UNIVERSITI PUTRA MALAYSIA

DESIGN SPECIFICATION DEVELOPMENT ON ECO-DESIGN CHAIR THROUGH USERS'S PERCEPTION ANALYSIS AND KANSEI ENGINEERING EVALUATION

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By

ASA NAIM BINTI RUSLI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

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Chairman : Associate Professor Shukri Mohamed, PhD
Faculty : Forestry

The approach of eco-design has gained wide attention globally as an alternative method to reduce harm to the environment. This approach is seen as providing a sustainable solution that integrates human needs and at the same time reduces environmental burden. Studies on various eco-design aspects have been carried out with regard to environmental engineering approaches, emphasising on waste management, pollution control and production site cleaning and disposal which are usually conducted at the end of the processing stage. Consequently, changes to eco-design products are difficult to be perceived and appreciated by users. As such, a study on users' perceptions towards eco-design products has been suggested in early stage of design development process as an alternative to reduce environmental loads. Unfortunately, the perception of product value based on appearance is often intuitive and emotional, and it is difficult to quantify. With this gap as a constraint, the study focuses on the eco-design of a chair as seating is often related to emotional aspects; thus, and enables to fulfil the needs of eco design requirements. The goal of this study was to determine the relationship between users' perceptions and eco-design attributes in improving design specifications as an alternative to increase consciousness in reducing environmental burden. Kansei Engineering (K.E.) methodology was applied and the Satellite Terminal Building, KLIA was chosen as the study area. Phase I of the study involved the decision of strategy attempted to support the demonstrable facts and provided answer to the research question and the resolution to the problem. Phase II of the study (Part A and Part B) was conducted to achieve these purposes: firstly, to identify the perception on the existing airport chair corresponding to the environmental consciousness in KLIA; and secondly, to identify the elements of desirable eco-design attributes that reflect environmental consciousness in KLIA. Phase III involved the detailed stages of Kansei experiments which comprised the collection and construction of Kansei's instrument tools, and Kansei evaluation experiment. In addition, this phase verified sitting comfort using the Force Sensitive Application (FSA). The findings of the study revealed the requirements needed to achieve an effective design specification for eco-design chair from the users' perspective which demanded the application of several requirements. Phase I introduced Kansei Words which represent emotional impressions towards the

attributes of an eco-design chair. The selected Kansei Words were finalised into Kansei Affinity Cluster, in accordance to the priorities of subjective and qualitative data in eco-design attributes. The findings of Phase II (Part A) revealed that the external appearance of an eco-design chair should be attractive, had a natural look with a green colour scheme and made of recycled materials. Users' high perception of the value of recyclable materials were found to be based on the state of the art of the design of the chair, and they felt that the versatility of recycled materials with variety of textures and patterns were able to reflect the environmental consciousness in KLIA. This was in contrast to the findings of Phase II (Part B) which revealed that the existing airport chairs had been perceived as having a simple design with a dark and dull colour scheme; thus, they failed to reflect environmental consciousness in KLIA. In addition, the study found that users were not able to judge on the types of materials used and component parts in the existing airport chairs as the materials used were clearly not made from natural materials. Nevertheless, the findings revealed that the whole components of existing airport chairs did fulfil the ergonomic requirements even though they did not provide maximum comfort for users to sit longer. With regard to aesthetic aspect, it was revealed that users desired eco-design attributes that used eco-materials in geometrics form with modern and simple design and used green natural colours to reflect KLIA as an environmentally friendly airport. Besides that, the study found that ergonomic aspects were perceived as the main requirement in providing comfort and helping users to refresh their body before they continue their journey. As a conclusion, findings of both Part A and Part B in Phase II showed that although the surficial aesthetics on eco-design attributes were capable of portraying environmental consciousness in KLIA, ergonomic attributes remained important. As good ergonomics was viewed as a pre-condition for comfort, Phase III highlighted the emotional eco-design chair that integrated both ergonomics and aesthetic aspects through detailed stages of Kansei evaluation experiments. The findings of Phase III revealed that to fulfil the requirements of ergonomic aspect in the design, shape and form with regard to the depth, width and height of seats and backrest chair were the significant factors that needed to be emphasised in design specifications. The use of curve foam padding in certain parts of both the seats and backrests chair were viewed as essential in determining design specifications. Through the validation among designers, this study demonstrates that guidelines on eco-design chair is beneficial to designers and users. The furniture designers involved agrees that this guideline is generic enough to be understood by non-designers and non-technical background of users. Although the study was performed with limitations and constraints, the findings provided several novel foundations in the engineering of emotion in the development of a guideline in eco-design chairs.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PEMBANGUNAN SPESIFIKASI REKA BENTUK PADA REKA BENTUK KERUSI EKO MELALUI ANALISA PERSEPSI PENGGUNAAN DAN PENILAIAN KEJURUTERAAN KANSEI

