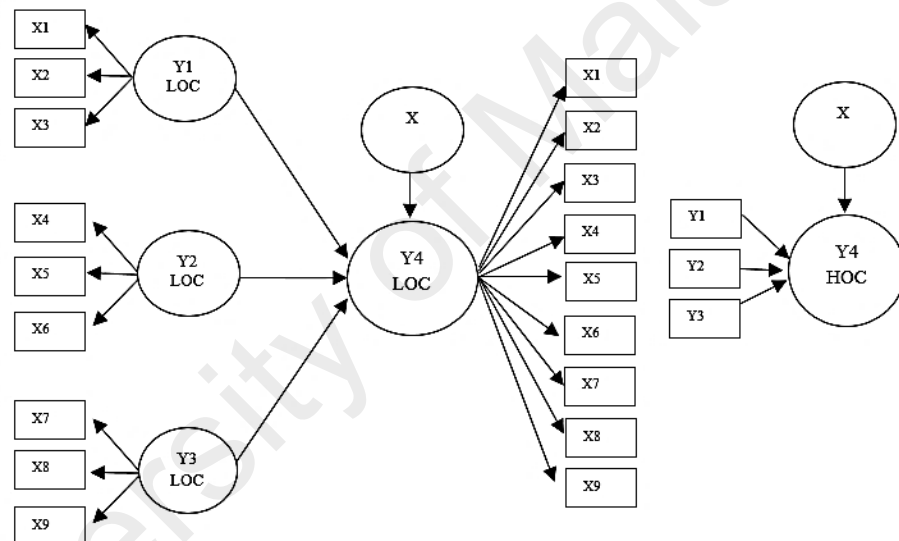


Figure 4.3: Two-stages analysis in HCM. The constructs can be transformed to be new indicators using their latent variable scores (Hair et al., 2014)

By referring to Hair et al. (2014) as shown in Figure 4.3 on the explanation of the two-stages analysis, the constructs of appearance, functionality, price and green product characteristics, need to be changed into new indicators, as manifest variables in the first stage, by using the extracted latent variable scores of each construct. After these four constructs have been changed into new indicators, the next step was to identify the relationships between the five cultural value dimensions that were pointed to the construct of preferences on green product characteristics. The significance of the relationships can

be determined by evaluating the t-value. The t-value is the standard criterion in which the significance of a coefficient is decided. It was recommended that bootstrapping to be performed with 5,000 sub-samples in order to evaluate the t-values. The computation of the cultural value dimension relationship with the construct of preferences on green product is shown in Figure 4.4 for the Indonesian data, and Figure 4.5 for the Malaysian data.

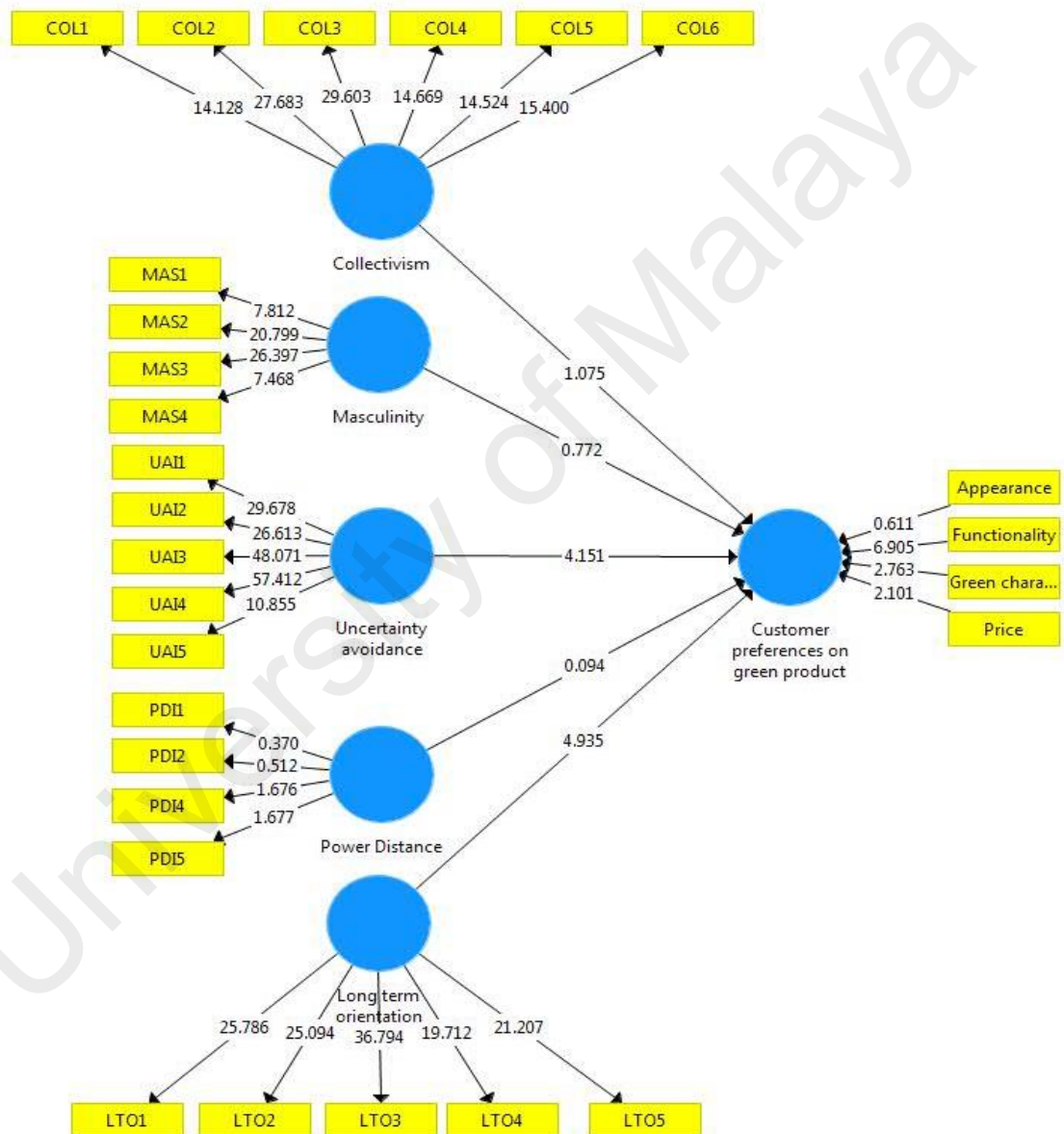


Figure 4.4: Structural modeling computation (Indonesia)

Table 4.10: Results of the structural equation model (Indonesia)

Hyp.	Description	Path coefficient	Std. error	<i>t</i> -value	Result
H1	Collectivism → Customer preferences towards green products	0.057	0.053	1.075	Not supported
H3	Masculinity → Customer preferences towards green products	0.038	0.049	0.772	Not supported
H5	Uncertainty avoidance → Customer preferences towards green products	0.350	0.084	4.151*	Supported
H7	Power distance → Customer preferences towards green products	0.005	0.050	0.094	Not supported
H9	Long-term orientation → Customer preferences towards green products	0.392	0.079	4.935*	Supported

* $p < 0.01$, ** $p < 0.05$, *** $p < 0.1$

The critical *t*-values were 2.57, 1.96 and 1.65, for significance level of 1 %, 5 % and 10 %, respectively. Based on the results in Table 5.10, the uncertainty avoidance ($\beta = 0.350$, $p < 0.01$) and long-term orientation ($\beta = 0.392$, $p < 0.01$) have significant influence towards the customer preferences on green products. However, collectivism, masculinity and power distance do not have any significant influence towards the customer preferences on green products in Indonesia, since their values were found to be less than the critical value. The computation for the Malaysian data is presented in Figure 4.5.

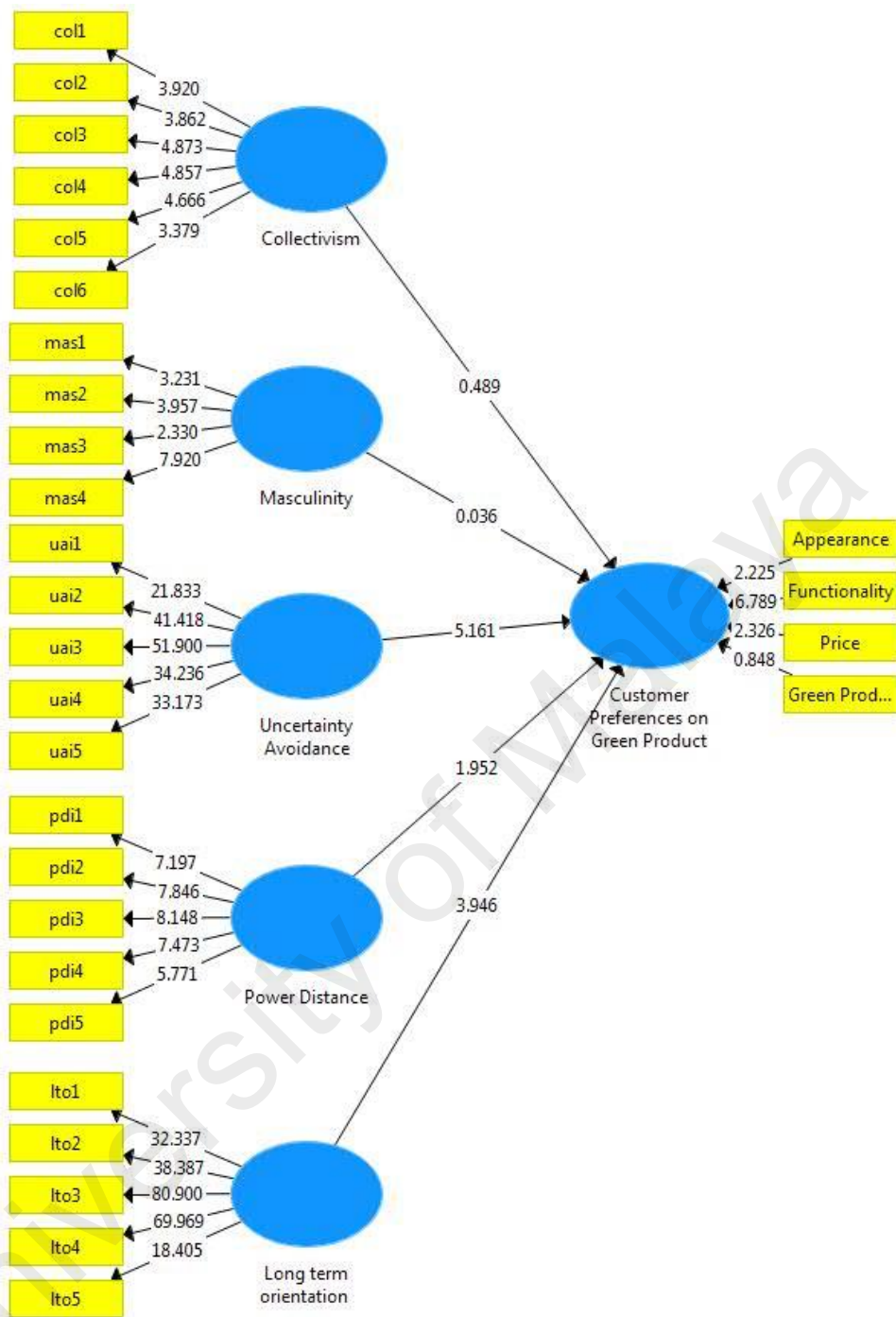


Figure 4.5: Structural modeling computation (Malaysia)

Table 4.11: Results of the structural equation model (Malaysia)

Hyp.	Description	Path coefficient	Std. error	t-value	Result
H2	Collectivism → Customer preferences towards green products	0.025	0.050	0.489	Not supported
H4	Masculinity → Customer preferences towards green products	0.002	0.057	0.036	Not supported
H6	Uncertainty avoidance → Customer preferences towards green products	0.351	0.068	5.161*	Supported
H8	Power distance → Customer preferences towards green products	-0.101	0.052	1.952***	Supported
H10	Long-term orientation → Customer preferences towards green products	0.280	0.071	3.946*	Supported

* $p < 0.01$, ** $p < 0.05$, *** $p < 0.1$

The critical t -values were 2.57, 1.96 and 1.65, for significance level of 1 %, 5 % and 10 %, respectively. Based on Table 4.11, it was found that for the Malaysian customers, the uncertainty avoidance ($\beta = 0.351$, $p < 0.01$), long-term orientation ($\beta = 0.280$, $p < 0.01$) and power distance ($\beta = -0.101$, $p < 0.01$) have significant influence towards the customer preferences on green product, whereas collectivism and masculinity do not have any significant influence towards the customer preferences.

4.2.7.1 Assessing R^2 (Coefficient of determination)

After significant relationships of the structural model were identified, the next step was to identify the level of the coefficient of determination (R^2). Coefficient of determination is a measure of proportion of an endogenous construct variance, that is explained by its predictor constructs. The value of R^2 depends on the research discipline. It can either be 0.75, 0.5 or 0.25, which are denoted as substantial, moderate or weak, respectively. For multiple regressions, Hair et al. (2016) suggested to use the adjusted R^2 , to avoid the bias towards complex models. Adjusted R^2 can be calculated by using the following formula:

$$R^2_{adj} = 1 - (1 - R^2) \cdot \frac{n-1}{n-k-1} \quad (4.1)$$

The notation of n is denoted as the sample size, while k is the number of exogenous latent variables used to predict the endogenous latent variables under consideration. However, in the SmartPLS version 3.0, the value of adjusted R^2 has been automatically provided. It can be generated by performing the bootstrapping routine. Similar with previous evaluation on the relationships of five cultural value influences, 5000 subsamples have been run to identify the coefficient of determination.

Table 4.12: The result for the calculation of adjusted R^2

Construct	Adjusted R^2		Std. error		t-statistics	
	IND	MAS	IND	MAS	IND	MAS
Customer preferences towards green product	0.496	0.345	0.054	0.052	.259	6.655

Based on Table 4.12, the value of adjusted R^2 for the Indonesian data was 0.496, and 0.345 for the Malaysian data. The value of 0.20 were considered as high in the discipline of prediction consumer behaviour (Hair et al., 2016). Thus, the result of the adjusted R^2 for both the Indonesian and Malaysian data were satisfactory for the coefficient of determination assessment.

4.2.7.2 Assessing the effect size (f^2)

Effect size (f^2) is a measure to assess the relative impact of a predictor construct on an endogenous construct. The critical thresholds for effect size were 0.02, 0.15 and 0.35, which were indicated as small, medium and large, respectively. The results of the effect size for all the constructs are described in Table 4.13.

Table 4.13: Results of the effect size (f^2) for the construct of customer preferences on green product

Construct	Effect size (f^2)	
	IND	MAS
Collectivism	0.006	0.001
Masculinity	0.002	0.000
Uncertainty avoidance	0.129*	0.117*
Power distance	0.000	0.023*
Long-term orientation	0.166**	0.077*

0.02, 0.15** and 0.35***; small, medium and large, respectively.*

Previously, the relationships of five cultural value dimensions construct and customer preferences on green product construct have been confirmed. In order to evaluate the relative impact of each influencing construct, their effect sizes towards the construct of customer preferences on green product, need to be established. Based on the calculated results of the effect size (f^2) for the Indonesian data, uncertainty avoidance provides small effect size (0.129), while the long-term orientation has a medium effect size (0.166). For the Malaysian data, uncertainty avoidance, power distance and long-term orientation provide small effect size, i.e. 0.117, 0.023 and 0.077, respectively. However, although the effect sizes seem small, these results confirmed that the calculation of the significant relationships in the path analysis can still be used for further analysis.

4.2.7.3 Assessing predictive relevance (Q^2)

Predictive relevance (Q^2) also known as predictive power, is a measurement to predict a model's accuracy. Q^2 values should be > 0 , and the value < 0 indicates that the developed model was lack of predictive relevance and accuracy (Hair et al., 2016). In order to assess the Q^2 values, a blindfolding analysis of the path model should be performed. The calculations of Q^2 for Indonesia and Malaysia are illustrated in Figure 4.6 and 4.7.

