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# Eco-Fashion Design Model Based on the Clothing Life Cycle

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Faculty of Applied and Creative Arts
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**DECLARATION**

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. Except where due acknowledgements have been made, the work is that of the author alone. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.



……

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Date: 24th November 2020

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## ABSTRACT

Eco-fashion clothes offer considerable promise to reduce clothing waste associated with improving consumer profits and the health of the community and extending the clothing life cycle. This research aims to develop an Eco-fashion design model based on the clothing life cycle. Therefore, the investigation of phases involved in the clothing life cycle is important. Subsequently, a capsule clothing collection named "*Eco capsule wardrobe*" was proposed in line with the life cycle concept. Therefore, this research seeks to discover phases related to the life cycle of clothing known as consumer, designer, design process and material to extend the clothing life cycle with supporting the three main pillars of Eco-fashion design: society, economy and the environment. Henceforth, the objectives of this research were; to explore consumer's behaviour and designer's behaviour on the decision toward Eco-fashion design subjects; to develop an Eco-fashion design model to source Eco-fashion materials and create Eco-fashion prototype, and finally to evaluate society's perception to the Eco-fashion prototype. The environmental-social, environmental-economic, and social-economic aspects among consumer, designer, design process and used material in Eco-fashion design subject were discovered for more investigation. Given these gaps, the researcher sought to contribute to the existing knowledge on clothing life cycle that is the consumer's behaviour, and designer's behaviour, material sourcing and design process that shall improve the existing Eco-fashion design model. This study applied the Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) as the foundation of the designer's behaviour and consumer's behaviour to discover the individuals' behaviour, respectively. Also, a design experiment workshop for designing Eco capsule wardrobe with Eco-fashion materials was done for the design outputs evaluation by two focus-group discussion. Overall, the Eco-fashion design model showed that consumer's and designer's behaviour are

influential factors in forming clothing design, especially on choosing the materials and design techniques, as well as to encourage sustainability in the fashion industry. Additionally, the Eco-fashion design model was used to making a profit and protecting the environment and people's health that can be achieved through investigation of the consumer's behaviour, the discovery of the designer's behaviour, exploration of the materials which are recyclable and finally study on the most related and easy to use Eco-fashion design techniques. So, this leads to design sustainability, where clothes can be disassembled and recycled easily after use and return to the economic system instead of burning. Hence, this model can help the designer and manufacture to identify the material and design techniques, therefore, the amount of unsafe material released into the planet and living place which is threatening health problem of current society could be reduced.

**Keywords:** Capsule wardrobe, clothing life cycle, clothing waste, eco-fashion design, textile recycling.

***Pembangunan dan Cadangan "Model Reka Bentuk Eko-Fesyen" Berasaskan Kitar Hayat Pakaian***

## *ABSTRAK*

*Pakaian berasaskan eko-fesyen dapat mengurangkan masalah sisa pakaian berlebihan selain mampu memberikan keuntungan kepada pengguna serta ia turut menyumbang kepada kesihatan masyarakat. Penyelidikan ini bertujuan untuk membangunkan dan mencadangkan model kajian eko-fesyen beserta rangka kerja berkaitan dengan kitaran hayat pakaian. Oleh itu, satu rangka proses reka bentuk eko-fesyen dengan faktor-faktor tertentu akan dibangunkan dan diuji melalui "Almari eko-Kapsul". Dengan itu, kajian ini bertujuan untuk melihat aspek kitaran hidup pakaian dari sudut pandangan pengguna, pereka, proses reka bentuk dan bahan yang disokong oleh tiga tiang utama reka bentuk eko-fesyen; masyarakat, ekonomi dan alam sekitar. Seterusnya, objektif kajian ini adalah untuk meneroka tanggapan dan pandangan dari pereka fesyen tentang reka bentuk eko-fesyen; untuk membangunkan model reka bentuk eko-fesyen yang tertumpu kepada sumber bahan-bahan eko-fesyen dan koleksi rekaan eko-fesyen; dan akhirnya menilai kesediaan orang ramai untuk memiliki dan menerima prototaip eko-fesyen dan perkembangannya. Di dalam rekaan eko-fesyen nilai maksimum sesuatu kitar hayat pakaian, serta mencari penyelesaian untuk meminimumkan kesan pakaian terhadap alam sekitar, sosial dan ekonomi adalah penting. Walau bagaimanapun, struktur model reka bentuk eko-fesyen yang sedia ada sesuai untuk profesional dalam pengeluaran mampan, oleh itu, pereka kurang cenderung mengikuti mereka. Selain itu, kekurangan pengetahuan di kalangan pereka terutama dari sudut reka bentuk eko-fesyen, sumber bahan dan faktor-faktor yang berkaitan adalah sebab utama mereka tidak fokus kepada pembangunan reka bentuk eko-feysen. Pengumpulan data perlu digunakan dalam penyelidikan ini dan ia ditentukan bergantung kepada tujuan kajian.*