Oleh

ASA NAIM BINTI RUSLI

Mei 2018

Pengerusi : Profesor Madya Shukri Mohamed, PhD
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Pendekatan reka bentuk eko telah mendapat perhatian luas secara global sebagai kaedah alternatif untuk mengurangkan bahaya kepada alam sekitar. Pendekatan ini dilihat sebagai menyediakan penyelesaian mampan yang mengintegrasikan keperluan manusia dan pada masa yang sama mengurangkan beban alam sekitar. Kajian mengenai pelbagai aspek reka bentuk eko telah dijalankan berhubung dengan pendekatan kejuruteraan alam sekitar, menekankan pada pengurusan sisa, kawalan pencemaran dan pembersihan dan pembuangan tapak pengeluaran yang biasanya dijalankan pada akhir peringkat pemprosesan. Akibatnya, perubahan kepada produk reka bentuk eko sukar untuk dilihat dan dihargai oleh pengguna. Oleh itu, kajian tentang persepsi pengguna terhadap reka bentuk produk eko telah dicadangkan pada peringkat awal proses pembangunan reka bentuk sebagai alternatif untuk mengurangkan beban pada alam sekitar. Malangnya, persepsi nilai produk berdasarkan penampilan seringkali intuitif dan emosi, dan sukar untuk kuantiti. Dengan jurang ini sebagai kekangan, kajian ini memberi tumpuan kepada reka bentuk eko kerusi memandangkan kerusi sering berkaitan dengan aspek emosi; dengan itu, membolehkan untuk memenuhi kehendak reka bentuk eko. Matlamat kajian ini adalah untuk menentukan hubungan antara persepsi pengguna dan sifat-sifat reka bentuk eko dalam meningkatkan spesifikasi reka bentuk sebagai alternatif untuk meningkatkan kesedaran dalam mengurangkan beban alam sekitar. Kaedah Kejuruteraan *Kansei* (K.E.) telah digunakan dan Bangunan Terminal Satelit, KLIA dipilih sebagai kawasan kajian. Fasa I kajian ini melibatkan keputusan strategi yang cuba untuk menyokong fakta-fakta yang boleh dibuktikan dan memberikan jawapan kepada soalan penyelidikan dan / atau penyelesaian kepada masalah tersebut. Fasa II kajian (Bahagian A dan Bahagian B) telah dijalankan untuk mencapai tujuan-tujuan ini: pertama, untuk mengenalpasti persepsi mengenai kerusi lapangan terbang sedia ada yang bersamaan dengan kesedaran alam sekitar di KLIA; dan kedua, untuk mengenalpasti unsur sifat-sifat reka bentuk eko yang diingini didalam mencerminkan kesedaran alam sekitar di KLIA. Fasa III melibatkan peringkat terperinci eksperimen Kansei yang merangkumi pengumpulan dan pembinaan peralatan instrumen Kansei, dan eksperimen penilaian Kansei. Di samping itu, fasa ini mengesahkan keselesaan tempat duduk kerusi dengan