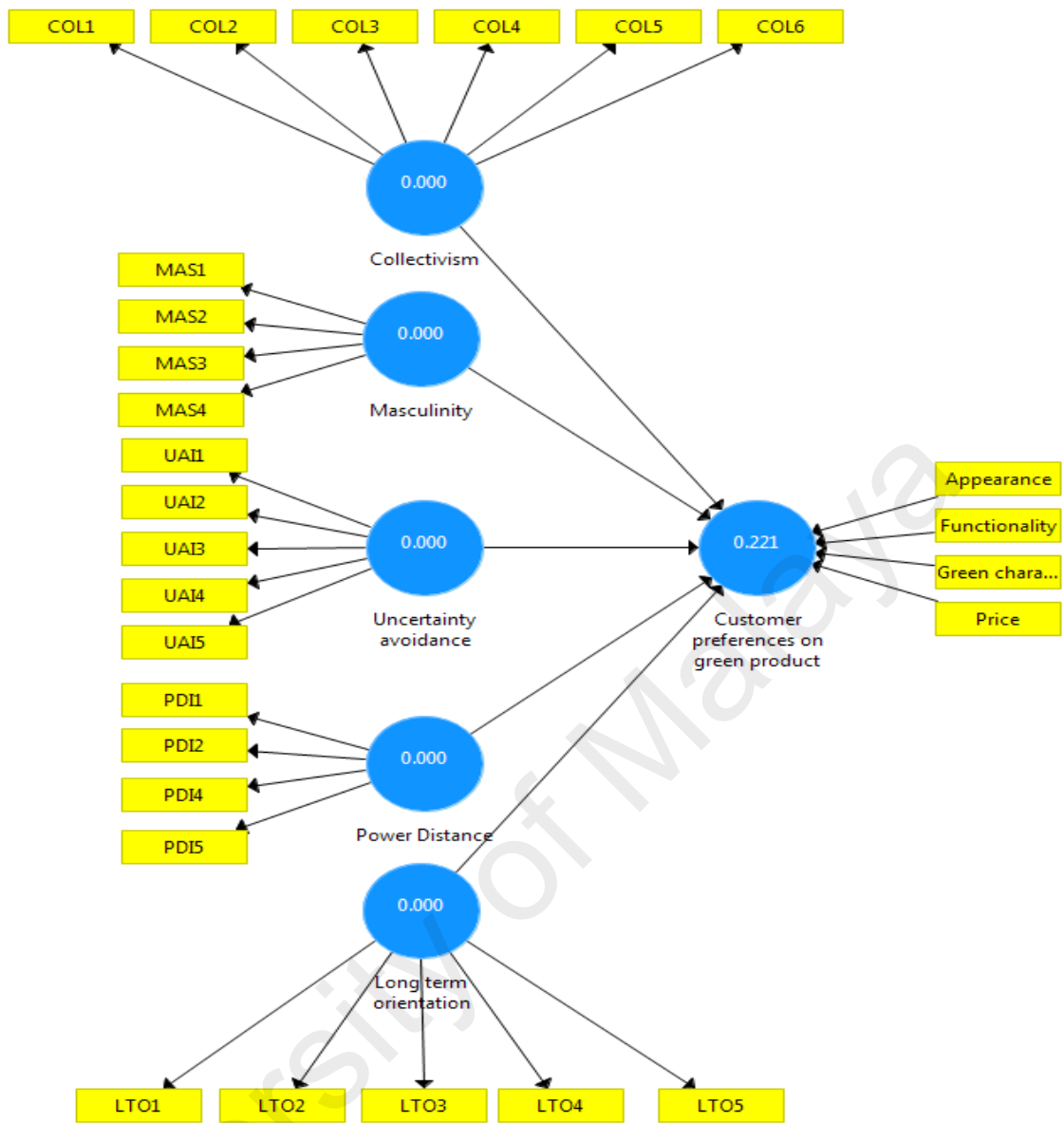


Figure 4.6: The calculation of Q² value (Indonesia)

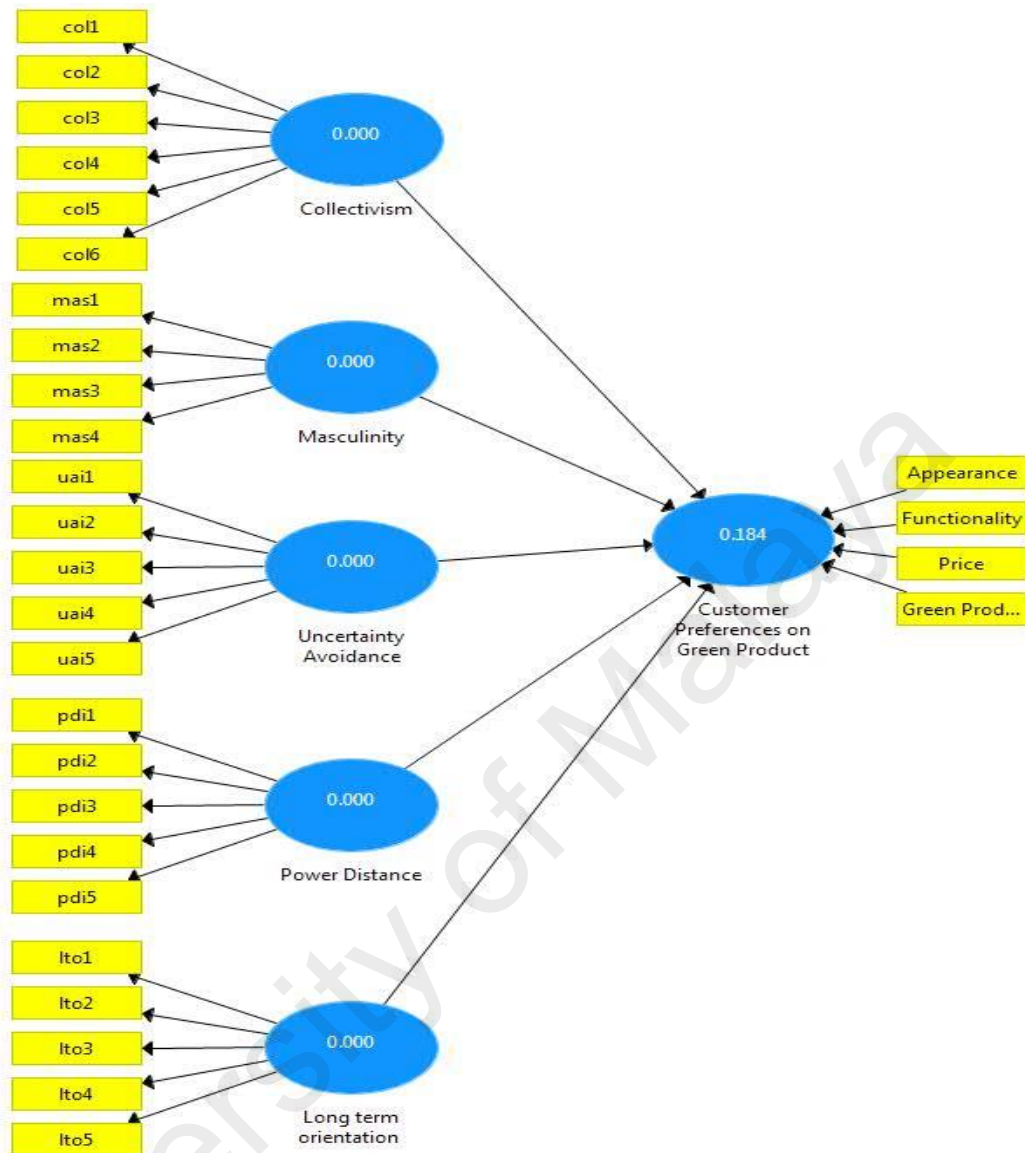


Figure 4.7: The calculation of Q² value (Malaysia)

Table 4.14: Predictive relevance (Q² value)

Predictive relevance (Q ² value)	
IND	MAS
0.221	0.184

Q² value > 0 indicates that the requirement for model accuracy has been established.

As shown in Table 4.14, the Q² values for both countries were > 0, i.e. 0.221 for Indonesia and 0.184 for Malaysia. This means that the models developed for Indonesia and Malaysia in identifying the cultural value influence towards the preferences on green product have

achieved the level of threshold for the model accuracy requirement. After the Q^2 value of the model has been confirmed, the following step was conducted to assess the effect size, q^2 of each construct in the model.

4.2.7.4 Assessing effect size q^2

The effect size denoted as q^2 , is a measure to assess the relative predictive relevance of a predictor construct on an endogenous construct. In this study, there were five q^2 for the constructs of collectivism, masculinity, uncertainty avoidance, power distance and long-term orientation, that should be calculated. The q^2 can be calculated by the following equation:

$$q^2 = \frac{Q_{included}^2 - Q_{excluded}^2}{1 - Q_{included}^2} \quad (4.2)$$

For example, to determine the effect size, q^2 for the collectivism construct to the endogenous construct of customer preferences on green product, the construct of collectivism should be embedded in the model, and continued by calculating the Q^2 . This was considered as Q^2 included. On the other hand, when collectivism construct was replaced from the model and the calculation of Q^2 was performed, this Q^2 was considered as Q^2 excluded. In the SmartPLS, these calculations should be manually performed. The results of the effect size, q^2 for Indonesia and Malaysia is described in Table 4.15.

Table 4.15: Results of the effect size q^2

Construct	q^2 effect size	
	IND	MAS
Collectivism	0.00385	-0.00123
Masculinity	0.00000	-0.00245
Uncertainty avoidance	0.02953*	0.07966*
Power distance	-0.00128	0.04779*
Long-term orientation	0.05006*	0.05882*

0.02, 0.15** and 0.35***; small, medium and large, respectively.*

In previous Section 4.2.7, the five cultural value dimensions' influences towards the construct of customer preferences on green product, have been confirmed. These can indicate that the influences of the five cultural value dimensions fulfilled the requirement of q^2 . However, although the values seem small, they were still under the critical threshold of q^2 . Thus, it can be concluded that the uncertainty avoidance and long-term orientation for Indonesia, and uncertainty avoidance, power distance and long-term orientation for Malaysia, can be used to predict the influences of cultural values towards the construct of customer preferences on green product.

4.2.8 Identifying preferences on green product

Since all the procedures of data validation have been performed and the relationships of the five cultural value influences were also confirmed. Thus, the customer preferences on green product while considering the cultural value influence can be identified. In order to identify these preferences, the outer weight of indicator should be used in the first stage of the calculation. This outer weight was considered as more reliable to be used, rather than using the mean value of questionnaire. This is because, the outer weight results have been statistically validated, and the measurement error have been evaluated. The outer weight was used to indicate the absolute contributions of the indicators to the assigned

constructs (Hair et al., 2014). The results of the outer weight for the customer preferences on green product is presented in Table 4.16.

Table 4.16: The outer weight results

Indonesia			Malaysia		
Indicator	Green product characteristics	Outer weight	Indicator	Green product characteristics	Outer weight
Gpc 8	Provide product services	0.362	Gpc 9	Eco-labelling	0.261
Gpc 3	Reduce harmful materials	0.306	Gpc 1	Energy efficiency	0.225
Gpc 9	Eco-labelling	0.270	Gpc 3	Reduce harmful materials	0.211
Gpc 5	Easy to reuse	0.267	Gpc 8	Provide product services	0.189
Gpc 1	Energy efficiency	0.119	Gpc 11	Easy to upgrade	0.130
Gpc 10	Biodegradable materials	0.072	Gpc 10	Biodegradable materials	0.127
Gpc 6	Recycled materials	0.050	Gpc 4	Recyclable materials	0.106
Gpc 2	Weight reduction	0.046	Gpc 2	Weight reduction	0.063
Gpc 7	Easy to maintain	0.038	Gpc 7	Easy to maintain	0.060
Gpc 11	Easy to upgrade	0.032	Gpc 6	Recycled materials	-0.008
Gpc 4	Recyclable materials	-0.227	Gpc 5	Easy to reuse	-0.083

Based on the outer weight as shown in Table 4.16, the preferences on green product in Indonesia involves providing product service, reduce harmful materials, eco-labelling, easy to reuse, energy efficiency, biodegradable materials, recycled materials, weight reduction, easy to maintain, easy to upgrade and recyclable materials. Different with the Malaysian data, eco-labelling was predicted as the most preferred characteristics of the green product. This was followed by energy efficiency, reduce harmful materials, product service, easy to upgrade, biodegradable materials, recyclable materials, weight reduction, easy to maintain, recycled materials and easy to reuse.

4.2.9 Discussion of the result: overview

The relationships of the five cultural value influences towards the customer preferences on the green product characteristics in Indonesia and Malaysia have been confirmed. The preferences on green product characteristics while considering the cultural value influences were also identified. Several layers of validation have been performed to ensure the quality of the results. This chapter is presented to discuss the results of the influences of the five cultural value dimensions, and the identified preferences on the green product characteristics.

4.2.9.1 Identified cultural value influences

Studies have been carried out over the years to determine the influences of cultural values towards the customer preferences, as reported in the literature. The influences of cultural values towards the product selection were mostly centred on the conventional attributes, such as appearance, functionality and price. Currently, the influences of the five cultural value dimensions towards the customer preferences on green products have not been investigated. It was found that the scores for the five cultural value dimensions investigated in this study differ slightly from those in the Hofstede's model of national culture. Malaysia has high scores for collectivism and power distance, intermediate score for masculinity, and low scores for uncertainty avoidance and long-term orientation (Hofstede, 2017). Indonesia has high score for collectivism, and low scores for masculinity, uncertainty avoidance and long-term orientation (Hofstede, 2017). The cultural scores for Malaysia and Indonesia are shown in Table 4.17.

Table 4.17: Scores for cultural value dimensions (Hofstede, 2017)

Cultural value dimensions	Score	
	MAS	IND
Collectivism	74	86
Masculinity	50	46
Uncertainty avoidance	36	48
Power distance	100	78
Long-term orientation	41	62

MAS = Malaysia; IND = Indonesia

Based on the mean scores obtained in this study, by using scale 0 to 10, Malaysia and Indonesia have similar culture scores, i.e. a high score for collectivism, masculinity, uncertainty avoidance and long-term orientation, where these values were higher than the intermediate score of the instrument. The scores for power distance were low for both countries, where the values were lower than the intermediate score of the instrument, as shown in Table 4.18.

Table 4.18: Scores for cultural value dimensions

Cultural value dimensions	Score	
	MAS	IND
Collectivism	6.27	7.04
Masculinity	6.18	7.68
Uncertainty avoidance	7.57	8.68
Power distance	3.35	2.39
Long-term orientation	7.00	9.21

MAS = Malaysia; IND = Indonesia

As shown in Table 4.17 and 4.18, the scores between the Hofstede's study and this study were found to be different. These differences may be due to the difference in the segmentation level. In this study, a segmentation was carried out for specific purpose on green product preferences, whereas in the Hofstede's study, segmentation was carried out to describe the cultural values from the general perspectives. The results of the identified cultural value influences, and green product characteristics preferences are described in Section 4.2.9.2 to 4.2.9.6.

4.2.9.2 Uncertainty avoidance

Uncertainty avoidance has significant influence towards the consumers in Indonesia and Malaysia, which implies that both the Indonesian and Malaysian consumers dislike the uncertainty when choosing a green product. In Malaysia, eco-labelling is the most preferred green product characteristics, which reflects that this method was preferred by Malaysian consumers to reduce the uncertainty towards green products. Eco-labels enable the consumers to obtain more information on the benefits of green products. This finding was in line with Rashid (2009), who found that the awareness of Malaysian customers on green products was still rather low. Eco-labelling was recommended to elevate the customer preferences towards green products in Malaysia (Rashid, 2009).

In Indonesia, uncertainty avoidance was associated with providing product services. Green products enable manufacturers to use non-virgin materials (e.g. recycled, recyclable), which reduce the usage of natural resources and waste generation. This in turn, can influence the customers' perceptions on the product quality. Shapiro (1982) explained that the uncertainty on product quality was an important factor that affects the customers' preferences to purchase the product. Hence, in order to reduce the uncertainty, product services should be included to assure the customers if there were any problems regarding the product quality in the future.