*Kajian ini menggunakan* Theory of Reasoned Action (TRA) *dan* Theory of Planned Behaviour (TPB) *sebagai asas perilaku pereka dan tingkah laku pengguna. Selain itu, bengkel eksperimen dan penilaian reka bentuk "Almari eko-Kapsul" juga turut dilakukan. Secara keseluruhannya, model reka bentuk eko-fesyen menunjukkan bahawa pendapat pengguna dan pereka adalah faktor yang mempengaruhi rekaan fesyen, serta menggalakkan industri fesyen menjadi mampan. Selain itu, dengan menggunakan model reka bentuk eko dulgun merekabentuk "Almari eko-Kapsul" dapat memberikan keuntungan melindungi alam sekitar dan kesihatan masyarakat melalui pandangan pengguna selain dapat meningkatkan pengetahuan alam sekitar mereka serta cara pelupusan pakaian yang mampan, menilai, penerokaan bahan-bahan yang boleh dikitar semula yang lebih mesra dan mengkaji teknik reka bentuk eko-fesyen. Dalam erti kata lain, model eko-fesyen yang dicadangkan dan rangka kerjanya boleh membawa kepada pengurangan kesan buruk terhadap alam sekitar dan sosial. Oleh itu, model dan rangka kerja yang dicadangkan dapat membantu pereka mengenal pasti proses teknik rekaan bahan dan yang bersesuaian.*

***Kata kunci:*** *Almari eko-kapsul, kitaran hayat pakaian, pakaian terpakai, rekaan eko-fesyen, kitar semula tekstil.*

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# CHAPTER 1

# INTRODUCTION

## 1.1 General Introduction

This research aims to discover, investigate, develop, and design the Eco-fashion design process model with supporting the phases involved in the clothing life cycle toward sustainability. This chapter is an overview of the research background, problem statement, research questions, research objectives, research scope, significant of the study, research hypothesis, research methodology, limitation, and the definition of terms.

## 1.2 Research Background and Purpose

### 1.2.1 Sustainability and Eco-Fashion

The sustainability concept is as a combination of different responsibilities. According to Elkington (1998) and Rodriguez et al. (2002), it consists of three main pillars known as profit (economic), people (society), and planet (environment). In simple words, this makes profits through communication with people, and respect to environmental responsibilities.

Global pollution awareness had increased the knowledge and encourage people to consider healthier living choices. Since the growth in the fashion and apparel industry, and the fact that this industry is the second most polluting industry to generate the textile and clothing waste in the world, it has received considerable attention recently (Köksal et al., 2017). Consequently, from the first step of the development to the textile recycling, this business makes a significant commitment to environmental concerns.

Moreover, Locker (2008) stated that the rapidly changing fashion styles known as a fast-fashion influence on the increasing rate of the clothing purchase. Since the fast fashion industry provides fashionable items from the catwalk into stores with affordable prices and a variety of choices. Hence, consumers are more interested in shopping rather than what they need due to the low prices. Therefore, many pieces of clothes are not worn at all or they are discarded less than lifespan to be worn. Thus, it is reasonable to understand the enormous clothing and fabric waste created (Fletcher, 2008).

Morgan and Birtwistle (2009) showed that textile and clothing waste has increased from 7% to 30% during the past five years. This indicates consumers are disposing of more clothing than before. According to Allwood et al. (2015), only 30% of the clothing waste was sent to charities, 10% was incinerated for another usage and the remaining, 60% was sent to the landfills. Nevertheless, the consumption phase is not only responsible for this issue, but producers are also responsible for the clothing production process. So, one of the biggest subjects affecting this industry is the issue of sustainability.

There is no longer a controversy between fashion and sustainability (Fletcher, 2008). Sustainability in fashion and apparel subject is investigated through the design process, fashion market, and the consideration of consumer behaviour. By applying the concept of sustainability to the existing fashion, “sustainable fashion” can be created (Fletcher, 2008). Sustainable fashion is described as a way which helps to design, produce, and consume fashion products toward protecting the environment, social living, and economic health.

Sustainable fashion is, as the term suggests, not only confined to the commodity or apparel but also encourages processes of design toward healthy living with consideration

making a profit, green strategies toward conserving the planet, and consumption practises for supporting people's health (Fletcher, 2008).

Therefore, the importance of incorporating the sustainability issue into fashion and apparel subject shows effects on the society, process, and environment. In terms of the fashion and apparel industry, it is a core responsibility to work together by satisfying people, environment and government laws (Naz, 2019). According to Kozlowski et al. (2018), the sustainability concept in the fashion and apparel design process defines as the related design regarding production, distribution, and disposal stage concerning the end of lifespan in clothing. It can support the economic aspect with minimising negative on both society and the natural environment.