menggunakan *Force Sensitive Application (FSA)*. Penemuan kajian mendedahkan keperluan yang diperlukan untuk mencapai spesifikasi reka bentuk yang berkesan untuk kerusi reka bentuk eko daripada perspektif pengguna yang menuntut kepada beberapa keperluan. Fasa I memperkenalkan perkataan *Kansei* yang mewakili kesan emosi ke arah sifat-sifat kerusi reka bentuk eko. Perkataan *Kansei* yang dipilih telah dimuktamadkan ke *Kansei Affinity Cluster*, selaras dengan keutamaan data subjektif dan kualitatif dalam sifat-sifat reka bentuk eko. Penemuan Fasa II (Bahagian A) mendedahkan bahawa penampilan luaran kerusi reka bentuk eko harus menarik, memiliki penampilan luaran semulajadi dengan skema warna hijau dan diperbuat daripada bahan kitar semula. Persepsi tinggi pengguna tentang nilai bahan kitar semula didapati berdasarkan kepada seni reka bentuk pada yang ada pada kerusi, dan mereka merasakan bahawa fleksibiliti bahan kitar semula dengan pelbagai tekstur dan corak dapat mencerminkan kesedaran alam sekitar di KLIA. Ini adalah berbeza dengan penemuan Fasa II (Bahagian B) yang mendedahkan bahawa kerusi lapangan terbang sedia ada telah dilihat mempunyai reka bentuk yang ringkas dengan skema warna gelap dan membosankan; Oleh itu, ianya gagal mencerminkan kesedaran alam sekitar di KLIA. Di samping itu, kajian mendapati pengguna tidak dapat menilai jenis bahan yang digunakan dan bahagian komponen di kerusi lapangan terbang sedia ada kerana bahan yang digunakan jelas tidak diperbuat dari bahan semulajadi. Walau bagaimanapun, penemuan mendedahkan bahawa keseluruhan komponen kerusi lapangan terbang sedia ada memenuhi keperluan ergonomik walaupun ianya tidak memberikan keselesaan maksimum untuk pengguna untuk duduk dengan lebih lama. Berkenaan dengan aspek estetika, ia mendedahkan bahawa pengguna menginginkan sifat-sifat reka bentuk eko yang menggunakan bahan-bahan eko dalam bentuk geometrik dengan reka bentuk moden dan ringkas serta menggunakan warna semula jadi hijau untuk mencerminkan KLIA sebagai lapangan terbang yang mesra alam. Selain itu, kajian mendapati aspek ergonomik dilihat sebagai keperluan utama dalam menyediakan keselesaan dan membantu pengguna menyegarkan badan mereka sebelum meneruskan perjalanan mereka. Sebagai kesimpulan, penemuan kedua-dua Bahagian A dan Bahagian B dalam Fasa II menunjukkan bahawa walaupun estetika surficial pada sifat-sifat reka bentuk eko mampu menggambarkan kesedaran alam sekitar di KLIA, sifat ergonomik kekal penting. Oleh kerana ergonomik yang tepat dilihat sebagai pra-syarat untuk keselesaan, Fasa III menekankan emosi pada kerusi reka bentuk eko yang menggabungkan kedua-dua ergonomik dan aspek estetik melalui peringkat terperinci penilaian dalam eksperimen Kansei. Penemuan Fasa III mendedahkan bahawa untuk memenuhi keperluan aspek ergonomik dalam reka bentuk, bentuk dan rupa berkenaan dengan kedalaman, lebar dan ketinggian tempat duduk dan tempat sandaran kerusi adalah faktor penting yang perlu ditekankan dalam spesifikasi reka bentuk. Penggunaan pad lengkung di bahagian tertentu pada kedua tempat duduk dan sandaran kerusi dilihat penting dalam menentukan spesifikasi reka bentuk. Melalui pengesahan di kalangan pereka, kajian ini membuktikan bahawa garis panduan tentang reka bentuk kerusi eko adalah bermanfaat kepada pereka dan pengguna. Para pereka perabot yang terlibat berpendapat bahawa garis panduan ini cukup generik untuk difahami oleh latar belakang bukan pereka dan bukan teknikal pengguna. Walaupun kajian ini dilakukan dengan batasan dan kekangan, penemuan ini akan menyediakan beberapa asas novel pada kejuruteraan emosi bagi pembangunan garis panduan dalam kerusi reka bentuk eko.

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I certify that a Thesis Examination Committee has met on (date of viva voce) to conduct the final examination of Asa Naim Binti Rusli on her thesis entitled "Evaluation of Users' Perception on Eco-design Chair for Developing of Design Specification" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the degree of Doctor of Philosophy.