Uncertainty avoidance characters have been described by Hofstede (1980) as higher anxiety, stress, concern on the security of life, rules and regulations should be written, and the uncertainty situation must be fought. Referring to these characters, the designers should clearly determine what strategies should be implemented to design the green product, which can be suitable with the customers' culture. Higher anxiety and wanting to be safe when using the green product may be faced by the customers. For example, to minimise the usage of natural resources, the manufacturers produce product using recycled, recyclable, biodegradable and light weight materials. However, the perceptions

of customers to the product that used these materials, can cause the increase in the customers' uncertainty, especially on the performance of the product. Therefore, to reduce the uncertainty of the customer towards green product, the strategies to increase the quality of recycled, recyclable, biodegradable and light-weight materials for green product are very important.

In addition, green product can possibly be made by a number of materials. However, some substances in the product may be harmful or toxic to the living environment, and need a specific treatment to minimise the impact (Ljungberg, 2007). In order to reduce the uncertainty of the customers towards green product, the usage of toxic materials need to be minimised to increase the preferences of customers on the green product.

Another characteristic that should be considered as an important strategy was the minimise energy consumption. It has been logically approved that the customers were concern on how much money that they should spend for their energy consumption. The consideration on the resources efficiency has become an important characteristic of the green product, to reduce the customers uncertainty. Explained possible strategies to the design of green product that relate to the uncertainty avoidance characters is served in Table 4.19.

Table 4.19: Approach and strategies to relate the uncertainty of customers on green product

Influenced cultural value dimensions	Described characters in literature	Approach to relate cultural value influences	Possible strategies can be applied
Uncertainty avoidance	<ul style="list-style-type: none"> – Higher anxiety and stress are experienced. – There is great concern with security in life. – There is a need for written rules and regulations. – The uncertainty inherent in life is felt as a continuous threat that must be fought. – A strong need for consensus is involved. – The uncertainty inherent in life is felt as a continuous threat that must be fought. 	Reduce the uncertainty of customers on green product.	<ul style="list-style-type: none"> – Embed eco-label on product design. – Minimise the usage of toxic material. – Provide product service. – Use high quality recyclable material. – Apply size and weight reduction with high quality material. – Use high quality biodegradable material.

4.2.9.3 Power distance

Another dimension that should be evaluated in this study was the power distance dimension. The influence of power distance towards the customer preferences in Malaysia and Indonesia differed from one country to another. In Malaysia, power distance has significant influence towards the purchase of green products, whereas this dimension has no significant influence in Indonesia. Based on the path coefficient results, power distance has a negative score for the customer preferences on green products. As previously mentioned, the Malaysian consumers have a low score for power distance, which implies that the preferences of customers on green products in Malaysia was influenced by the low power distance. According to Hofstede (1980), a low power distance was indicative of harmony between the powerful and the powerless, cooperation in achieving target orientation was based on solidarity, the whole society was considered to be equal, and the income was not an indicator of social status. The influence of low power distance was also explained by Kueh and Voon (2007), who studied the expectations of Y-generation customers towards the quality of service in Malaysia. They

found that, in order to improve the quality of a service, the Y-generation customers expected that the quality of service should not only be encouraged among the employees, but also at the management level. Those in the management level should actively participate in delivering a quality service.

These findings can be used as a basic understanding to describe the influence of low power distance towards potential customers, and their preferences in choosing the green products in this study. This implies that the green products can be accepted by the customers from all levels of society in Malaysia, such as the educated and less educated customers, as well as the higher and lower income customers. Therefore, it was recommended that in order to increase the market share, manufacturers should design green products by taking into account the low power distance profiles. For example, production of furniture through deforestation in developing countries with lack of reforestation, but the product was used mostly by the developed countries, and thus results in less contribution to the developing countries. Although the furniture product implements green attributes, such as less toxic, light weight, biodegradable etc., the deforestation activity in the developing countries cannot be accepted. This is because, low power distance customers may become concern to why the developed countries, as the ones with a higher power did not consider the impact of deforestation in the developing countries, which not only results in the depletion of the resources, but also problems for the inhabitants in the forest. The other example was the production of green product through child labour, to minimise the cost of product by a company. The low power distance customers may disagree with this matter. Therefore, it should be highlighted that the green product was important to be produced. However, the production should not indicate any social gaps, and no injustice in the treatment towards the unfortunate society.

The other example of low power distance can also be seen in terms of social class, i.e. the less educated and educated customers, and income of the customers. The green products

should be easily understood by both the educated and less educated customers, since not all customers can clearly understand the green product. Some customers may prefer to use the green product, however they may not know much on how to specify the green product. Providing eco-label can also be used as a potential strategy to provide the information on the benefits of the green product to the less educated customers (D'Souza et al., 2006). In addition, providing product service can possibly be used to relate to the influences of low power distance. The service can be given in the purchasing phase, such as by providing product advice or briefing, to explain the details of the green product specification, and answering all the questions from both levels of customers (Maxwell, 2003). Considering resources efficiencies can also be applied to relate to the influences of low power distance customers. Lower level income customers may focus on the cost that they should pay for the usage of the resources (Darby, 2006). If the energy efficiency during the consumption phase can be minimise, the lower income customers may have positive perspective on the green product. This is due to the cost of the resources consumption that were still affordable by the lower income customers. The possible strategies to relate the low power distance influences towards the green product preferences is shortlisted in Table 4.20.

Table 4.20: Approach and strategies to relate the low power distance influences towards green product preferences

Influenced cultural value dimensions	Described characters in literature	Approach to relate cultural value influences	Possible strategies that can be applied
Low power distances	<ul style="list-style-type: none"> – Inequality in society should be minimised. – Everyone should have equal rights. – Latent harmony exists between the powerful and the powerless. – Cooperation among powerless can be based on solidarity. – All should have equal right. 	Concern to design green product that does not indicate social gap and should not give negative impact to others.	<ul style="list-style-type: none"> – Embed eco-label on product design. – Provide product service. – Consider resources efficiency especially in the consumption phase.

4.2.9.4 Long-term orientation

Long-term orientation also has a significant influence towards the customer preferences on green products in Indonesia and Malaysia. The characteristics of long-term orientation, with emphasis on the savings, persistence and fostering pragmatic values towards the rewards, should be given more attention in the future. Based on the outer weights of the preferred green product characteristics, it can be deduced that the Malaysian customers prefer eco-labelling, followed by energy efficiency. According to Mahlia et al. (2004), energy-saving features of a product can increase the customer preferences, based on the rationale that the customers save money for the energy that was used over time, even though the product was more expensive compared to the others. The savings gained from the lower operating costs in the long term, will be sufficient to justify the high cost in acquiring the product. Thus, in order to gain a larger market share in Malaysia, the designers should consider the long-term characteristics of the products when designing the green products. Examples of the long-term characteristics include: (1) providing product services, such as repairs or replacements in order to maintain the performance of the product and extend the product lifetime, (2) incorporating easy-to-maintain product features, whereby the customers can do self-maintenance, such as cleaning and repairs in

order to extend the product lifetime, and (3) incorporating customisable product features, whereby the customers can modify the product in order to enhance its performance and extend the product lifetime.

In Indonesia, the customers prefer the availability of product services for the green products, with emphasis on extended usage period of the products. In order to achieve sustainability, the product services must be considered throughout the entire product's life cycle. According to Aurich et al. (2006), product services must be provided to the customers during purchasing, usage and disposal of the product. During the purchasing phase, providing advice or guidance on the product can be used as an effective strategy to explain the details and functions of the product to the customers. After sales services, such as maintenance, upgrades and providing spare parts will help retain the customer's satisfaction. During the disposal stage, retrieval and refurbishing should be practised to reduce the landfill wastes.

In addition, the usage of recycled, recyclable or reused materials can be possible alternatives in designing the green product which can provide benefits to reduce the consumption of natural resources and minimise the disposal stage (Gungor & Gupta, 1999; Gehin et al., 2008; Ljungberg et al., 2007; Fuller & Ottman, 2004). However, the problem is that this may influence the customers, in terms of the product quality. The customer may perceive the product with these kind of materials to have lower quality, than the product that was using the virgin materials (Mainieri et al., 1997). In this case, the preferences of customers not only can be affected by high uncertainty, but also by the long-term orientation dimension. Therefore, to increase the customer preferences, the strategy to improve the quality and durability, i.e. using virgin materials for the green product is important. This can fill the long-term orientation of the customers when choosing the green product. The possible strategies to relate long-term orientation influences towards green product preferences is shortlisted in Table 4.21.

Table 4.21: Approach and strategies to relate the long-term orientation influences towards the green product preferences

Influenced cultural value dimensions	Described characters in literature	Approach to relate cultural value influences	Possible strategies that can be applied
Long-term orientation	<ul style="list-style-type: none"> – Attaching more importance to the future. – Foster pragmatic values oriented towards rewards. – Persistence. – Saving (thrift). – Capacity for adaptation. 	Concern on long-term expectation of customers on the green product.	<ul style="list-style-type: none"> – Provide product service. – Consider resources efficiency in consumption phase. – Easily maintained and upgraded to extent products' lifetime. – Use high quality recyclable material. – Easily reused.

4.2.9.5 Collectivism-individualism

In Malaysia and Indonesia, collectivism has no significant influence towards customer preferences on green products, indicating that the customers were not easily influenced by others. According to Hofstede (2017), when the dimension of collectivism provides less significant influences, this means that the social group can be influenced by individualism characters. The customers in Malaysia and Indonesia were probably influenced by the individualism characters. Thus, individualism was found to be preferred in these two countries, where the customers prefer to act as individuals when purchasing the green products, rather than as a member of a group. This finding suggests the shopping habits of the customers in Malaysia and Indonesia, where the selection of green products was dependent on individual preferences rather than group influence.

4.2.9.6 Masculinity-femininity

Masculinity has no significant influence towards customer preferences on green products. Both the masculine and feminine components were intended to describe gender-based responses. In a masculine society, the customers were oriented towards targets, success and achievements. Based on the results, the customer preferences in both Malaysia and

Indonesia were not affected by the masculine orientation on environmental protection. According to Hofstede (2017), when the dimension of masculinity provides less significant influences, this means that the social group can probably be influenced by the femininity characters. The customers in Malaysia and Indonesia focused more on the quality of life, people and environment were more important, and sympathises with the unfortunate, which were all the characteristics of a feminine society.

4.3 Designer perspectives

Once the data analysis of the cultural value influences towards customer preferences on green product have been completed, the next step was to identify the cultural value influences in designing the green product. The designers were interviewed in order to give their perspectives on green product design and cultural value consideration in designing the green product. Semi-structured interview was performed to different profiles of designers. The profiles of designers is described in Table 4.22.

Table 4.22: Profiles of designers

Designers ID	Product types	Experiences
Designer A	Furniture	20 years
Designer B	Semi-conductor equipment product	7 years
Designer C	Electronic product	6 years
Designer D	Packaging product	10 years
Designer E	Wood based product	8 years

There were nine questions which have been developed in order to interview the designers. The first question was to identify their perspectives on green product. This question was important to know their understanding on green product. The interview question for this purpose was “*What is your opinion about green product?*”. The designers answers for this question are described in Table 4.23.

Table 4.23: Designers perspectives on green product

Designer ID	Perspective on green product
Designer A	<i>Green product is important to be developed, it can be used as a strategy to reduce the environmental impact, starting from the raw material until the end of life of the product.</i>
Designer B	<i>Product with less negative environmental impact. However, the preferences of customers on green product is still low due to them not realising what green product is.</i>
Designer C	<i>Product that is designed with the purpose of environmental protection from the raw material until the end of life of the product.</i>
Designer D	<i>Green product is an environmentally friendly product.</i>
Designer E	<i>Green product is important to eliminate the environmental problem.</i>

For these questions, all designers have almost similar perspectives on green product. They agreed that the green product is the product that was designed with the concern on environmental protection, starting from the raw material until the product's end of life. Some designers explained that the implementation of green product in their company was not an easy task. This was due to the high cost and that not all customers have the realisation about green products. However, the development of green product was very important to reduce the resources consumption and waste generation. The implementation of recycled materials for instance, can be used to eliminate the degradation of these resources. The objective of the interview was to explore the designers' perspectives on the green product characteristics. In order to achieve this objective, two questions were delivered to the designers. These two questions were "*What are the green characteristics that a green product should have?*" and "*What are the green characteristics that should be considered in your design?*". The identified green product characteristics based on the designers' perspectives are presented in Table 4.24.

Table 4.24: Designers' perspectives on green product characteristics

Designers ID	Designers' perspectives on green product characteristics
Designer A	<i>Resources efficiencies, such as reduce the usage of wood, electrical consumption when producing product, use recyclable material, less toxic material, recycled material, and eco-label for the product.</i>
Designer B	<i>Resources efficiencies, such as reduction on electricity consumption and less water consumption, feature reduction (weight reduction) to save the usage of electricity, and less toxic material.</i>
Designer C	<i>Using recycled plastic, packaging using recycled paper.</i>
Designer D	<i>Recycled material, eco-label and less toxic material.</i>
Designer E	<i>Recycled material and eco-label.</i>

As described in Table 4.24, several green product characteristics were identified from the designers' perspectives regarding resources efficiencies, e.g. electrical saving and less water consumption, recyclable material, weight reduction, recycled material, eco-label and less toxic material. These characteristics have similarities with the green characteristics that were identified from the literature. The designers have different perspectives on the characteristics of the green product. This was due to different types of product were design by different designers. For example, designer A explained that recyclable and recycled materials were used in the design of his furniture, whereas designer B was more concerned on the weight reduction and energy saving of his semi-conductor product.

The next objective of the interview was to identify the designers' perspectives on the strategies for green product development. In order to achieve this objective, the question delivered to the designers was *"In your opinion, what are possible strategies that can be used to incorporate those green characteristics?"*. The answers of this question are presented in Table 4.25.

Table 4.25: Designers' perspectives on the strategies to design the green product

Designers ID	Designers' perspectives on the strategies to design the green product
Designer A	<i>Maintaining product quality, especially for recycled material.</i>
Designer B	<i>Reducing feature of the designed product, it can save the consumption of electricity when running the machine.</i>
Designer C	<i>Concern to make durable product for long-term usage, although by using recycled plastics for some part of the product, the product should have high durability.</i>
Designer D	<i>Considering suitable green product characteristics related to the product design specification.</i>
Designer E	<i>Control the usage of resources, such as wood consumption.</i>

Based on Table 4.25, it can be seen that there were several important notes from the designers in designing the green product with high quality and durability. Although the product was made by using recycled or recyclable materials, it should be good in quality and durability. In addition, suitable green product characteristics that can be used to minimise the environmental impact should be consider, since the specification of the product can be different depending of the types of product.

The next purpose of the interview was to identify the designers' perspectives on the consideration of cultural value influences in designing the green product. The interview for this purpose was divided into four questions. Firstly, the question was to know their perspectives whether the consideration of cultural values can support the development of the green product or not. Secondly, the question was focused to know what kind of method or guideline that they used to incorporate the cultural value influences towards the green product. Thirdly, the question was to know designers perspective on the need of guideline development for the incorporation of cultural value consideration in designing green product. Finally, the focus of the question was to know in which design phase did the consideration of cultural values can be involved.

In order to identify the designers' perspectives on cultural value consideration in designing the green product, the question for the interview was *"Will cultural value be*

useful to support the development of green product? Why?'". The designers' answers for this question are presented in Table 4.26.