According to Henninger et al. (2016), the sustainable fashion has many expressions among designers, brands, companies, and academics such as Eco-fashion, Ethical fashion, Organic fashion, Green fashion and Vegan fashion. Hence, the "Eco-fashion" becomes a key concept for those encouraging the ecologically responsible design of fashion and clothing products (Fletcher & Grose, 2012).

This study accepts the "Eco-fashion" expression instead of using the "sustainable fashion" term. Design and environmental issues have seen to render the apparel industry a leader in sustainable manufacturing and recycling. Therefore, the importance of incorporating the sustainable issue into the fashion shows effects to make a profit for people, the planet and economy, directly. Over the past years, the fashion and apparel industry has actively put to become more sustainable.

### 1.2.2 Eco-Fashion and Apparel Design Model

According to Kozlowski et al. (2012), the design phase is a significant aspect of the fashion and apparel industry, as well as the use of a scalable, flexible framework, can challenge the designer to introduce the dimensions of sustainable development into the design process. Some researchers emphasise on the importance of making clothes in a more environmentally friendly style (Jin Gam et al., 2009), while others believe that the second-hand, vintage clothes, renting or borrowing items are the most related tactics (Palmer & Clark, 2005). However, all strategies promote more conscious decision-making during the production and consumption phase by considering the environment, social and ethical issues to possess a more sustainable industry. Numerous researchers are trying to find solutions regarding the protect the environment at the design phase in the fashion and apparel industry.

Previous literature in the fashion and apparel industry have provided apparel design and production models that showed the main focus on the designer's role and the design phase in this industry only considers on the functional, aesthetic, and economic issues (LaBat & Sokolowski, 1999; May Plumlee & Little, 1998; Regan et al., 1998; Workman et al., 1999). Such models represent the creation and manufacturing processes of current apparel designs.

Also, with the rising need for sustainable practises in the fashion and apparel industry, there are limited researches to help designers in consideration environmental issues in their design process. Most designers do not realize how their creations will cause environmental destruction (Cao et al., 2006). Regrettably, the designer's role in environmental sustainability was not clearly mentioned or included in the fashion and apparel design and production theoretical models.

Hence, some researchers developed environmental tools in the apparel design process model specifically to help the fashion and apparel designers to improve and develop sustainable fashion such as Cradle to Cradle Apparel Design Model (C2CAD) (Jin Gam et al., 2009), Considerate Design (CDT) (Black, 2012), Sustainable Fashion Bridges Ideation Toolkit (SFB) (Hur et al., 2013), Considered Take and Return (CT&R) (Aakko & Koskennurmi-Sivonen, 2013), Sustainable Fashion Design Model (SFD) (Gwilt, 2015) and Sustainable Design Cards DSKD (SDC) (Hasling & Raebild, 2017). All these tools in sustainable models are developed regarding various scale productions with two different perspectives participatory and assessment properties, where C2CAD and CDT are considered as assessment tools in the sustainable apparel design model.

With accordance to Kozlowski et al. (2019), the assessment tool and models (C2CAD and CDT) are easier and more realistic to use at different stages of the design process regarding recognise and minimise negative environmental, and social effects in production processes as well as consideration clothing life cycle. Moreover, the assessment tools should be comprehensible, a step by step applicable from the designer's viewpoint and appropriate in the large scale production (Kozlowski et al., 2018). Hence, according to the aims of this study, Cradle to Cradle Apparel Design Model (C2CAD) is accepted as a guide to developing the Eco-fashion design process model.

Indeed, via incorporating a sustainability idea "Cradle to Cradle" into the existing apparel design and production process in the apparel and textile industry, Jin Gam et al. (2009) established the Cradle To Cradle Apparel Design model "C2CAD". "Cradle to Cradle" is a design concept developed by McDonough and Braungart (2002) inspired by nature, regarding the principles of the environment protection in the production process. It

is a closed-loop design process which is free of waste. The significant concept of C2CAD model is the sustainable features are considered by designers to make decisions during the design process, especially professionals in this industry (Kozlowski et al., 2019). The cradle to cradle concept presents a new way of thinking in sustainability for designers, truly. It gives inspiration for design products to remove various environmental problems at the beginning of the product life cycle and during the design stage.

On the other hand, understanding the complexity of Eco-fashion issues can make some barrier for designers with new to the concept of sustainability in design (Hur & Cassidy, 2019). Moreover, if the fashion and apparel industry does not use appropriate solution systems to reduce waste, they can destroy the environment and threaten human health (Jin Gam et al., 2009). Therefore, the Eco-fashion design's structure with consideration of environmental impacts throughout the life cycle clothing from production to the disposal phase (Niinimäki, 2006) is an understandable concept for all designers and also can help them to reach sustainability in extending product's life.

### 1.2.3 Clothing Life Cycle

The Eco-fashion subject needs greater understanding. One of the essential issues which each designer can understand during the Eco-design is defined as the concept of the clothing life cycle (Jenkins, 2015). In other words, this concept is related to consider the environmental and social issues throughout the entire life of clothing (Jin Gam et al., 2009).