Members of the Thesis Examination Committee were as follows:

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The thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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Declaration by graduate student

I hereby confirm that:

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Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

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Of Supervisory
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Signature: _____
Name of Member
of Supervisory
Committee: Jegatheswaran Ratnasingam, PhD

Signature: _____
Name of Member
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Committee: Anitawati Lokman, PhD

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%	Percentage
cm	Centimetre
kg	Kilogram
mm	Mimi meter
mmHg	Millimeter of Mercury

CHAPTER 1

INTRODUCTION

1.1 Background

Development of eco-design product in designing process have become a significant approach in creating a sustainable solution that integrates human needs and desire as well as complying with the environmental regulations. An eco-design concept primarily focuses on product development improvements with the aim to reduce environmental loads. In fact, previous studies have proven that designing environmental-friendly products that meets consumers' expectation has become an alternative approach towards controlling environmental pollutions (Zimmerling et al., 2017; Nizam et al., 2011; Haghiri, 2011; Chen & Yeh, 2010).

Previous literatures on eco-design aspects emphasized on environmental engineering approaches (Koh et al., 2007; Mathieux et al., 2007; Tischner et al., 2000) in which Behrisch et al. (2011) highlighted studies involved in environmental practices such as waste management, pollution control and cleaning up production and disposal sites were not likely to reduce the environmental impact of products. This is mainly due to untapped potential of eco-design practice in the engineering phase (Sonego, et al., 2018; Tukker & Tischner, 2006; Fletcher & Goggin, 2001). Specifically, product development in the engineering phase is usually conducted towards the end stage of the product design process. As a result, any change is difficult to be implemented in comparison if it is done at an earlier stage (Bhamra & Lofthouse, 2001). User behaviour is a factor that could influence the earlier phase of product design process, which will subsequently give a huge impact with regard to product usage against environmental load (Behrisch et al., 2011).

In addition, Behrisch et al. (2011) stated that users are unaware of the eco-design activities done in the engineering phase; as a result, they do not recognize the products as having eco-design attributes. This factor also limits the possibility of making eco-designed products more attractive and desirable by the users. Another factor is that when environment-related issues are often addressed by engineers, it is easy to measure and evaluate because these issues emphasized less on the users' emotion factor (Schneider (1989); Zafarmand et al. (2003). Therefore, Behrisch et al. (2000) stressed out that the interventions of eco-design concept in the early stage of development product design have higher potential to improve environmental performance.

Behrisch et al. (2010) explained that the tasks of industrial designers are important in many stages involved in the product development process as their decisions affect the improvements related to the eco-design strategy. Thus, industrial designers have significant potential to contribute to the creation of new eco-products which subsequently may reduce the impact to the environment. Besides that, Chen et al. (2011) pointed out that eco-product designers needed to focus on three distinctive

dimensions i.e. aesthetics, function and environment with the purpose of sustaining the development of eco-products. The study was parallel with Nowosielski, et al. (2007) which found that apart from materials, technology applied in design process has also started to gain attention for the growing needs of environmental protection.

As a result, industrial designers need to emphasize on the eco-design attributes in accordance to users' needs and preferences. Nevertheless, Chen and Yeh (2010) discovered that the perception of product appearance is often regarded as intuitive and emotional. Several studies emphasized on the need to address the emotional aspect of user perception in eco-design (De Medeiros et al., 2018; Behrisch et al., 2011; Nizam et al., 2011; Haghiri, 2011). The main reason is that emotion plays an important role in capturing users' attention in improving the performance of eco-design products.

1.2 Problem Statement

Over the past decades, environmental-friendly practices have been gaining global attention. In fact, initiatives to develop environmental consciousness practices are noticeable in various fields such as businesses, industries, and academics. The same efforts are also evident in the airport industry such as Kuala Lumpur International Airport (KLIA) managed by Malaysia Airport Holding Berhad (MAHB). KLIA becomes as an important place to be studies due to KLIA has committed in creating sustainable world-class aviation gateways as a symbol of national pride (MAHB 2012). In doing so, the users' perception is becomes an essential factor to enhance the reputation of Malaysia airport.

A report published by MAHB (2016) underlined the practices that they have taken in relation to energy management and energy efficiency in their businesses and operations as part of their commitments towards environmental consciousness. The practices implemented in KLIA are water management, waste management, low-cost energy saving initiatives, improvements of energy performance and reduction of carbon emission.