Table 4.26: The designers' perspectives on the cultural value consideration in designing the green product

Designer ID	Perspectives on the cultural value consideration in designing green product
Designer A	<i>Yes, the consideration of cultural value is important to give an insight for identifying the customers' need and set suitable specification of the green product.</i>
Designer B	<i>Yes, customers preferences cannot be easily identified since they are different to each other, therefore by considering cultural values in designing the green product, it can provide deeper information to identify the customer preferences on the green product.</i>
Designer C	<i>Yes, company produces the product for the market. Cultural value is the identity of customers and it can affect the identity of the company to set specification for designing the green product.</i>
Designer D	<i>Yes, it is important. We always try to explore the customer preferences considering their culture by redesigning the product for every 2 years. This is a challenging task to determine the design specification of the product that can satisfy the preferences of customers.</i>
Designer E	<i>Yes, culture can influence. Cultural value can influences every aspect. Market sentiment is very complicated, the consideration of cultural value can give information in designing green product.</i>

Based on Table 4.26, it can be seen that all designers agreed that the consideration of cultural value influences can be used to support the development of the green product. Designer A, B, C, and E have similar manner in describing the cultural values consideration in the green product development. They explained that the consideration of cultural value influences was enabled to provide an insight in identifying the customers' needs and set suitable specification for the green product. Designers D and E explained that the sentiment of the customers in the market was very complicated. They have different characters and purchasing behaviour. Therefore, the consideration of cultural value can be used as an approach to identify the customer preferences on the green product. Based on the explanation from all the designers, i.e. designer A to E, it can be deduced that the consideration of cultural value can be used to support the development of green product, especially in identifying the customer preferences. The consideration of

customer preferences was prominent in designing the green product. This is because the later phase, such as establishing product specification, generate product concept and set final specification, were depended on the identified customer preferences.

The purpose of the next interview question was to identify whether the designers have any techniques to incorporate the cultural value consideration in designing the green product. The question was “*Do you use any techniques to capture cultural values when designing the green product? If yes, please explain*”. However, if the designers answer was “*No*”, the following question was asked “*Do you think that techniques incorporating cultural values need to be developed to support the green product development? Why?*”.

Table 4.27: Designers perspectives on the method for the consideration of cultural values in designing the green product

Designers ID	Have any techniques, methods, guidelines to incorporate cultural value influences in designing the green product?
Designer A	No
Designer B	No
Designer C	No
Designer D	No
Designer E	No

Table 4.28: Designers perspectives on the development of a guideline for the incorporation of cultural value consideration in designing the green product

Designers ID	Perspectives on guideline development in incorporating cultural value consideration in designing the green product
Designer A	<i>Yes, the consideration of cultural value in designing green product can be used to evaluate the design specification that is related to the customers cultural value preferences.</i>
Designer B	<i>Yes, the preferences of customers varies to each other, the consideration of cultural value is important to capture collective preferences in establishing the green product specification.</i>
Designer C	<i>Yes, until now, we just know the purchasing behaviour through sales unit. If the method is available, it can be used to assist designers in identifying customers' needs on the green product.</i>
Designer D	<i>Yes, culture is intangible to be measured. The tool to incorporate cultural value for capturing customers preferences is needed.</i>
Designer E	<i>Yes, every customer is unique due to their different identity and culture. The guideline for incorporating culture value can be useful to capture the customer preferences on green product.</i>

According to Table 4.27 and Table 4.28, it can be seen that there was no established method yet for the incorporation of cultural values in designing the green product. Designers C explained that the product that was designed by the designers in the company, was based on the information from the sales department. However, Designers D and E underlined that the cultural value was intangible to be measured, since culture is unique and very subjective. Therefore, a method for incorporating the consideration of cultural values in designing the green product needs to be developed, to assist the designers in designing the green product.

Based on the designers' perspectives, the consideration of cultural values can be used to support the development of the green product. However, it is important to know in which design phase does the consideration of cultural value can be involved. As discussed in the literature review section, the design phase consists of identifying the customers' needs, establish target specification, generate product concepts, select product concepts, test product concepts and set final specification (Ulrich & Eppinger, 2008). In order to identify in which design phase the consideration of cultural value influences can be involved, the interview questions was "*In which phase should cultural values be incorporated to support the green product development? Why?*". The answers of the designers for this question are presented in Table 4.29.

Table 4.29: Designers’ perspectives on which phase cultural values consideration can be involved

Designers ID	In which phase should cultural values be incorporated to support green product development? Why?
Designer A	<i>Identifying customers’ needs, the designers will set detail specification of the product based on the customers’ requirement.</i>
Designer B	<i>Establishing target specification, the designers indeed can set the specification of a product, however the specification of the product should also relate to the cultural values of the customers.</i>
Designer C	<i>Identifying customers’ needs, it is because the initial phase of the product design was to determine the customers’ needs, whereas the next phase depended on the initial phase. The consideration of cultural value may provide beneficial information to understand customer preferences on the green product.</i>
Designer D	<i>Identifying customers’ needs, detail of design specification can be easily determined if the requirement of product by the customers have been identified. Therefore, the consideration of cultural values was useful to know the characters of the customers on the green product preferences.</i>
Designer E	<i>Establishing target specification, the detail of product specification should be suitable with the customer preferences on the culture.</i>

Based on Table 4.29, most of the designers agreed that the consideration of cultural values can be incorporated to identify the customers’ needs. Designer A, C and D explained that as the initial phase of the design, the identification of customer preferences should be clearly determined, otherwise the next phase would become problematic especially in establishing the design specification. Therefore, cultural value consideration was important to explore a deeper insight to understand the customer preferences. Designer B and E explained that, the consideration of cultural values in designing the green product can be incorporated while establishing the design specification. This is because the preferences of customers on the green product can be captured, when they see the detail specification. For example, the usage of recycled paper to produce a bento packaging may directly affect the customer preferences, in terms of the chemical content that may be appeared in the packaging. However, based on these two perspectives, it can be deduced that the consideration of cultural values in designing the green product was important to support the designers in developing the green product, especially in identifying the customers’ needs and establish the product specification. Content analysis was performed to evaluate the designers’ perspectives for the answers given. This study defines four

important information that should be identified based on the perspectives of the designers. The contents were denoted as Content 1 to 4. The descriptions of the content analysis are presented in Table 4.30.

Table 4.30: Focus of content analysis for the designers' perspectives

Contents	Description
Content 1	Perspectives on cultural value consideration for green product development.
Content 2	Perspectives on green product characteristics.
Content 3	Perspectives on strategies in designing the green product.
Content 4	Perspectives on the guideline for cultural value consideration in designing the green product.

Based on Table 4.30, there were four main information that needs to be extracted from the designers' perspectives. These include the perspectives on cultural value consideration for the green product development, perspectives on the green product characteristics, perspectives on the strategies in designing the green product, and perspectives on the guideline for cultural value consideration in designing the green product. After evaluating the answers as described in Table 4.23 to 4.29, there were some information which can be identified. The main information from the designers' perspectives is illustrated in Figure 4.8.

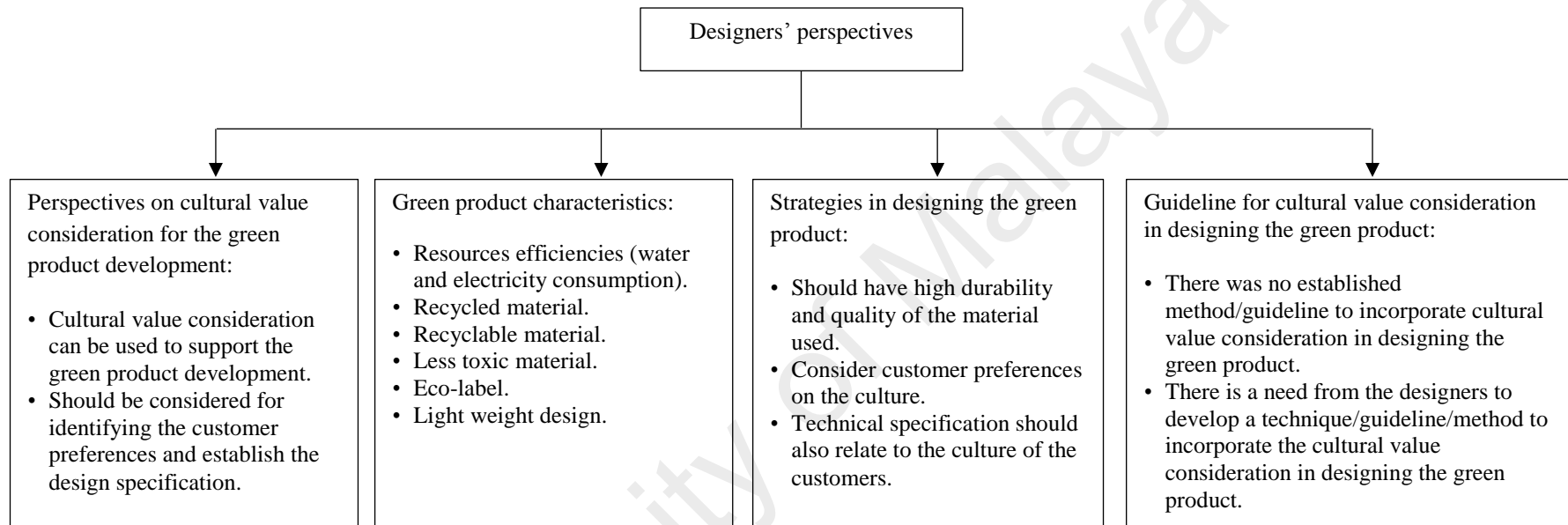


Figure 4.8: The designers' perspectives on the green product and cultural values consideration in designing the green product

As illustrated in Figure 4.8, there were four main information that can be obtained from the designers, i.e. (1) perspectives on cultural value consideration in designing the green product, (2) perspectives on the green product characteristics, (3) strategies to design the green product, and (4) the emerging reason to support the development of a guideline for incorporating the cultural value consideration in designing the green product. Most of designers explained that the consideration of cultural value influences can be used to support the development of the green product, and it should be incorporated into the phase of identifying the customers' needs.

There were several green product characteristics that can be extracted from the designers, such as resources efficiency, recycled material, recyclable material, less toxic material, eco-label, and designing light weight product or weight reduction. These identified green product characteristics from the designers were similar with the identified green product characteristics in the literature. However, as explained by the designers, the green product characteristics may be different to one another, depending on the designers' perspectives. The products may have different specifications. These differences can influence the designers to decide on which suitable green characteristics that should be embedded into the product design.

From the designers explanation, this study underlined three important strategies to design the green product. Firstly, the quality and durability of the green product should be maintained. For example, although the green product was made from recycled or recyclable materials, the quality of the product should not be lower than the product that was made using a virgin material. This is important to reduce the uncertainty of the customers on the green product. The designers also explained that the consideration of cultural value towards the customer preferences was important to design the green product. The preferences of customers are unique, very subjective and not easy to be

determined. Therefore, the consideration of cultural influences can be used as valuable strategies to provide an insight for the designers in designing the green product.

All the information from the designers' perspectives were important as the input to develop a guideline for incorporating the cultural value influences in designing the green product. This study noticed that there was no guidelines or techniques that were used by the designers to incorporate the cultural value consideration in designing the green product. In order to assist in the designers' decision, development of the guideline was required to incorporate the cultural value influences in designing the green product.

4.4 Literature analysis

The perspectives of the designers have been identified through the interviews. However, these perspectives were found to be rather general. These general perspectives were not sufficient to assist the designers in designing the green product. Thus, the next step was to extract potential strategies from the literature that can be used to support the designers' perspectives on the green design strategies, for the guideline development. This was important to describe in more detail all the strategies that were given by the designers. The extracted design strategies from the literature with respect to that given by the designers are presented in Table 4.31.

Table 4.31: Design strategies extracted from the literature

Strategies based on the designers' perspectives	Design strategies based on the literature
Eco-label	- Provide relevant information and state main objective of eco-label to avoid misinterpretation.
	- Use a certified eco-label from the legislation (government) rather than self-declaration.
	- The eco-label symbols used can be easily understood by the consumers.
Resources efficiency	- Maximise efficiency of water consumption.
	- Maximise efficiency of material used.
	- Maximise efficiency of energy used in the consumption phase.
	- Reduce emission and waste produced during usage.
	- Provide information to consumers, such as prediction on how much resources were used within a month, year, etc. (e.g. water, energy, material).
Non-toxic material	- Eliminate toxic material to decrease environmental impact and customer health contamination.
	- Consider material substitution to more superior materials in terms of sustainability.
	- Assures that non-recyclable parts or materials can be disposed in an ecological way.
	- Although using non-toxic material, the quality and durability of the product should be ensured.
	- If unavoidable, use of toxic material only when necessary.
Product services	- In the purchasing phase: provide product advice or briefing to explain the various details and functions of the product.
	- Using phase: provide regular maintenance, upgrades, provide spare parts availability and responsive to customer complain.
	- In the disposal stage, retrieval and refurbishing should be practiced to reduce waste generation to the landfill.
	- Offer rental of product rather than purchasing, so the producer can retrieve product at the end of the product's life.
Easily maintained	- Easily to disassemble or replace for self-repairing.
	- Make the function independent (design by module).
	- Support with spare part availability for reasonable duration of time.
Applied size or weight reduction	- Minimise material used and combination, the more material combination, the more energy required in the production line.
	- Should not interfere with flexibility, impact strength or functional properties.
	- Keep the performance of product by using high quality and durable material.
Recyclable material	- Focuses on maximum recyclability and a high content of recycled materials in the product.

Table 4.31, continued

Design strategies based on the literature	Design strategies based on the literature
Biodegradable material	- Use natural organic material; the product waste should be easy to decompose naturally.
	- Resulted product have high durability.
	- Eliminate hazardous material, if unavoidable used only when necessary and minimise it as much as possible.
Recycled material	- Eliminate the hazardous content in the recycled material.
	- Provide the quality product using recycled material like a new product.
	- Increase reparability of product.
Easily reused	- Design proper quality assurance of used part of the product.
	- Easily to disassemble or replace for problematic parts.
Easily to upgrade	- Easily to disassemble design.
	- Consider modular design with minimising the changing of the product function by making it structurally independent.
	- Consider modular design with allowing additional function to the product, without changing the structure of the product.

Based on Table 4.31, it can be seen that the design strategies from the designers were elaborated in more detail using the green design strategies, which were obtained from the literature. The design strategies from the literature can also be used, to support the development of the proposed guideline, for incorporating the consideration of cultural value influences in designing the green product. There were three sources of data for the proposed guideline, i.e. customers' perspectives data, designers' perspectives data and literature analysis data. The data required for the guideline development are illustrated in Figure 4.9.

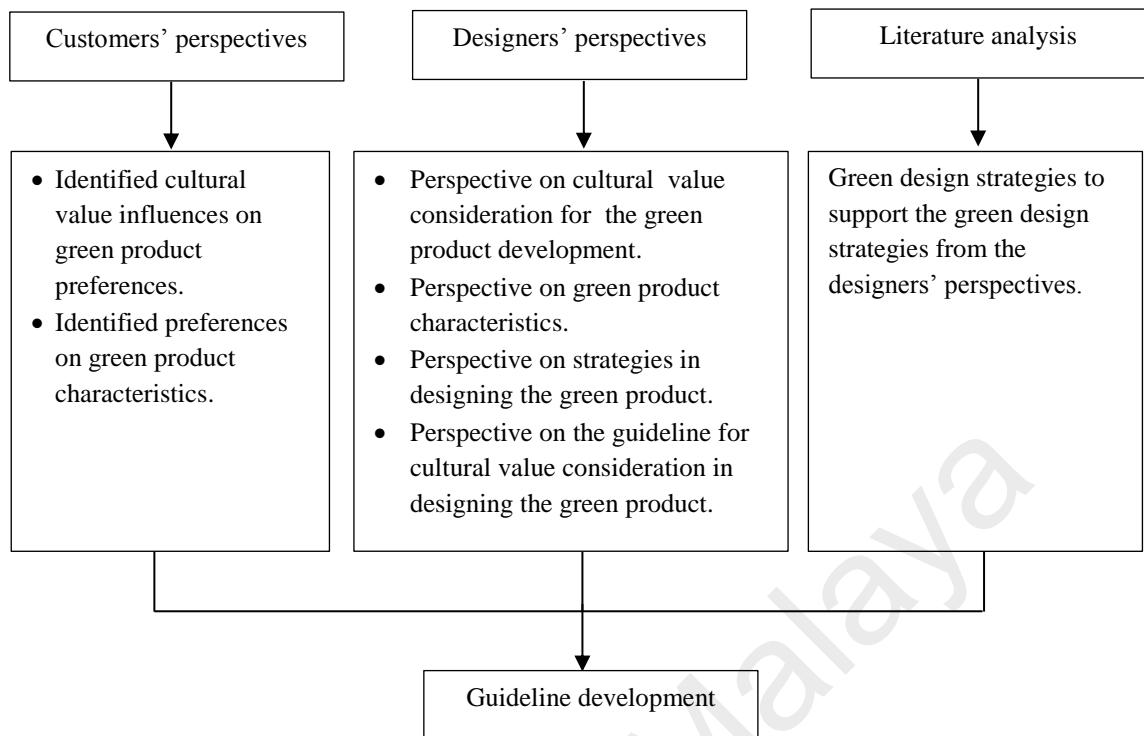


Figure 4.9: Three sources of data for the guideline development

4.5 Summary

This chapter was presented to describe all the process of data analysis, as explained in Chapter 4. It was classified into three phases. In the first phase, the influences of cultural value on the green product preferences were evaluated in this study. Secondly, the designers' perspectives on the cultural value consideration in designing the green product, green product characteristics and strategies to design the green product have been identified. The designers pointed out that the consideration of cultural value influences in designing the green product was prominent, as it can assist the designers to evaluate on which suitable green design specifications for their product. The designers also suggested that the development of the green product should consider the customer preferences, as the initial phase in the design process. The technical specification should also be related to the cultural preferences of the customers. In the third phase, the design strategies from the literature have been presented to provide in more detail of the design strategies that

were obtained by the designers, in the second phase. They contain several alternatives on the green design strategies, with respect to the design strategies from the designers. The data required for the guideline development have been illustrated in Figure 4.9. The development of the guideline, procedures to use the guideline and validation process from the viewpoint of the designers on the proposed guideline, will be presented in Chapter 5.