From a designer, it means that the product interacts with the environment in material production, manufacture, transportation, packaging, use, and dispose of clothes phases. It means that one of the effective factors and essential tools in the Eco-fashion design is related

to the investigation of the phases involved in the clothing life cycle (Fletcher, 2008). Indeed, sustainability is achieved by extending the life cycle of clothes.

Hence, the clothing life cycle needs more consideration regarding sustainability (Kozlowski et al., 2018). Based on the study by Rodriguez et al. (2002), Loker (2008) and Koo et al. (2014), there are four important phases involved in the clothing life cycle that includes; materials selection, designer's team, design process (manufacture) and the end of life clothing managed by consumers.

**(1) Material Selection.** Gam and Banning (2011) indicated that the sustainability is related to selecting and using sustainable materials such as organic and renewable fibres, natural dyes, using renewable energy, reusing, and recycling resources linked to the cradle to cradle concept. One of the ways to achieve sustainability, which has become very popular, is using Eco-fashion materials especially organic and recycled contents in the clothing design process. According to Joergens (2006), Eco-fashion clothes are defined as any type of clothes designed with Eco-fashion materials during the design process to reduce the environmental impacts toward improving consumer profits and the community's health.

**(2) Designer's Team.** Also, according to Gam and Banning (2011), designers are the decision-makers in each step of the production process, the cradle to cradle concept (McDonough & Braungart, 2002) indicates the designer's role in achieving sustainability. Designers have the opportunity to growth Eco-friendly issues in all phase of the clothing life cycle during the design process (Fletcher & Grose, 2012). Some of the researches have shown a positive relationship between the designer's attitude and designer's waste minimisation behaviour (Lawson, 2006) which most of them were women with a higher level of education (Payne, 2011). Fletcher (2008) established that designers have more

responsibility for material selections during the Eco-design process based on customer preferences than for production and retailers.

**(3) Design Process (Manufacture).** The future of Eco-fashion largely depends on its ability to adapt the design process toward reducing the use of resources and minimisation waste in the reuse and recycled products. In addition, there are other aspects of sustainability that the fashion and apparel industry should focus on, including protection of the environment and human health, understanding consumer's behaviour, and meeting their demands of the Eco-fashion products.

Moreover, regarding the promotion of Eco-fashion design and reduce the waste, designers are thinking to create new designs with a focus on the concepts of zero waste designs (McQuillan, 2011; Rissanen, 2008), design for disassembly (Jin Gam et al., 2011) and multifunctional or transformable design (Fletcher, 2008).

**(4) Consumer.** While the environmental concerns in the fashion and apparel industry are becoming increasingly important, little work has investigated the way to educate consumers about the social-environmental problem inside Eco-fashion design. Nerurkar (2016) showed that Eco- fashion design models should integrate psychosocial factors for greater effectiveness. Consumers have become more aware of the environmental threats that show negative impacts on health and social well-being. They are concerned about the next generations and this phenomenon is increasing. However, there are many consumers interested in clothing purchase more than what they need. Therefore, understanding the issue of overconsumption is important, which contributed to the fabric and clothing waste. Therefore, this study adopts the concept of a capsule wardrobe as a solution for managing the number of clothing based on essential needs. The capsule wardrobe is limited in clothes

that can be worn in various ways and create different outfit styles (Hsiao & Grauman, 2018). The benefits of using a capsule will limit the purchase of unnecessary clothing, as well as saving time and money. The Eco-fashion has the potential to support consumer's feeling by making more conscious decisions. Hence, in terms of the fashion and apparel industry, it is a core responsibility to work together by satisfying people, environment and government laws (Naz, 2019).

Fishbein and Ajzen (1975) also stated that the action of an individual is influenced by the memory, anxiety, awareness, and social pressure of the past. Therefore, understanding consumer's environmental concerns, beliefs and attitudes are essential to understand their behaviour. Moreover, the willingness and purchasing decisions toward the development of Eco-fashion clothing design and their sustainable behaviour are notable investigations for designers to consider during the Eco-fashion design process.

Indeed, consumers and designers are defined and categorised based on their behaviour, therefore, an investigation among the individual's behaviour in decision-making toward sustainability is valuable. While no widely inclusive solution has been found, efforts continue to find continuity on the subject. Henceforth, the connection between the socio-psycho part to the existing Eco-fashion and apparel design models is an understandable topic.

According to Creswell and Clark (2017), researching on the significance and important issues in the Eco-fashion design with consideration on consumer's attitude and designer's reactions in such design process may lead to the development of new concepts and theories.

Therefore, this research aims to discover the relationships between social science, especially the investigation of consumer's behaviour and designer's real behaviour regarding

sustainability issues. Indeed, this study develops an Eco-fashion model formed based on the phases in the clothing life cycle. So, phases involved with the consumer, designers, material source and design process are important subjects. Hence, this research aims to investigate the individual's behaviour and to develop the Eco-fashion design model toward restoring relations between the consumer and environment with the production of clothes concerning sustainability in the fashion industry.