In fact, environmental consciousness practice in KLIA involves the management, operation employees as well as related stakeholders such as the investors, regulators and business partners. Besides, KLIA is committed to achieve environmental and social sustainability in order to promote its services (MAHB, 2012). Based on this reason, a detailed observation indicated that physical interactions between airport users (passengers and visitors) and chairs was absent despite the fact that an eco-design product approach was suggested to attract airport users' attention on environmental consciousness in KLIA (MAHB, 2012). Eco-design of airport chair involves aesthetics and ergonomics attributes from airport users needs to be emphasized as parameter in the effort for reflecting environmental consciousness at KLIA.

In the airport, the chairs are among the most needed and important facilities used by visitors particularly the passengers. Therefore, the passengers' perception on the airport

chairs is crucial to be highlighted since passengers use them regularly before their departure: (i) during check-in process; (ii) passing security checks; (iii) while waiting before boarding; and (v) during boarding. According to Li and Xu (2011), seating has a big impact on users' visual experience and psychological reaction. Apart from that, Rodriquez-Lozano (2002) stated that airport chairs focus more on the aspect of comfort, and thus the designs of KLIA chairs are substantial to be evaluated in correlation to the environmental consciousness initiatives in KLIA.

Airport users tend to assess the quality of service not only based on the comfort level, but also the aesthetic appearance. Norman (2004) stated that highly rated products could be rejected if they do not appeal to the users' aesthetic value. Norman (2004) also added that appearance matters to the users. This view is supported by Hung and Chen (2012) who claimed that product appearance has been recognized as an important factor in the success of a product. It is important for this study to focus on the designs of airport chairs to determine the relationship between users' emotional perceptions and eco-design attributes in establishing new airport chairs which are environmental-friendly. Hence, this study evaluated users' emotional response on the existing airport chairs with regard to environmental consciousness to support the development of eco-design chair that cultivates emotional connectivity.

Kansei Engineering has been used in this study due to this method is a consumer-oriented product development technique for creating suitable product forms to satisfy consumers' affective need (Hsu et al., 2017). For this purpose, applying Kansei engineering have typically adopted subjective evaluation methods (termed as Kansei evaluation), such as the semantic differential (SD) method, to understand the user affective perceptions on evaluated chairs design. The target respondents involved in this study comprises of airport users and their demographic include information on the age, gender, continent of origin, occupation and education background of the respondents.

1.3 Research Framework

The research framework was divided into four phases (Figure 1.1). The first phase is the literature review, which was organized in two chapters (Chapters 2 and 3). The first of these chapters discusses the importance of eco-design approach in improving the environmental-friendly product performance based on users' point-of-view. Previous eco-design studies were reviewed in depth with the following purposes: (i) to have a better understanding of the issues related to eco-design products; (ii) to observe the significance of users' perception in eco-design furniture; and (iii) to integrate the eco-design attributes based on users' perception in order to establish the designer's skills and knowledge. The second part of the literature review addresses the Kansei Engineering approach with regard to its importance and contextual method.

The second phase involves the research methodology which is further explained in Chapter 4. The research method is divided into three parts namely; (i) Phase I: Decision Strategy, (ii) Phase II: Primary Evaluation Experiment, and (iii) Phase III: Detailed

Stages of Kansei Experiment. Phase I: Decision Strategy was based on the implementation of environmental practic at KLIA and focused on airport users' perception on the airport chair design in the context of environmental-friendly concept. Phase II: Primary Evaluation Experiment explains the survey and measurement procedures. Finally, Phase III: Detailed Stages of Kansei Experiment describes the methods for eco-design specifications and guidelines. Results and discussions are presented as phase three of the study.

Phase four presents the conclusions of the study. The detailed explanations from the previous three chapters were gathered and clarified in order to propose guidelines for improving the eco-design specifications. Based on the findings, suggestions for further research were proposed based that meet the proposed eco-design specifications to enable the incorporation of target emotion in environmental of chair designs.