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CHAPTER 5: GUIDELINE DEVELOPMENT AND VALIDATION

5.1 Introduction

The findings on the identified relationships between the five cultural value influences and the preferences on the green product characteristics, were still considered as a prediction, which were statistically measured based on the SEM results. In addition, the identified green product characteristics and green product design strategies that were collected from the designers, were important in order to find suitable strategies that can be incorporated into the product design. Therefore, to confirm the applicability of the statistical results and to validate the designers' perspectives in designing the green product with the consideration of cultural value influences, the evaluation from the viewpoints of practices were required. A guideline was developed, which consists of the strategies for considering the cultural value influences in designing the green product. The strategies were generated based on the input data from the customers' and designers' perspectives. The designers who were considered as the experts in designing the product, were asked to evaluate the applicability of the guideline. The flow of validation procedures is presented in Figure 5.1.

Validation process

Descriptions

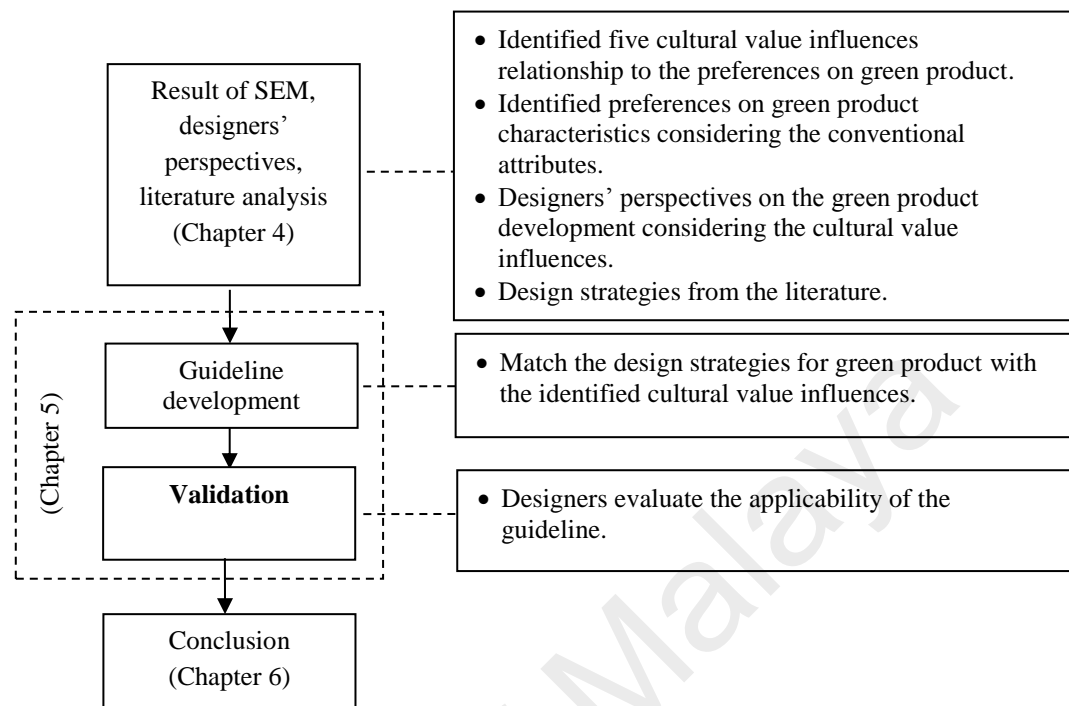


Figure 5.1: Flow of the validation process

5.2 Guideline development

The proposed guideline was developed based on the identified cultural value influences towards the customer preferences on the green product, and identified perspectives from the designers regarding the green product design while considering the cultural value influences. Based on these two findings, the strategies to incorporate the cultural value influences in designing the green product have been discussed in Chapter 4. The strategies for designing the green product while considering the cultural value influences are described in Table 5.1.

Table 5.1: Guideline development of the design strategies for the green product considering the cultural value influences

Influencing cultural value dimensions	Described characters	Approach to relate cultural value influences	Possible strategies that can be applied
Uncertainty avoidance	<ul style="list-style-type: none"> - Higher anxiety and stress were experienced - There is a great concern with security in life. - There is a need for written rules and regulations. - The uncertainty inherent in life was felt as a continuous threat that must be fought. 	Reduce the uncertainty of customers on the green product.	<ul style="list-style-type: none"> - Embed eco-label on the product design. - Use non-toxic material. - Provide product service. - Consider resources efficiency in the consumption phase. - Use high quality recyclable material. - Apply size and weight reduction with high quality material. - Use high quality biodegradable material. - Use high quality recycled material.
Long-term orientation	<ul style="list-style-type: none"> - Attaching more importance to the future. - Foster pragmatic values oriented towards rewards. - Persistence. - Saving (thrift). - Capacity for adaptation. 	Concern on the long-term expectation of customers on green product.	<ul style="list-style-type: none"> - Provide product service. - Consider resources efficiency in the consumption phase. - Easily maintained. - Use high quality recyclable material. - Can be upgraded easily by the user. - Easily reused.
Low power distances	<ul style="list-style-type: none"> - Inequality in society should be minimised. - Everyone should have equal rights. - Latent harmony exists between the powerful and the powerless. - Cooperation among powerless can be based on solidarity. - All should have equal rights. 	Concern to design the green product that does not indicate social gap and should not give negative impact to others.	<ul style="list-style-type: none"> - Embed eco-label on product design. - Provide product service. - Consider resources efficiency, especially in the consumption phase.

5.3 Scope of the guideline

There were four scopes that should be considered in developing the guideline:

1. Since the data were specifically obtained from Malaysia and Indonesia, the proposed guideline can only be applied in these two countries.
2. The proposed guideline cannot be applied in the other countries with the national culture indicated by Hofstede, as the cultural indices found in this study were different from those found by Hofstede.
3. The proposed strategies were decided based on eleven green product characteristics. These characteristics were defined based on the literature and designers' perspectives on the green product. They were arranged based on the identified ranks in the statistical calculation results. The identified ranks of the green product characteristics are presented in Table 5.2.

Table 5.2: Identified ranks of the green product characteristics based on the SEM results

Identified rank	Malaysia	Indonesia
1	Eco-labelling.	Providing product services.
2	Considering resources efficiency.	Reducing harmful materials.
3	Reducing harmful materials.	Eco-labelling.
4	Providing product services.	Easy to reuse.
5	Easy to upgrade.	Considering resources efficiency.
6	Using biodegradable materials.	Using biodegradable materials.
7	Using recyclable materials.	Using recycled materials.
8	Considering weight reduction.	Considering weight reduction.
9	Easy to maintain	Easy to maintain.
10	Using recycled materials.	Easy to upgrade.
11	Easy to reuse.	Using recyclable materials.

Based on the composition to develop the guideline as presented in Table 5.1 and Table 5.2, the proposed guideline is illustrated in Figure 5.2 and 5.3, as follows:

Approach to relate the cultural value influences.

Proposed strategies (from most to less important)

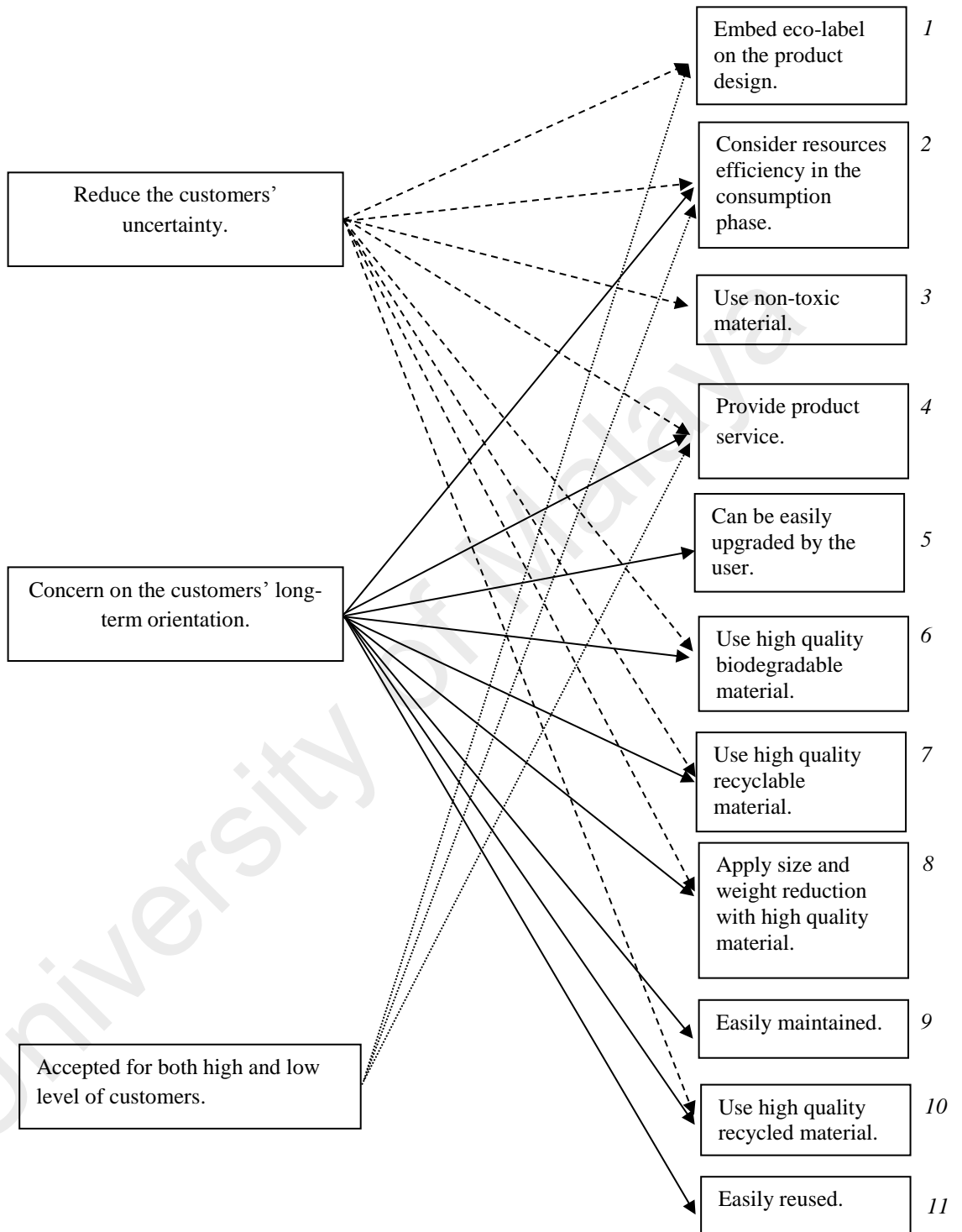


Figure 5.2: The proposed guideline for designing the green product while considering the cultural value influences in Malaysia

Approach to relate cultural value influences.

Proposed strategies (from most to less important)

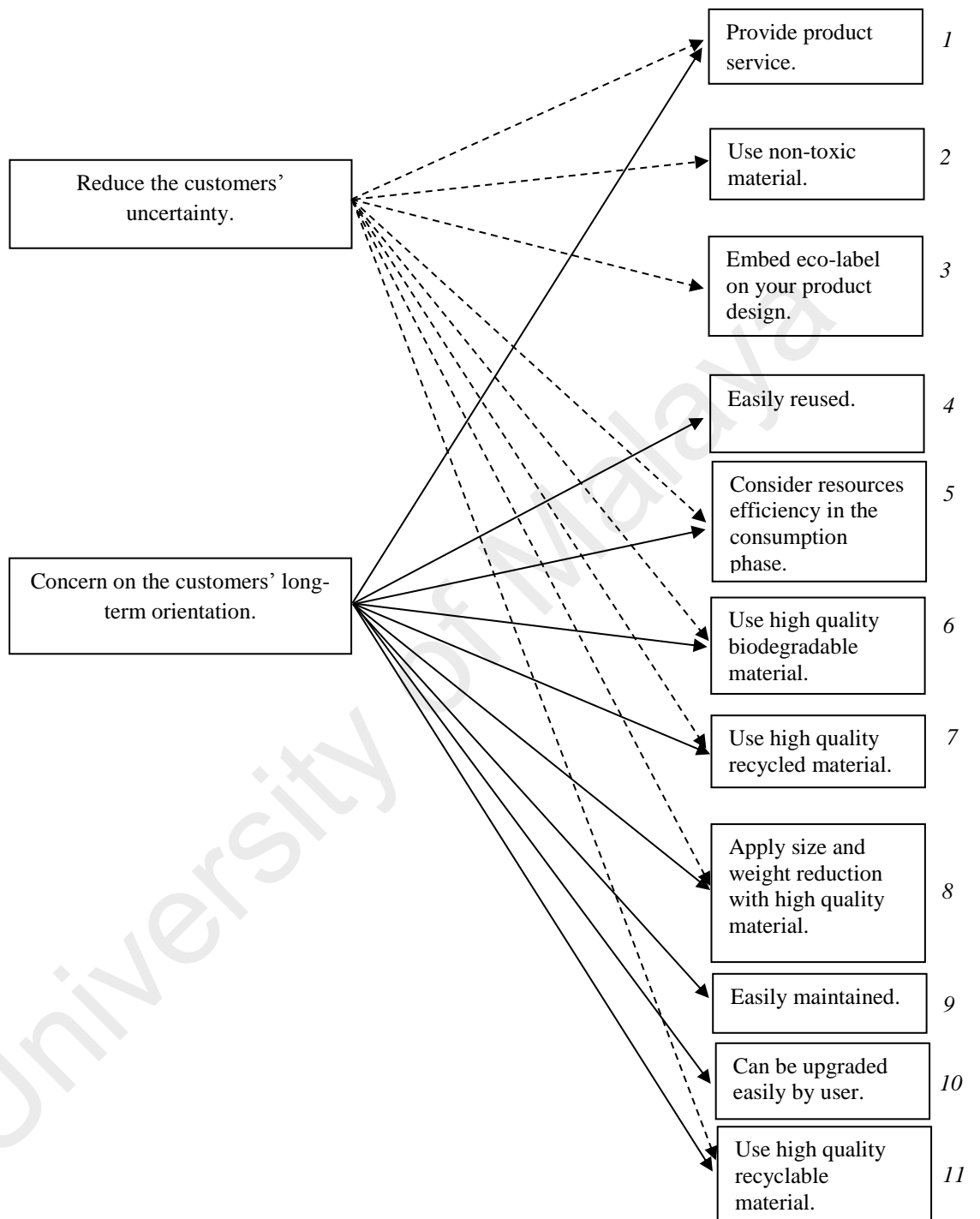


Figure 5.3: The proposed guideline for designing the green product while considering the cultural value influences in Indonesia

4. To provide a more detail information, substrategies with respect to each strategy are presented in Table 5.3. The table consists of several alternatives to design the green product, with respect to the strategies used in this study. The substrategies were obtained based on the literature review.