All in all, this research seeks to discover phases related to the life cycle of clothing (consumer, designer, design process and material) with supporting the three main pillars of Eco-fashion design (society, economic and environment) to develop an Eco-fashion design model.

Hence, this study designs three objectives; to explore consumer's and designer's behaviour about deciding on the Eco-fashion subjects, to develop an Eco-fashion design model with related factors concerning the Eco-fashion material and create an Eco-fashion collection, and finally to evaluate the society's perception and willingness to possess and accept the Eco-fashion collection based on the clothing life cycle.

This study hopes to broaden the literature that focuses on the clothing life cycle in the fashion and apparel industry to develop future strategies and encourage using the Eco-fashion design process in the fashion and apparel industry around the world. As seen in Table 1.1, the summary of the literature shows needs toward development in Eco-fashion design model. In the literature review chapter, it will be processed precisely.

**Table 1.1:** Implications toward Eco-Fashion Design Model

| Concepts | | Key Findings (Author(s)) | Implications toward Eco-fashion Design Model |
|---|---|---|---|
| Clothing Life Cycle toward sustainability<br><br>The essential tool of the Eco-fashion design is related to the clothing life cycle (Fletcher, 2008). Hence, the clothing life cycle needs more consideration regarding sustainability issue in each phase; consumer, material sourcing, designer and design (Kozlowski et al., 2018) | Consumer | -To consider consumer's behaviour during the clothing life cycle such as purchasing, consumption and disposal them as a successful key in producing Eco-fashion products (Birtwistle & Moore, 2007; Irick, 2013; McDonough & Braungart, 2013).<br><br>-Challenging consumer with Eco-fashion clothes in real-world effect much deeper than typical solutions (Farrer, 2011).<br><br>-Understanding consumer's needs and their acceptance for the achievement of Eco-design development (Gam & Banning, 2011). | -Needs to understand consumer's sustainable behaviour (consumer's environmental concerns, beliefs, attitudes, and everything related to their experiences).<br><br>-Needs to understand how they interact with Eco-fashion clothing and their willingness and purchasing decisions toward Eco-fashion clothing. |
| | Material | -All materials in the Eco-fashion design will need to meet the criteria to recyclable (McDonough & Braungart, 2002; Rumsey, 2009). | -Needs to consider and focus on using Eco-friendlier materials, especially Eco-fashion |

**Table 1.1** continued

| | | | |
|---|---|---|---|
| Clothing Life Cycle toward sustainability | Material | -Using the newest technology in the production of the Eco material and process toward the development of the Eco-fashion design (Ma et al., 2017).<br>-Collaborate with the recycling company to use recycled fabrics (Jin Gam et al., 2009). | materials during the fashion and apparel design process. |
| | Designer | -One of the major barriers which do not persuade designers toward sustainability is the lack of knowledge and apparel design model considered through ability, needs, and perceptions of the designers (Jin Gam et al., 2009; Kozlowski et al., 2019; Moon et al., 2015).<br>-Understanding the designer's behaviour can lead to developing fashion and apparel design to more sustainability (Gam & Banning, 2011). | -Needs to understand the designer's behaviour and how they interact toward Eco-fashion clothing design.<br>-Needs to investigate a flexible and user-friendly Eco design framework can challenge the fashion and apparel designer to involve sustainable development into the design process. |

**Table 1.1** continued

| | | | |
|---|---|---|---|
| Clothing Life Cycle toward sustainability | Design | -Considering Eco-fashion design techniques at the end of the clothing life cycle has positive impacts of economic and ecological subjects (Woolridge et al., 2006).<br>-New concepts of Eco techniques such as zero-waste designs (McQuillan, 2011; Rissanen, 2008), design for disassembly (Jin Gam et al., 2011) and transformable designs (Fletcher, 2008) are helping to fashion industry toward more Eco-friendly design.<br>-Applying knowledge and related factors with quickly understand and get updated with news on sustainability practises into the framework of the design apparel process are valuable (Kjaerheim, 2013; Watkins, 1988). | -Needs to add more detail and focus on the design phase and the related factors in this phase to the existing Eco-fashion design process.<br>-Needs to consider the design techniques in Eco-fashion design models, as well as structures with sustainability information. |

## 1.3 Problem Statement

As a new concept in the fashion world, only a few researchers, designers and manufacturers have sought out this concept and the real value within the sustainability issue to the fashion and apparel industry. Therefore, this study presents the problem statement

based on the three pillars of sustainability (environmental, economic, and social), where all concepts are involved in phases of the clothing life cycle.