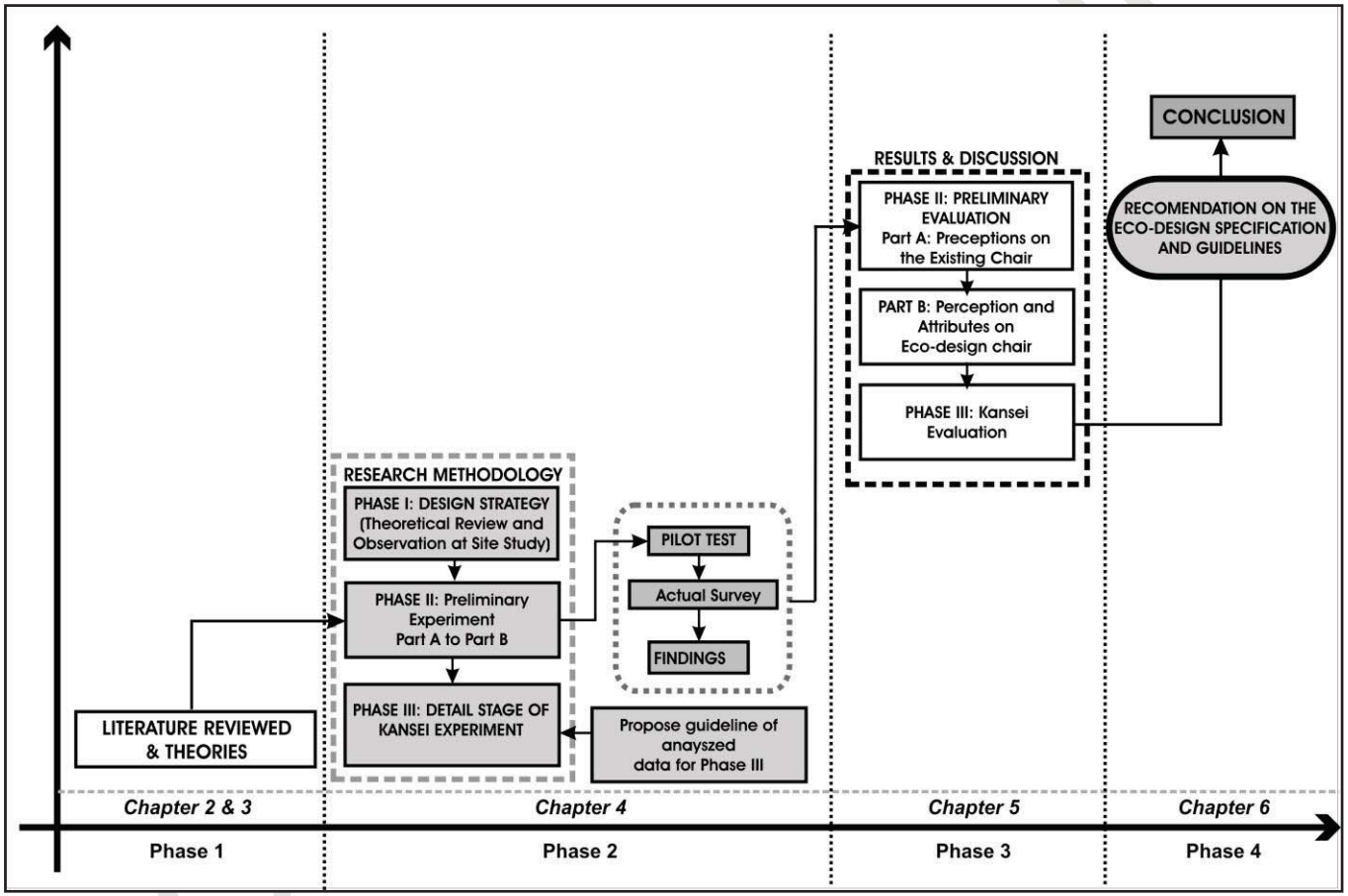

Figure 1.1: Research Framework

1.4 Research Questions

The research questions were formulated in order to answer the research objectives. The research questions are as follows:

A. How the existing airport chairs can be improved and modified with the intention to promote the significant eco-design attributes in increasing environmental consciousness?;

B. How significant users' emotional perceptions are towards eco-design chairs that can improve the designs of chairs in KLIA?; and

C. What are the steps to formulate design specification for eco-design chairs based on the findings?

1.5 Objectives of the Study

The objective of this study was to prepare eco-design guidelines for airport chairs in KLIA that can be used to improve design specifications and design requirements of eco-design products. The specific objectives of this study are:

1. To identify the importance of eco-design, the relationship between eco-design, designers and users through literature review and theoretical studies.

2. To determine the eco-design attributes in accordance to users' preferences using the Kansei Engineering method;

3. To prepare the eco-design specification guidelines for designing eco-design chairs.

1.6 Research Scope and Relevance

The study highlight the novelty of the research as this is the first study carried out in Malaysia for the eco-design based on human attributes and the findings of this study has presented a good guideline to design an eco-design chair.