Table 5.3: Strategies and sub-strategies to design the green product while considering the cultural value influences

Strategies	Sub-strategies	Can be implemented ?	
		Yes	No
Embed your product with eco-label	- Provide relevant information and state main objective of eco-label to avoid misinterpretation.		
	- Use a certified eco-label from the legislation (government) rather than self-declaration.		
	- The eco-label symbols used can be easily understood by consumers.		
Consider resources efficiency	- Maximise efficiency of water consumption.		
	- Maximise efficiency material used.		
	- Maximise efficiency of energy used in the consumption phase.		
	- Reduce emission and waste produced during usage.		
Use non-toxic material	- Provide information to consumers, such as prediction on how much resources they were using (e.g. water, energy, material) within a month, year, etc.		
	- Eliminate toxic material to decrease environmental impact and customer health contamination.		
	- Consider material substitution to more superior materials in terms of sustainability.		
	- Assures that non-recyclable parts or materials can be disposed in an ecological way.		
	- Although using non-toxic material, the quality and durability of the product should be ensured.		
Provide product services	- If unavoidable, use of toxic material only when necessary.		
	- In the purchasing phase: provide product advice or briefing to explain the various details and functions of the product.		
	- Using phase: provide regular maintenance, upgrades, provide spare parts availability and responsive to customer complain.		
	- In the disposal stage: retrieval and refurbishing should be practiced to reduce waste generation to landfill.		
Easily maintained	- Offer rental of product rather than purchasing, so the producer can retrieve product at the end of the product's life cycle.		
	- Easy to disassemble or replace for self-repairing.		
	- Consider modular design to make part of the product independent and easily replaced by the customers.		
	- Support with spare part availability for reasonable duration of time.		

Table 5. 3, continued

Strategies	Sub-strategies	Can be implemented ?	
		Yes	Yes
Applied size or weight reduction	- Minimise material used and combination, the more material combination the more energy required in the production line.		
	- Should not interfere with flexibility, impact strength or functional properties.		
	- Keep the performance of product by using high quality and durable of material.		
Using recyclable material	- Focuses on maximising recyclability and a high content of recycled material in the product.		
Using biodegradable material	- Use natural organic material; the product waste should be easy to decompose naturally.		
	- Resulted product have high durability.		
	- Eliminate hazardous material, if unavoidable used when necessary and minimise it as much as possible.		
Using recycled material	- Eliminate the hazardous content in the recycled material.		
	- Provide a quality product using recycled material like a new product.		
	- Increase reparability of the product.		
Easily reused	- Design proper quality assurance of the used part of the product.		
	- Easy to disassemble or replace for problematic parts.		
Easy to upgrade	- Easy to disassemble design.		
	- Consider modular design with minimising the changing of product function by making it structurally independent.		
	- Consider modular design with allowing additional function to the product without changing the structure of the product.		

5.4 How to use the guideline

The expected output of the proposed guideline was to assist the designers for considering the cultural value influences in designing the green product. There are five steps that the designers need to follow when using the proposed guideline:

- a. *Step 1*: the design concept and specification of the product should be initially prepared by the designers.
- b. *Step 2*: based on that design concept, the designers need to select possible green design strategies as presented in the guideline, which can be possibly embedded into the design by giving *Yes* or *No*. This table is generated based on Figure 5.4 and 5.5.

Table 5.4: Checklist of the strategies for designing the green product to relate the cultural value influences (Malaysia)

Cultural value consideration	Recommended characteristics	Checklist	
		Yes	No
Reduce your customer uncertainty	Embed eco-label on your product design.		
	Use non-toxic material.		
	Provide product service (e.g. rent the product, provide longer service support).		
	Consider resources efficiency in the consumption phase (e.g. save energy, save water, save material etc.).		
	Apply size or weight reduction with high quality material.		
	Use recyclable material.		
	Use high quality biodegradable material.		
Concern on the customers' long-term orientation	Provide product service.		
	Consider resources efficiency, especially in the consumption phase.		
	Use durable recyclable material.		
	Can be upgraded easily by the user.		
	Easily reused.		
	Can be maintained easily by the user.		
Reduce your customers' power distance (gaps)	Embed eco-label on your product design.		
	Provide product services.		
	Consider resources efficiency in the consumption phase.		

For Indonesia, the power distance influence was not included in Table 5.5, because in the statistical result, this dimension has no significant influence towards the customers preferences in Indonesia. The checklist of the strategies for designing the green product to relate with the cultural value influences, are presented in Table 5.5.

Table 5.5: Checklist of green design strategies to relate with the cultural value influences (Indonesia)

Cultural value consideration	Recommended characteristics	Checklist	
		Yes	No
Reduce your customer uncertainty	Embed eco-label on your product design.		
	Use non-toxic material.		
	Provide product service (e.g. rent the product, provide longer service support).		
	Consider resources efficiency in the consumption phase (e.g. save energy, save water, save material etc.).		
	Apply size or weight reduction with high quality material.		
	Use recyclable material.		
	Use high quality biodegradable material.		
Concern on the customers' long-term orientation	Provide product service.		
	Consider resources efficiency, especially in the consumption phase.		
	Use durable recyclable material.		
	Can be upgraded easily by the user.		
	Easily reused.		
	Can be maintained easily by the user.		

Based on the consideration of cultural value influences checklist, the designers need to select which design characteristics can be implemented in their design. The preferences ranks of the characteristics are presented in Table 5.6 (Malaysia) and Table 5.7 (Indonesia), for the designers' consideration.

Table 5.6: Green product strategies checklist (Malaysia)

Possible strategies that can be applied	Preferences rank	Possible to be implemented?	
		Yes	No
Eco-labelling	1		
Energy efficiency	2		
Reduce harmful materials	3		
Provide product services	4		
Easy to upgrade	5		
Biodegradable materials	6		
Recyclable materials	7		
Weight reduction	8		
Easy to maintain	9		
Recycled materials	10		
Easy to reuse	11		



Selected strategies (Yes answers), please prioritised your selected strategies based on the rank of the green product characteristics.
1.
2.
3.
.....
.....

Table 5.7: Green product strategies checklist (Indonesia)

Possible strategies that can be applied	Preferences rank	Possible to be implemented?	
		Yes	No
Provide product services	1		
Reduce harmful materials	2		
Eco-labelling	3		
Easy to reuse	4		
Energy efficiency	5		
Biodegradable materials	6		
Recycled materials	7		
Weight reduction	8		
Easy to maintain	9		
Easy to upgrade	10		
Recyclable materials	11		



Selected strategies (Yes answers), please prioritised your selected strategies based on the rank of the green product characteristics
1.
2.
3.
.....
.....

- c. *Step 3:* Based on the selected design strategies (i.e. Yes answers), the designers can continue to select the substrategies that can be implemented into their design by giving *Yes* or *No* answers (See Table 5.3).
- d. *Step 4:* The selected green design strategies and substrategies, which can be possibly embedded into the design concept were extracted. The extracted strategies and substrategies can be placed in Table 5.8.

Table 5.8: Selected green strategies and substrategies

Selected strategies	Selected substrategies
1.....	a.....
	b.....
	c.....
2.....	a.....
	b.....
	c.....
3.....	a.....
	b.....
	c.....

- e. *Step 5:* The selected green design strategies and substrategies were embedded into the initial design concept.

The procedure to use the proposed guideline is illustrated in Figure 5.4.

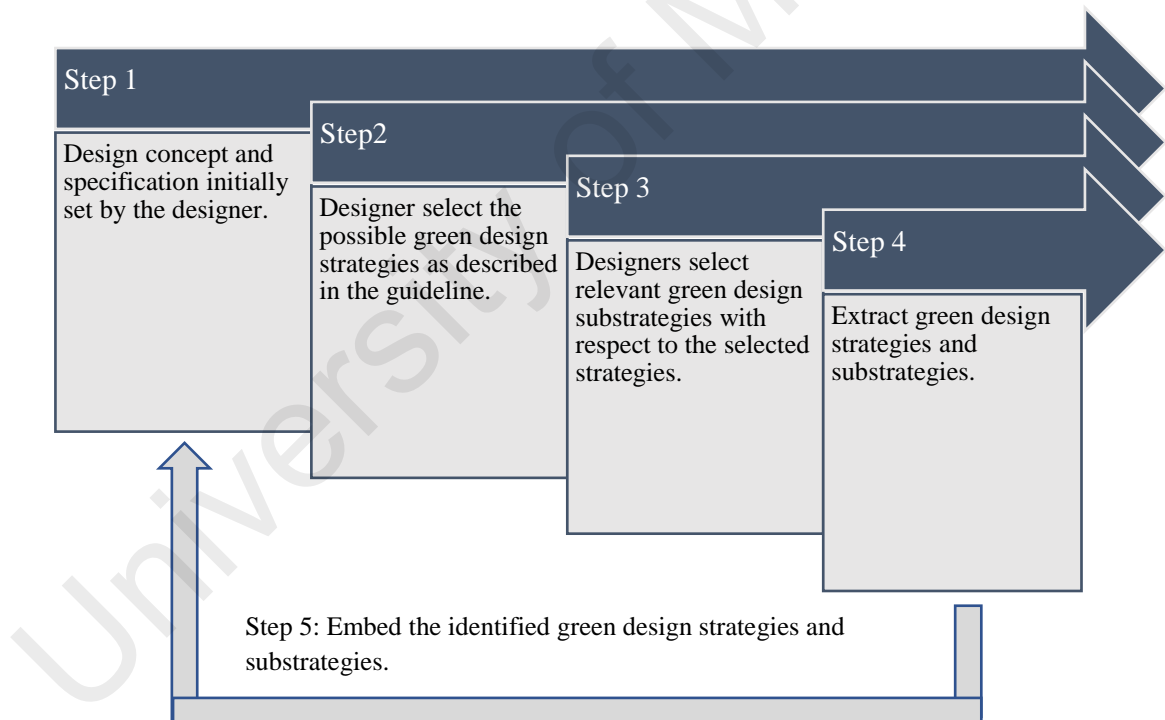


Figure 5.4: The procedure to use the proposed guideline

In order to evaluate the applicability of the proposed guideline, twelve case studies were conducted by providing the guideline to the designers. The process and results of the case study are presented in Section 5.5.

5.5 Case study of proposed guideline

The questionnaires which consists of the proposed strategies and substrategies in designing the green product while considering the cultural value influences, were distributed to the designers. A total of twelve professional designers from Malaysia and Indonesia with different backgrounds, were inquired to give their evaluations regarding the guideline development. The full profiles of the designers involved in the guideline validation, are presented in Table 5.9.

Table 5.9: Profiles of the designers

Code	Experience (years)	Market	Product
DSM-1	26	Malaysia and other countries.	Product packaging, exhibition booths, etc.
DSM-2	20	Malaysia and other countries.	Smart Forest/Digital Forest product.
DSM-3	20	Malaysia and other countries.	Toll highway management and maintenance products.
DSM-4	20	Malaysia and other countries.	Suspension system (absorber, coil spring and stabiliser bar), brake system, engine parts for automotive industries.
DSM-5	10	Malaysia and other countries.	Machine/equipment for semiconductor industries.
DSM-6	10	Malaysia and other countries.	Juicer, food processor, blender, meat grinder products.
DSI-7	15	Indonesia	Watch product and accessories.
DSI-8	6	Indonesia	Cadcam based product (by order).
DSI-9	10	Indonesia	Cadcam based product (by order).
DSI-10	5	Indonesia and other countries.	Waste water treatment plant product.
DSI-11	5	Indonesia and other countries.	Reusable bag.
DSI-12	7	Indonesia and other countries.	Reusable bag.

DSM = Designers from Malaysia; DSI = Designers from Indonesia

The compilation of designers' answers for the selection of strategies and substrategies, are presented in Table 5.10 and 5.11.

Table 5.10: The compilation of filled checklist that was performed by the designers for the selection of green product characteristics considering the cultural value influences

Cultural value consideration	Recommended characteristics	DSM 1		DSM 2		DSM 3		DSM 4		DSM 5		DSM 6		DSI 7		DSI 8		DSI 9		DSI 10		DSI 11		DSI 12	
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
		Reduce your customers' uncertainty.	Embed eco-label on your product design.	√		√		√		√		√		√		√				√		√		√	
	Use non-toxic material.	√		√		√		√		√		√		√	√		√		√		√		√		√
	Provide product service (e.g. rent the product, provide longer service support).		√	√			√	√		√		√		√		√		√		√		√			√
	Consider resources efficiency in the consumption phase (e.g. save energy, save water, save material etc.).	√		√		√		√		√		√		√		√		√		√		√			√
	Apply size or weight reduction with high quality material.	√		√		√		√		√		√		√	√		√		√		√		√		√
	Use recyclable material.	√		√		√		√		√		√		√	√		√		√		√		√		√
	Use high quality biodegradable material.	√		√		√	√			√		√		√	√		√		√		√		√		√
Concern on the customers' long-term orientation.	Provide product service.	√		√		√		√		√		√		√		√		√		√		√			√
	Consider resources efficiency especially in the consumption phase.		√	√		√		√		√		√		√		√		√		√		√			√
	Use durable recyclable material.	√		√		√		√		√		√		√		√		√		√		√			√
	Can be upgraded easily by the user.		√		√	√				√		√		√		√		√		√		√			√
	Easily reused.	√		√		√		√		√		√		√	√		√		√		√		√		√
	Can be easily maintained by the user.		√	√		√		√		√		√		√		√		√		√		√			√
Reduce your customers' distance (gaps).	Embed eco-label on your product design.	√		√			√	√		√			√	Have no influences in Indonesia											
	Provide product services.	√		√			√	√		√		√													
	Consider resources efficiency in the consumption phase.	√		√		√		√		√		√													

Table 5.11: The compilation of filled checklist that was performed by the designers for the selection of strategies and substrategies for the incorporation of green product characteristics while considering the cultural value influences

Strategies	Substrategies	DSM 1		DSM 2		DSM 3		DSM 4		DSM 5		DSM 6		DSI 7		DSI 8		DSI 9		DSI 10		DSI 11		DSI 12	
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Embed your product with eco-label.	Provide relevant information and state main objective of the eco-label to avoid misinterpretation.	√		√			√		√		√		√		√		√		√		√		√		
	Use a certified eco-label from the legislation (government), rather than self-declaration.	√		√		√		√		√		√		√		√	√		√			√		√	
	The eco-label symbols used can be easily understood by the consumers.	√		√		√		√		√		√		√		√		√		√		√		√	
Consider resources efficiency.	Maximise efficiency of water consumption.	√		√		√	√		√		√		√		√	√		√		√		√		√	
	Maximise efficiency of material used.		√			√	√		√		√	√		√	√		√	√		√		√		√	
	Maximise efficiency of energy used in the consumption phase.	√		√		√		√		√		√		√		√		√		√		√		√	
	Reduce emission and waste produced during usage.	√		√		√		√		√		√		√		√		√		√		√		√	
	Provide information to the consumers, such as prediction on how much resources they were using within a month, year, etc. (e.g. water, energy, material).	√		√			√	√		√		√		√	√		√		√		√		√		√

Table 5.11, continued

Strategies	Substrategies	DSM 1		DSM 2		DSM 3		DSM 4		DSM 5		DSM 6		DSI 7		DSI 8		DSI 9		DSI 10		DSI 11		DSI 12	
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Use non-toxic material.	Eliminate toxic material to decrease the environmental impact and customer health contamination.	√		√		√		√		√		√	√		√		√		√		√		√		
	Consider material substitution to more superior materials in terms of sustainability.	√		√		√	√		√		√		√		√		√		√		√		√		
	Assures that non-recyclable parts or materials can be disposed in an ecological way.	√		√		√	√		√		√		√	√		√		√		√		√		√	
	Although using non-toxic material, the quality and durability of the product should be ensured.	√		√		√		√		√		√		√		√		√		√		√		√	
	If unavoidable, use of toxic material only when necessary.	√		√		√	√		√		√		√		√	√		√		√		√	√		√
Provide product services to your customers.	In the purchasing phase: providing product advice or briefing to explain the various details and functions of the product.	√		√		√		√		√		√		√		√		√		√		√		√	