### 1.3.1 Environmental-Social and Economic-Social Aspects among Consumer, Designer and Used Material in Eco-Fashion Design Subject

Kjaerheim (2013) investigated that fashion and apparel designers desire more knowledge and incentives for environmental action. Also, according to Gam and Banning (2011), the most critical explanation of why designers will not concentrate on designing the sustainable product is only the lack of knowledge in concentrated on consumer's desires. Moreover, Curwen et al. (2013) believed that in the Eco-fashion design process, the designer should find related solutions not only considering the design phase but also consider all phase of the clothing life cycle. In addition, Kozlowski et al. (2018) claimed that in the sustainability subject, designers should address phases of the clothing life cycle which consumers are involved. Concerning this Papanek and Fuller (1972) stated that the most important aspect of Eco-fashion design and designers is how it is related to consumers.

Previous researchers proved that clothing waste and environmental issues are the results of the lack of awareness about clothing disposal methods and sustainable decision-making during the dispose of and purchasing clothes in society (Wai Yee et al., 2016; Young Lee et al., 2013). Indeed, to improve the Eco-fashion subject, all factors that affect the consumer's purchasing are needed to be studied. However, it is important to understand how consumers perceive and characterize clothes made of sustainable or Eco-fashion materials and how they observe products made of such materials before commercialization. However, consumers may not prefer to use and purchase Eco clothing due to the high price and sometimes poor quality (economic-social perspective). While, the significant features of the Eco-fashion clothing are protecting the environment, making a profit, strictly adhere to the

basic environmental knowledge to support awareness and concerns regards to this issue, only consumers with certain knowledge and academic education have the opportunity to see and judge such clothes.

In addition, to investigate purchase behaviour toward Eco-fashion clothes, some scholars have highlighted the role of the intentional gap (Cleveland et al., 2012; Thogersen et al., 2012). Besides, attitudes and behaviour gaps are the biggest obstacles to the implementation of the Eco-design process (Jin Gam et al., 2009). Jin Gam et al. (2009) showed that opportunities will increase for Eco clothing made of Eco-fashion materials with the growing consumer's environmental concern in the future. Nevertheless, only a few fashion designers and apparel companies have taken this trend as a competitive opportunity due to they are not sure that consumers will accept Eco-fashion clothes. Laitala (2014) stated that no study investigates factors can influence purchase behaviour toward Eco clothing by focusing on social-environmental perspective. In addition, the results of the recent study by Rhee and Johnson (2019) showed that there is a gap between consumer's attitudes toward sustainable purchasing and their clothing disposal behaviour which increases the clothing waste.

### 1.3.2 Environmental-Economic Aspects among Designer, Design Process and Used Material in Eco-Fashion Design Subject

According to Payne (2011), the concept of the clothing life cycle, particularly end of life clothing needs further consideration during the design process. Design is responsible to use the maximisation value of clothes during their life cycle, as well as finding solutions for minimisation clothing impacts into the environment and improve economic issue (Payne, 2011). However, the existing structure of the design phase in Eco-fashion and apparel process models is suitable for professional in sustainable subjects. Henceforth, most of the

designers with little experience in the field of sustainability are less likely to follow such models in the design process (Kozlowski et al., 2019). Indeed, this structure could not help junior designers and manufactures to consider the clothing life cycle and convince them in economic terms during the production as an environmental-economic perspective (Jin Gam et al., 2009).

In addition, the previous literature has shown that the lack of knowledge about the Eco-fashion design process and material sourcing and related physiological factors are the biggest reason that the designers do not focus towards development in the Eco-fashion design issue (Jin Gam et al., 2009). Therefore, the need for systemic change in the existing Eco-fashion design process and the affected factors is necessary toward more sustainability based on the designer's role in the fashion and apparel industry, in the other words focusing on the environmental-social, economic-social and economic-environmental perspectives (Curwen et al., 2013).

Owing to these gaps, the researcher sought to contribute the existing knowledge about the phases involved in the clothing life cycle such as the consumer's behaviour, designer's behaviour, material sourcing and design process toward supporting three pillars in the sustainability: environmental, economic and social. Therefore, efforts are needed to develop a model with focusing on the Eco-fashion design based on the involved phases in the clothing life cycle and supporting three spheres of the sustainability will be valuable.

## 1.4 Research Scope

The proposed concept of the Eco-fashion design is based on the clothing life cycle, by switching the focus from preventing waste production to the maximum usage of the waste product. This study aims to use the concept of the clothing life cycle to develop an Eco-fashion design model. In fact, the lifespan of the clothes can be expanded with the investigation of the clothing life cycle concept. Hence, this research seeks to discover phases related to the clothing life cycle (consumer, designer, design process and material) with supporting the three main pillars of the sustainability in design (society, economic and environment).