This study was performed with the intention to identify the emotions by the perception of the eco-design aspect of airport chairs on the users. The purpose is to formulate design specification guidelines for an eco-design that embeds the target emotion. The focus of the study was on the eco-design guidelines of airport chairs with regard to KLIA environmental-friendly consciousness practices and its promotion in order to obtain good impression of this concept among airport users in KLIA.

The perception from passenger and visitors of various backgrounds on the environmental consciousness approach practices at KLIA is a matter of concern for Malaysia Airports Holdings Berhad. As mentioned, KLIA is committed to practise energy efficiency management as an approach to achieve the environmental friendly concept. Yet, the implementation of this approach has not involved the direct participation of passengers or visitors at KLIA. As such, this study was carried out based on the view that airport users at KLIA are not aware of the existence of the environmental-friendly practices at KLIA.

Thus, the scope addressed in this study was focused on the perception eco-design attributes of airport chairs. The study highlighted that airport chairs with eco-design attributes have a big impact on users' visual experience and psychological reaction.

1.7 Limitation of the Study

The limitation of this study is on the eco-design aspect consists of: (i) the identification of chair components that need to be redesigned; (ii) the development of product characteristics (i.e. eco-design attributes) with a consideration on simplicity in designing a new eco-design of airport chairs; and (iii) evaluation of users' perception on the proposed new eco-design chairs specification and guidelines. The limitation of study also emphasizes on designing aspects such as the shapes, colours and materials of a new eco-design of airport chair that could affect subjective user satisfaction.

The study did not cover several aspects such as: (i) environmental management; (ii) use of energy / natural resources; (iii) product distribution; and (v) documentation and packaging owing to the emphasis of the study on users' emotional perception at the early stage of the new product development process.

The study was also limited to the evaluation experiment of the design attributes on the present KLIA chairs as a result of time and financial constraints. In other words, the evaluation experiment focused only on the design of existing chairs and not on the production of a prototype chair.

1.8 Thesis Structure

The thesis is divided into six chapters:

Chapter 1 highlighted the background of the study which includes the emotional eco-design aspect between users and the environmental aspect of the chair design, and issues related to eco-design and research area. This chapter also discusses the current environmental-friendly consciousness at KLIA and the lack of awareness among users regarding environmental practices at KLIA. The objectives, research framework and scope of this study are also included in this chapter.

Chapter 2 is the first part of the review of literatures which looks at the relationship between eco-design, designers and users. The chapter begins with the discussions on the significance of an eco-design approach in the context of sustainable development. It also describes the importance of an eco-design concept, implementation of eco-design from design perceptive, user perception on eco-design chairs and the integration of eco-design attributes to establish designers' point-of-view. It then discusses the adoption of an eco-design strategy. Finally, it reviews the methods of incorporating users' emotion in eco-design.

Chapter 3 describes the second part of the literature review. It provides an overview of Kansei Engineering (K.E.) as a potential method in emotional engineering of products.

Chapter 4 presents the research methodological framework and describes in details the experimental procedures. This chapter elaborates on the instrument building, commencing with the process of synthesizing specimens followed by the selection of chair specimens. The experimental procedures continued with the process of building a Kansei evaluation checklist as an emotion measurement tool. The chapter concludes with a set of valid chair specimens and a Kansei evaluation checklist for the study.

Chapter 5 presents and discusses the findings. The results elaborate on the conceptualization of emotion in eco-design chairs and propose design specifications for eco-design chairs. This chapter ends with the proposed Kansei eco-design chair guidelines, with a sample drawing of Kansei Eco-design chairs.

Chapter 6 concludes the study based on the findings and provides the recommendations on the guidelines to be followed by designers. It also lists out the contributions of the study and suggests several recommendations for future works related to this study.

1.9 Summary

This chapter highlights the need for this study in improving environmental consciousness through the improvements of eco-design strategies to ensure satisfactory user perception towards eco-design chairs. Focus was given to the waiting lounge area in the Satellite Terminal at KLIA. In order to further understand the current scenario relating to the study, the literature supporting the scope of the study and relevant theories are reviewed in Chapters 2 and 3.

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