Table 5.11, continued

Strategies	Substrategies	DSM 1		DSM 2		DSM 3		DSM 4		DSM 5		DSM 6		DSI 7		DSI 8		DSI 9		DSI 10		DSI 11		DSI 12	
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Provide product services to your customers.	Using phase: provide regular maintenance, upgrades, providing spare parts availability and responsive to customer complain.	√		√		√	√	√		√		√		√		√		√		√		√		√	
	In the disposal stage, retrieval and refurbishing should be practiced to reduce waste generation to the landfill.	√		√		√	√	√		√		√		√		√	√	√		√		√		√	
	Offer rental of product rather than purchasing, so the producer can retrieve the product at the end of the product's life.	√		√		√	√	√		√		√	√	√		√	√	√		√		√		√	√
Easily maintained.	Easy to disassemble or replace for self-repairing.	√		√		√		√		√		√		√		√		√		√		√		√	
	Consider modular design to make part of the product independent and easily replaced by the customers.	√		√		√		√		√		√		√		√	√	√		√		√		√	√
	Support with spare part availability for a reasonable duration of time.	√		√		√		√		√		√	√	√		√	√	√		√		√		√	√

Table 5.11, continued

Strategies	Substrategies	DSM 1		DSM 2		DSM 3		DSM 4		DSM 5		DSM 6		DSI 7		DSI 8		DSI 9		DSI 10		DSI 11		DSI 12	
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Applied size or weight reduction.	Minimise material used and combination, the more material combination the more energy required in the production line.	√		√		√		√		√		√		√		√		√		√		√		√	
	Should not interfere with flexibility, impact strength or functional properties.	√		√		√		√		√		√		√		√		√		√		√		√	
	Keep the performance of the product, by using high quality and durable material.	√		√		√		√		√		√		√		√		√		√		√		√	
Using recyclable material.	Focuses on maximum recyclability and a high content of recycled material in the product.	√		√		√		√		√		√		√		√		√		√		√		√	
Using biodegradable material.	Use natural organic material; the product waste should be easy to decompose naturally.	√		√		√		√		√		√		√		√		√		√		√		√	
	Resulted product have high durability.	√		√		√		√		√		√		√		√		√		√		√		√	
	Eliminate hazardous material, if unavoidable used when necessary and minimise it as much as possible.	√		√		√		√		√		√		√		√		√		√		√		√	

Table 5.11, continued

Strategies	Substrategies	DSM 1		DSM 2		DSM 3		DSM 4		DSM 5		DSM 6		DSI 7		DSI 8		DSI 9		DSI 10		DSI 11		DSI 12	
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Using recycled material.	Eliminate the hazardous content in the recycled material.	√		√		√		√		√		√		√		√		√		√		√		√	
	Provide a quality product using recycled material like a new product.	√		√		√		√		√		√		√		√		√		√		√		√	
	Increase reparability of the product.	√		√		√		√		√		√		√		√		√		√		√		√	
Easily reused.	Design proper quality assurance of used parts of the product.	√		√			√	√		√		√		√		√		√		√		√		√	
	Easy to disassemble or replace for problematic parts.	√		√		√				√		√		√		√		√		√		√		√	
Easy to upgrade.	Easy to disassemble design.	√		√		√				√		√		√		√		√		√		√		√	
	Consider modular design and minimising the changing of product function, by making it structurally independent.	√		√		√				√		√		√		√		√			√	√		√	
	Consider modular design and allowing additional function to the product without changing the structure of the product.	√		√		√				√		√		√		√		√		√		√		√	

The answers from the designers were found to be slightly different. It was showed that they have different priorities in selecting which green product characteristics that can be embedded in their design. Once the procedures to select the appropriate strategies and substrategies in designing the green product while considering the cultural value influences have been completed, the designers were asked to evaluate all the contents in the guideline. A compilation of the designers' evaluations are described in Section 5.6.

5.6 Evaluation of guideline

Four questions were delivered to the designers, to evaluate the proposed guideline. Each designer gave different perspectives in evaluating the proposed guideline. The answers for question 1, i.e. “*Based on your experiences, do you think cultural value should be considered in designing the product?*”, are compiled in Table 5.12.

Table 5.12: Compilation of the designers' answers for questions 1

Designers	Yes/ No	Comment
DSM-1	Yes	<i>Perhaps you should consider cultural values to be embedded if you were targeting a particular segment of users. You should have a look at the products that you are designing too. Embedding such values may create a niche market for the product.</i>
DSM-2	Yes	<i>The design of product should be relevant with the customers' culture, since the product design cannot be easily generalised. By considering culture in the design, we can get more detail information to set the product specification for our particular market.</i>
DSM-3	Yes	<i>It is very important as part of building and enhancing a design identity and reputation, by being trendy, attractive, likable and also applicable with current times and needs, without sacrificing the heritage, culture, customs and values. In short, an integration of both worlds.</i>
DSM-4	Yes	<i>The involvement of culture enables me to explore customer requirement in designing a product.</i>
DSM-5	Yes	<i>Product design that matched to the local cultural values would have an easier acceptance by the end user.</i>
DSM-6	Yes	<i>Yes. Design of a product should consider the cultural values to suit specific target of consumers. For example, Japan culture is more towards eco-friendly, 'all-in-1' type of product, and does not create any harm towards the consumers. They really are concern on every details of the product, such as the guide on how to use, how to maintain, which part should be carefully handled, and etc. All are stated and provide with caution label.</i>

Table 5.12, continued

Designers	Yes/ No	Comment
DSI-7	Yes	<i>The product beside having a good design, it must have a soul, like an art. Indonesia has many local stories/ cultures that could be the inspiration and an educational media for the people of the world. This way could bring a good image for the brand, and increase the prestige of a design.</i>
DSI-8	Yes	<i>The consideration of cultural value influences is important to build product innovation.</i>
DSI-9	Yes	<i>Design of product should be relevant with the customers' culture.</i>
DSI-10	Yes	<i>Every market has their own unique characteristics and should be considered when we design a product. But if there are any cultural values which are totally differ from its local wisdom and give negative impact for the environment, we should still be committed to fix and innovate the product, even when the consumers are not familiar with the product. In this case, government needs to support the green product, to be accepted by the consumers.</i>
DSI-11	Yes	<i>Product is used by humans; humans have behaviour, environment and culture. So, a product should support the behaviour, environment and culture of the human as well. These aspects are important to be applied, and reassured that the product is sustainable.</i>
DSI-12	Yes	<i>Yes, but depends on our segmentation. Mostly, when it comes to green product, people will think cultural value embedded into the product itself. In our case (baGoes Bag), we use traditional fabric for one of our variant.</i>

DSM = Designers from Malaysia; DSI = Designers from Indonesia

According to Table 5.12, all the designers from Malaysia and Indonesia agreed that the consideration of cultural value influences in designing the green product was important. Most of the designers explained that the consideration of cultural value influences in designing the green product may allow them to explore in more detail of the product specification. This is because the customers may have different characters in each particular market. DSM1 explained that the consideration of cultural value influences in a particular market may create a niche market for the product. DSM2 – DSM6 have almost similar viewpoints in terms of the cultural consideration in designing the green product. The consideration of cultural value influence provides more insight for the designers to design a more relevant product with the customers' preferences, since the specification of a product can be determined accordingly, based on the cultural value influences. The consideration of cultural values in designing the green product also enables to enhance the acceptance of the product, since the designed product is more

suitable with the customers' local characters. The answers from the designers in this study were in line with the theory that was explained by Bloch (1995) and Salmi and Sharafuthdinova (2008), where the cultural value of the customers was a prominent aspect, and should be included in the design process. Since culture was naturally formed, it can differentiate the behaviour between groups in a certain area. It can also affect the preferences of customers in their purchasing decisions.

In the next evaluation, the designers were asked to give their comment on the proposed guideline. The answers of the designers for the question “*Do you think the developed guideline provides some valuable information to support the development of green product?*” in Malaysia and Indonesia are presented in Table 5.13.

Table 5.13: Designers evaluation on the proposed guideline

Designers	Yes/ No	Comments
DSM-1	Yes	<i>It has opened my mind to consider other aspects, such as culture value influence in designing the green product.</i>
DSM-2	Yes	<i>This guideline provides me a new insight to understand how to set a product specification, especially for green product based on the cultural values of the customers.</i>
DSM-3	Yes	<i>It has potential to support the development of a product, however needs enforcement and audits.</i>
DSM-4	Yes	<i>Malaysian culture is intangible to be measured, the guideline provides me a deeper understanding on how the customers perceive environmental concern through a product.</i>
DSM-5	Yes	<i>The current manufacturers in Malaysia are encouraged to consider environmental aspects within the production line, as well as for the end user of the product (consumers). The guideline provides a new perspective from the natural setting of consumer behaviour, which leads me to be more careful to decide the design attributes with more concern on the environment.</i>
DSM-6	Yes	<i>Yes. Relevant guideline can provide some information to support the development of a sustainable product in Malaysia. This can be a good guideline or reference for a company to initiate a business plan, so that they can produce the product that the market needs. However, this guideline should be more precise, in-depth, and easy to understand by all kind of people for future use.</i>
DSI-7	Yes	<i>The user in Indonesia is smarter than 5 or 10 years ago. Their awareness with values and detail on the base of a product, are the most important thing that you can bring by being a part of the users' experience.</i>
DSI-8	Yes	<i>The more we know the reasons through cultural value influence, the more we can be creative in designing the green product.</i>

Table 5.13, continued

Designers	Yes/ No	Comments
DSI-9	Yes	<i>By this guideline, now I know what are the reasons behind the customers' preferences on green product in Indonesia.</i>
DSI-10	Yes	<i>The guideline clearly describes the mind mapping of the green product design. We need to evaluate and develop our product by using the way of thinking based on the guideline.</i>
DSI-11	Yes	<i>As I know, it is still under progress. We have some eco-labels and green product guideline and certifications, but as I mentioned before, the government still focus on the big brands, but not for local brands/ products.</i>
DSI-12	Yes	<i>It could become the standard guideline for producers in developing the green products. Quality should be on the spotlight, because a lot of the products have quality which are still far from the industrial products (non-green product).</i>

DSM = Designers from Malaysia; DSI = Designers from Indonesia.

Referring to Table 5.13, all the designers agreed that the proposed guideline provides some valuable information to support the development of green product with different perspectives. DSM-1 for instance, described that the provided guideline gave some information where the cultural value influence can be involved in designing the green product. In similar manner, DSM-2 to DSM-6 explained that the proposed guideline gave a deeper understanding to capture the customer preferences on the green product, enable to assist their decision to set a product specification for the green product, based on the cultural value influences. DSM-6 from Malaysia, DSI-9 and DSI-12 from Indonesia kindly agreed that the proposed guideline can be used as a standard guideline in developing the green product. Although the designers agreed that the proposed guideline can be used as a potential tool to involve the cultural value consideration in designing the green product, it can be made clearer in which phase of design process the proposed guideline can be applied. It can be in the phase of identifying the customers' needs, establish target specification, generate product concepts, select product concepts, test product concepts, or set final specifications (Ulrich & Eppinger, 2008). Therefore, question 3, i.e. *“Based on your experiences, in which design process the guideline can help”*. The answers for this question are compiled in Table 5.14.

Table 5.14: Implementation of the guideline in the design process

Designers	Design Process	Comments
DSM-1	<ul style="list-style-type: none"> – Identify customers' needs. – Generate product concept. 	<i>Cultural involvement in design is important in the stages of identifying the customers' needs and generate product concept.</i>
DSM-2	<ul style="list-style-type: none"> – Identify customers' needs. – Establish target specification. – Test product concept. – Set final specifications. 	No comment.
DSM-3	<ul style="list-style-type: none"> – Establish target specification. – Generate product concept. 	No comment.
DSM-4	<ul style="list-style-type: none"> – Identify customers' needs. – Establish target specification. – Generate product concepts. – Test product concept. – Set final specifications. 	No comment.
DSM-5	<ul style="list-style-type: none"> – Identify customers' needs. – Establish target specification. – Generate product concepts. – Select product concepts. – Test product concept. – Set final specifications. 	No comment.
DSM-6	<ul style="list-style-type: none"> – Identify customers' needs. – Establish target specification. – Generate product concepts. 	<i>This guideline can be used at the initial stage to help the organisation to have a clearer view on the project direction, the aim, and also the strategy to win the market.</i>
DSI-7	<ul style="list-style-type: none"> – Identify customers' needs. – Establish target specification. – Set final specifications. 	<i>Most of the time, designers don't know well about the market. So you can guide them.</i>
DSI-8	<ul style="list-style-type: none"> – Generate product concepts. – Select product concepts. 	<i>Brainstorming the concepts is always the key of the final product.</i>
DSI-9	<ul style="list-style-type: none"> – Identify customers' needs. – Establish target specification. – Generate product concepts. – Test product concept. – Set final specifications. 	No comment.
DSI-10	<ul style="list-style-type: none"> – Establish target specification. – Generate product concepts. – Select product concepts. 	<i>The guideline is easy to understand, and remind us of the whole process that can be implemented, with sustainable development way of thinking. Start from the raw material – product making – consumer usage – maintenance – and the disposal of waste.</i>
DSI-11	<ul style="list-style-type: none"> – Identify customers' needs. – Generate product concepts. – Test product concept. 	No comment.
DSI-12	<ul style="list-style-type: none"> – Identify customers' needs. – Establish target specification. 	No comment.

DSM = Designer from Malaysia; DSI = Designer from Indonesia.

Based on Table 5.14, from the six phases of the design process, the designers have different perspectives in which part the guideline can be applied. However, most of the designers agreed that the guideline can be involved in the phase of identifying the

customers' needs. For example, DSM-1 was concerned that the guideline can be used to identify the customers' needs and generate product specification. DSM-2 focused on to identify the customers' needs, establish target specification, test product concept and set final specification. DSM-4 explained that the guideline can be used to assist designers in the phase of identifying the customers' needs, establish target specification, generate product concepts, test product concept and set final specifications. The other designers, such as DSM-5, DSM-6, DSI-7, DSI-9, DSI-11 and DSI-12, also have same opinions on the proposed guideline, where it is more suitable in identifying the customers' needs. In addition, 9 out of the 12 designers (i.e. DSM-1, DsM-3, DSM-4, DSM-5, DSM-6, DSI-8, DSI-9, DSI-10, DSI-11) also agreed that the proposed guideline was suitable to generate the product concept. However, although the designers mostly agreed that the proposed guideline can be used in identifying the consumers' needs and generate product concept, the guideline can also be applied in the other phases of the product design. It can be seen from the different answers that were given by the designers in terms of the application of the guideline. It depends on how the designers perceive the provided guideline. The proposed guideline was confirmed to have a contribution in the design process. However, the provided guideline may have some limitation for the designers. Therefore, to evaluate what should be improved for the guideline, question 4 was asked to the designers. The question was "*Considering your experience as a designer, what are the things that can be improved in the guideline?*". The answers of the designers for this question are compiled in Table 5.15.

Table 5.15: Recommendation from the designers to improve the guideline

Designers	Comments
DSM-1	<i>The guideline could use more information or show how-to or where-to directions to guide a designer towards his goal in producing the best possible product. The guideline should also evolve with the change in social environment, economic standing, purchasing power and current to future technology.</i>
DSM-2	No comment.
DSM-3	No comment.
DSM-4	No comment.
DSM-5	No comment.
DSM-6	No comment.
DSI-7	No comment.
DSI-8	No comment.
DSI-9	<i>The guideline is good already. However, it can be more interesting if the guideline can assist the designers to choose the best alternative of green product design, based on the cultural value influences. Since, generally the designers will design a product with several alternatives, and then eventually decide the best alternative.</i>
DSI-10	No comment.
DSI-11	No comment.
DSI-12	Nil

From Table 5.15, it can be seen that there were only two designers that gave positive comments to improve the guideline. DSM-1 explained that the provided guideline can be used as a direction to guide the designers to produce the best product. It could be more interesting if the social and economic aspects can be incorporated into the guideline. However, this study was focused to explore the cultural value influences towards the green product preferences. As the three pillars of sustainable development, the expectation from DSM-1 to include the social and economic aspects in the guideline, was greatly appreciated. It can be considered for future plans to complete the guideline, not only for the green product, but also for sustainable product. In addition, the other recommendations also came from DSI-9. DSI-9 expected that for future steps, the guideline can assist the designers to select the best alternative design based on the cultural value influences. This recommendation can be a potential direction for future study to explore in more detail the importance of cultural value consideration in designing the green product.