So, the proposed model of Eco-fashion design will be developed based on the phases of the clothing life cycle. Therefore, to achieve the research objectives, the following scopes are listed and be considered through the whole development:

i. The research investigates the consumer's behaviour toward sustainable activities such as disposal of clothing, especially recycling and purchase of Eco-fashion clothes.
ii. The research studies the designer's behaviour toward minimisation clothing waste, as well as the design of Eco-fashion clothes and related factors, which may lead to help the designer's perception to use Eco-fashion materials.
iii. The main research focuses on designing and development an Eco-fashion design process model with supporting Eco-fashion material and sustainable techniques toward creation an Eco-fashion clothing collection as named "Eco capsule wardrobe".

iv. The research discovers the society's knowledge and awareness of the Eco-fashion design.

The scope of the research (Figure 1.1) shows the relationship between three main pillars of the sustainability; planet (environment), the consumer (society) and profit (economic), and the phases involved in the clothing life cycle. Fletcher (2008) showed that traditional models of sustainability include the environment, social and economic issues in three pillars. Indeed, the life cycle of clothing starts from consumer's need (phase one) to material sourcing (phase two), designer's team (phase three) and design process (phase four) until this cycle return to the consumer. As a side note, two main pillars of sustainability named profit and consumer are involved in the clothing life cycle, directly. In addition, the phases of the clothing life cycle have a relationship with the third pillar of sustainability (environment), indirectly. This shows the clothing in the entire own life cycle, whether directly or indirectly, affects sustainability issue.

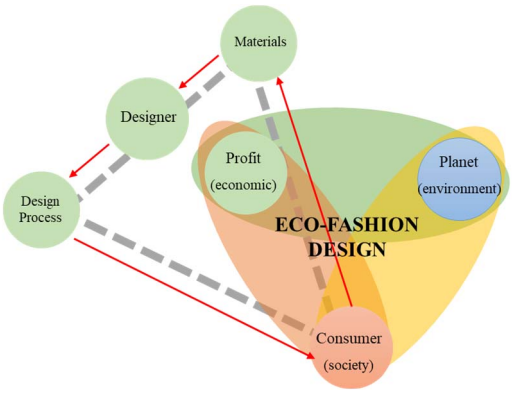



**Figure 1.1:** Scope of Research

Additionally, this research focuses on the design process phase, therefore an Eco-fashion design process model with related factors will be developed and tested. Henceforth, this study will seek the potential Eco-fashion design model to improve existing fashion and

apparel design process concerning the environment, social and economic. Therefore, from this scope, this research will propose an Eco-fashion design model.

## 1.5 Significant of Study

In terms of the practical aspects of sustainability issues, the Eco-fashion theoretical model can be an alternative guideline to encourage designers and other individuals interested in the Eco-fashion design by switching the focus from preventing waste production to the maximum usage of the waste product. However, designers may have a better understanding of their ability to design thinking into the design process based on their experiences and the consumer's demand. Based on the proposed model of this study, all clothing can be recycled and used as a new material in the production process, instead of contributing to the pollution. This is not only limited to cost-saving for purchasing materials but may also have benefits to preserve the environment and creating jobs for people.

Moreover, it can lead to reducing environmental and social impacts. Hence, the proposed model may help the designer and manufacture to identify the material, therefore, the amount of unsafe material released into the living place can be reduced. This important approach has other audiences; fashion companies for cost reduction, presentation new Eco-fashion collection, gaining a good image, society for financial benefits, being fashionable for low-income people, attracting customers with improvement knowledge and at the same time may create jobs in the fashion industry.

The recycle clothing policy agendas have started to consider related policy measures to address textile and clothing waste prevention. In the ideal world, nothing should be wasted, therefore, all clothes must be designed recyclable. In this situation, this model will help government, as well as the fashion industry, to participate for protecting the

environment through reducing emissions from the fabric waste, to boost the economy through return materials to the economic system instead of burning and to increase the awareness of the public about sustainable activities.

## 1.6 Research Questions

The research raises several research questions as a guideline to meet the objectives of this research. The research questions are developed as below:

i. What are the significant factors of consumer's and designer's behaviour toward purchasing and designing Eco-fashion, respectively?
ii. How is an Eco-fashion design model shall be constructed to meet the concept of the clothing life cycle phases toward supporting three sustainability pillars: the environment (planet), economic (profit) and society (people)?
iii. What are the significant factors that affect society's perceptions to accept Eco-fashion outputs designed through the proposed Eco-fashion model?

Based on the three pillars of sustainability (social, environmental, and economic), question number one is related to the social issue and investigate the role of society in the develop an Eco-fashion model. The environmental and economic issues in the proposed Eco-fashion model are covered through study in question number two. Indeed, it focuses on environmental and economic issues by providing solutions to protect the environment as well as cost-saving concerns. Finally, question number three is supported by the economic and social parts in the proposed Eco-fashion model through investigation among consumers. Consequently, all three main research questions are developed to support the sustainability pillars regarding the development of an Eco-fashion design model.