5.7 Summary

A structured validation process for the guideline of cultural value consideration in designing the green product has been presented in this chapter. The validation process was conducted by inquiring the designers to evaluate the proposed guideline that has been developed based of the data of identified cultural value influences towards customer preferences on the green product, and the designers' perspectives on the consideration of cultural value influences in designing the green product. The purpose of the guideline was to assist the designers for incorporating the cultural value consideration in designing the green product. The procedure on how to use the guideline has been clearly described. By conducting twelve case studies involving the designers as experts, this study confirmed that the proposed guideline was enabled to support the development of the green product. Most of the designers explained that the proposed guideline was suitable for identifying the consumers' needs and generating a product concept. It can also be used for the other phases of design, however depending on how the designers perceive the guideline. Based on the validation results, it is concluded that the cultural value consideration can be involved in designing the green product.

CHAPTER 6: CONCLUSION

6.1 Introduction

This chapter is served to present the conclusion of the research. This includes the achievements of the research objectives, the contributions of the research to the theory, and practices and the novelties of the research. The achievements of research objectives are presented in Section 6.2. The limitations of the research and the direction for future researchers are also described in the last section of this chapter.

6.2 Achievement of research objectives

The aim of this research was to develop a guideline to incorporate the consideration of cultural value influences in designing the green product. In order to achieve the research aim, there were four objectives that needs to be achieved. The objectives of this research are described as follows:

1. To develop a conceptual model for the incorporation of the cultural values into the green products design.
2. To identify the significant relationship between the cultural values and the customer preferences on green products.
3. To develop a guideline for the consideration of cultural values in designing the green products for Malaysia and Indonesia.
4. To validate the guideline of cultural values consideration in the green product design.

The achievements of research objectives are elaborated in the following subsections.

6.2.1 The achievement of objective 1

The first objective was achieved by developing a conceptual model for incorporating the cultural value consideration in designing the green product. The purpose of the model development was to conceptualise all procedures that should be undertaken to incorporate the cultural value consideration in designing the green product. The input of the conceptual model was classified into three sources of data, i.e. customers' perspectives, designers' perspectives and the literature. These three inputs were used to develop a guideline for incorporating the cultural value consideration in designing the green product. The proposed guideline was given to the designers for validation process. The conceptual model to incorporate the cultural value consideration in designing the green product by this study, is illustrated in Figure 6.1. The achievement of this research objective contributed to the fulfilment of the 1st research gap.

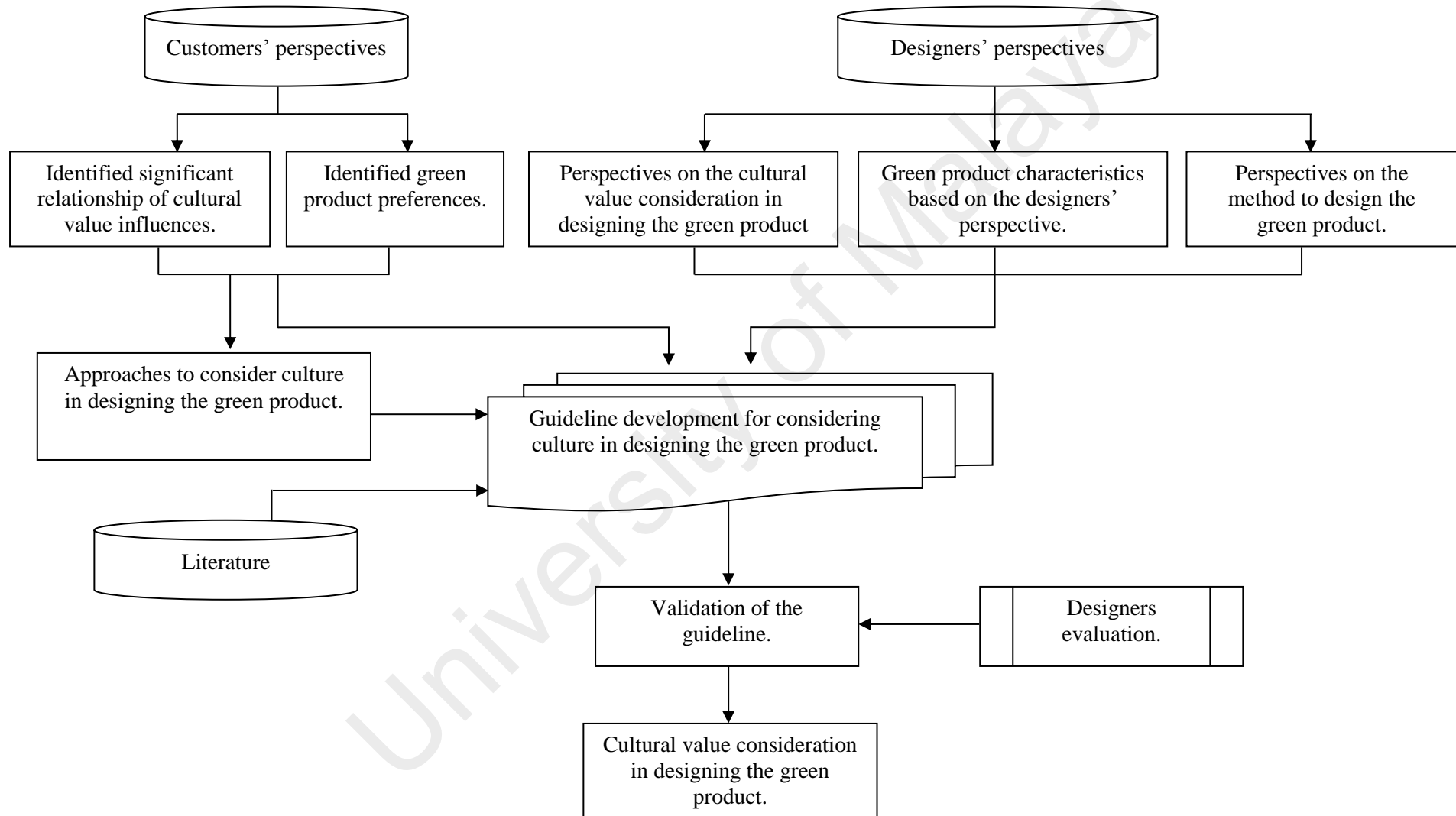


Figure 6.1: Conceptual model for incorporating the cultural value consideration in designing the green product

As illustrated in Figure 6.1, the data of the customers' and designers' perspectives should be firstly identified. These include the identified cultural value influences towards the green product preferences, green product preferences considering cultural value influences, designers' perspectives on cultural consideration in designing the green product, perspectives on the green product characteristics, and methods to design the green product. The further steps were to develop and validate the proposed guideline. The detail method of the implementation for the proposed model has been described in Chapter 3.

6.2.2 The achievement of objective 2

The second objective of this research was achieved by identifying the relationship of cultural value influences towards customer preferences on the green product. The details of the achievement of this objective has been presented in Chapter 4. A framework by developing the hypotheses has been developed in order to achieve this objective. Malaysia and Indonesia were selected as the samples for the data collection to implement the proposed framework. Several layers of statistical method were adopted to evaluate the significant relationships of the hypotheses. Based on the findings of this study, it was revealed that the influences of the five cultural value dimensions towards the green product preferences, was slightly different for the customers in both Malaysia and Indonesia. This study confirmed that uncertainty avoidance, long-term orientation and power distance were identified to have significant influences towards the preferences of customers on green product in Malaysia. On the other hand, the customers in Indonesia were mostly influenced by uncertainty avoidance and long-term orientation. Unlike Malaysia, power distance has no significant influences towards the green product

preferences in Indonesia. Collectivism and masculinity were identified to have no influences in both countries.

Considering this cultural value influence, the customer preferences on the green product were identified through the preferences ranks of the green characteristics. Most Malaysian customers preferred the characteristic of eco-label. After eco-label, the preferences of customers on the green product characteristics were followed by energy efficiency, eliminate or reduce toxic material, providing product service, easy to upgrade, using biodegradable material, using recyclable material, size and weight reduction, easy to maintain, using recycled material, and easy to reuse. For the customers in Indonesia, providing product service was identified as the most preferred characteristic. This was followed by eliminate or reduce toxic material, eco-label, easy to reuse, energy efficiency, using biodegradable material, using recycled material, size and weight reduction, easy to maintain, easy to upgrade, and using recyclable material. The achievement of this research objective partly contributed to the fulfilment of the 1st, 2nd and 3rd research gaps.

6.2.3 The achievement of objective 3

The third objective was achieved by developing a guideline for incorporating cultural values consideration in designing the green product. The guideline was developed based on the input from the customers' and designers' perspectives data. The data from the customers consist of the identified cultural value influences towards the green product preferences, while the data from the designers consist of the strategies to develop the green product. The guideline consists of a checklist of strategies for the cultural values consideration in designing the green product. This study used the literature to confirm the relevancies of the strategies with the theory. The scope of the guideline and instructions on using the guideline have also been clearly described. The process of the guideline

development was described in Chapter 5. The achievement of this objective contributed to the fulfilment of the 2nd research gap.

6.2.4 The achievement of objective 4

The fourth research objective was achieved by conducting a validation for the proposed guideline. A total of twelve designers from Malaysia and Indonesia were selected to evaluate the proposed guideline in a case study. Due to the data collection, the results analyses in this study were generated based on the case study in Indonesia and Malaysia. Based on the evaluation results, most of the designers in both countries agreed that the consideration of cultural value influences was an important aspect in the phase of the green product design. The designers confirmed that the proposed guideline provides them with some valuable information, to support the development of the green product. The designers also agreed that the proposed guideline can be implemented in designing the green product, especially for identifying the customer preferences and generating a concept for the product. The achievement of this research objective contributed to the fulfilment of the 1st and 3rd research gaps.

6.3 Research contributions

There were two main contributions that can be generated in this study, i.e. contributions to the knowledge and practices. These two contributions are explained in more detail in the following subsection.

6.3.1 Contribution to knowledge

There were three important contributions to knowledge from this study. Firstly, this study extended the application of the Hofstede cultural value dimensions, for identifying the customer preferences on the green product. Although cultural studies using the Hofstede cultural value dimensions continues to be emerging in the literature, this study noticed that there was a lack of studies that investigate the applicability of the Hofstede cultural value dimensions for the evaluation of the customer preferences on the green product. For example, Pookulangara and Koesler (2011) used Hofstede cultural value influences towards the customer preferences on the online purchasing decision. Kueh and Voon (2007) investigated the preferences of Y-generation consumers for the quality of services in Malaysia, using the Hofstede cultural value dimensions, Goodrich and De Mooij (2014) performed a study on the cultural value influences towards the online and offline purchasing decisions, using the Hofstede cultural value dimensions. This findings contributed to the theory where Hofstede cultural value dimensions can be applied, to explore in more detail and provide valuable information for the understanding of the green product preferences. For example, one of the findings of this study was in line with the study conducted by Rashid et al. (2009), who found that the eco-label was an important aspect to increase the customer preferences on the green product in Malaysia. However, Rashid et al. (2009) did not mentioned which characters that can influence the customer preferences on the eco-label characteristic. This study extends the findings of Rashid et al. (2009) by explaining the reasons on why the customers in Malaysia prefers eco-label. This study found that it was caused by the high uncertainty characters that appeared amongst the customers towards the green product. The customers wanted to reduce the uncertainty by identifying the eco-label which was embedded into the green product design.

Secondly, this study has identified that most of the existing studies used cultural values limited to identify the customer preferences on conventional products attributes, such as appearance, functionality and price. For example, Bloch (1995) performed a study to identify the cultural value influences towards the customer preferences on product form, Salmi and Sharafuthdinova (2008) evaluate the influences of culture towards designing the product functionality preferences, such as product form and benefits. This study confirmed that the consideration of cultural value influences was not only used to identify the preferences for the conventional attributes, i.e. appearance, functionality and price, but also for the green product characteristics. The extension attributes, i.e. green product characteristics, also becomes a prominent aspect in order to evaluate the customer preferences on the environmentally friendly product. The identified cultural value dimensions influence and prioritisation of preferences on green product characteristics in Malaysia and Indonesia can be used, as a reference for future researchers, particularly for cultural and product design studies.

Thirdly, it has been highlighted in the literature review that there was no study on cultural value influences towards the green product preferences in Indonesia and Malaysia. This finding contributes to the body of knowledge on the insight of the identified cultural value influences and preferences on the green product characteristics for Indonesia and Malaysia. It can be used as a reference for cultural and product design studies, in order to achieve their specific research aim and objectives.

6.3.2 Contribution to practices

In order to get a higher response for green product in the market, the designers should clearly determine suitable green product specifications that can be related to the customer preferences. However, the identification of customer preferences on green product has

still be a challenge for the designers, due to that the preferences of customers can be influenced by culture. This work offers the designers a guideline to incorporate the consideration of cultural value influences in designing the green product. The applicability of the guideline was evaluated and confirmed through the case studies and by the designers. The results showed that the developed guideline can be used to assist the designers in the development of the green product, especially to identify the customer preferences and generating a concept for the green product.

6.4 Novelties an originality of the research

Two novelties have been generated through the achievements of the research objectives in this study. Firstly, it was found that there was no evident from the other studies to investigate the relationship of cultural value influences towards the green product preferences. A framework has been developed in this study, to investigate the influences of cultural values towards the green product preferences, which was a part of the conceptual model of the research. The framework consists of five cultural value dimensions' (i.e. collectivism, masculinity, uncertainty avoidance, power distance and long-term orientation) arrowheads that point to the preferences on the green product (i.e. appearance, functionality, price and extension attributes of the green product characteristics). This framework has been tested and validated for its applicability to identify the cultural value influences towards the green product preferences, and identify the preferred green product characteristics considering the cultural value influences. This study used Indonesia and Malaysia as the locations of case study. Using the same method, this framework can also be applied to evaluate the customer preferences on the green product in the other countries of the world.

Secondly, this study confirmed that the developed guideline for considering the cultural value influences in designing the green product as one of the novelty of the research. It has been identified that there were a lack of other studies with the concern to develop a guideline involving cultural value consideration in designing the green product. As found in this study, the identified cultural value influences were similar between the Indonesian and Malaysian customers, in terms of the influences from uncertainty avoidance and long-term orientation. It was only different for one cultural value dimension, i.e. power distance. Although the guideline was only applicable to be used in Indonesia and Malaysia, the other studies can still use the guideline as a reference to develop green products in the developing countries with similar characters.

6.5 Research limitations and direction for future study

There were two research limitations in this study. Firstly, since the data was collected from specific countries, i.e. Malaysia and Indonesia, the results cannot be simply generalised to the other countries. Therefore, the same framework and methodologies can be used to evaluate the other regions for cross-cultural studies. Secondly, the characteristics of the green product used in this study were limited to only eleven characteristics and the conventional attributes were limited to appearance, functionality and price. Therefore, adding more attributes of green and conventional products to identify the customer preferences can be done in the future. Thus, since the product attributes should not only be limited to the green characteristics, future researchers can explore the influence of cultural values towards the socioeconomic attributes as the whole concept of a sustainable product.

6.6 Summary

The aim of this study was to investigate the influences of cultural values in designing the green product. Four research objectives have been achieved in order to address the research aim. Research contributions to knowledge and practices, as well as the research novelties have also been described. This study has scientifically confirmed that cultural values play an important role to influence the customer preferences on the green product and the development of the green product. As the initial stage of the product development, the consideration of customer preferences should be clearly determined by the designers, before continuing to the next stages of the design. Based on the findings of this study, it is strongly recommended that the designers to incorporate the cultural value consideration when designing the green product. It allows the designers to explore in more detail about the customer preferences, as a basis to develop the green product.

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