## 1.7 Research Objectives

The general objective of this research is developed and proposed the Eco-fashion design model based on the phases involved in the clothing life cycle: consumer, designer, material, and design process. Also, it presents a new version of the Eco-fashion and apparel design regarding support psychological perspective. It is to provide sustainability features with concerning people health, protection the planet and consideration making the profit in the community. Hence, the specific objectives of the research are described:

i. To explore consumer's behaviour and designer's behaviour on the decision toward Eco-fashion design subjects.
ii. To develop an Eco-fashion design model with related factors to source Eco-fashion materials and create an Eco-fashion collection.
iii. To evaluate society's willingness and perceptions to accept the Eco-fashion outputs designed based on the clothing life cycle concept.

## 1.8 Research Hypothesis

This research will develop an Eco-fashion design model that supports the clothing life cycle which can be implemented in the fashion and apparel industry. The proposed model is concentrating on a new perspective on the Eco-fashion development and sustainability. This design model will support the society (consumer), environment (planet), economic aspects (making a profit through design process and production) and the role of the designer as the heart of Eco-fashion design process and production.

This is also believed that consumers are more inclined to consider and purchase Eco-fashion clothes in the retail industry. So, the following hypotheses are proposed:

- Consumer's attitude towards Eco-fashion clothes made of recycled materials influences the direct and positive on purchase intention for such clothes.
- A Subjective norm towards Eco-fashion clothes made of recycled materials influences the direct and positive on purchase intention for such clothes.
- Perceived behavioural control towards Eco-fashion clothes made of recycled materials influences the direct and positive on purchase intention for such clothes.
- Perceived behaviour to dispose of clothing influences the direct and positive on purchase intention of Eco-fashion clothes made of recycled materials.
- Perceived behaviour to dispose of clothing influences the direct and positive on purchase behaviour for Eco-fashion clothes made of recycled materials.
- Purchase intention of Eco-fashion clothes made of recycled materials has direct and a positive relationship with the purchase behaviour for such clothes.

Moreover, more fashion designers and apparel manufacturers have added Eco-friendly or sustainability features to their clothing design and production. Hence, these are hypotheses are proposed:

- Environmental knowledge has a direct and positive relationship with the designer's attitude toward Eco-fashion design.
- Perceived quality and price of Eco-fashion materials has a direct and positive relationship with the designer's attitude toward Eco-fashion design
- Perceived function and aesthetic of Eco-fashion materials have direct and a positive relationship with the designer's attitude of Eco-fashion design.
- Perceived usefulness and ease to use of using technology has direct and a positive relationship with the designer's attitude toward Eco-fashion design.

- Attitude toward Eco-fashion design has direct and a positive relationship with the design intention.
- Subjective norms toward Eco-fashion design has direct and a positive relationship with the design intention.
- Behavioural intention toward design Eco-fashion clothes has direct and a positive relationship with the actual behaviour for design such clothes.

Additionally, consumer's environmental concerns are reflected by their role in society and their environmental knowledge. Hence, young women consumers with age between 20 to 30 years old are the most conscious generation (Pal, 2016) with most sensitive to risks from environmental problems. The Eco-fashion concept may give new options or alternatives clothing styles and trends to the society, especially those who support the environment safe. It may be potential if the design implemented additional value functions. Therefore, the development of an Eco-fashion design model, as well as investigation about the consumer's willingness and acceptance of the Eco-fashion clothes designed by the proposed model, will be valuable.

## 1.9 Research Methodology

According to the objectives of this study, based on the previous researches in sustainable fashion subject (Jin Gam et al., 2009; Koo et al., 2014), a mixed-method strategy is adopted to obtain data collections and analysis. The research methodology includes three phases based on the three objectives to develop model; the first step studies on psychological phases involved in the clothing life cycle as known designer and consumer behaviour, the second step is an investigation on practical phases involved in the clothing life cycle as known material and design process and then develop the Eco-fashion design model base on

these four phases, and final step is the evaluation on society's willingness to possess clothes design based on the new model.

**Phase One.** The methodology of the first objective contains a mixed-method strategy. The first step is to study of consumer's sustainable behaviour toward Eco-fashion clothes. This investigation is applied through the creation hypothesis and testing them by developing a questionnaire and an in-depth interview session with consumers. The second step is to investigate about the fashion and apparel designer's behaviour regarding the Eco-fashion design. It is implemented through the creation hypothesis in an in-depth interview session with expert designers in sustainable fashion, those who have been active in the field of clothing and fashion design for a long time and entering the field of sustainable design for several years, and finally testing hypotheses by developing a questionnaire among fashion designers.

Descriptive statistics, reliabilities, and correlations using Statistical Package for Social Science (SPSS) version 23 is used to obtain the results and to identify the relationships. Also, Partial Least Squares Structural equation modelling (PLS-SEM) using the analysis of structures software SmartPLS version 3.0 is employed to analyse and evaluate the structure of consumer's sustainable behaviour and designer's sustainable behaviour. In addition, Nvivo software is employed to transcribe and analyse the interview's data by creating trees and nodes.

**Phase Two.** The methodology of the second objective includes a mixed-method strategy to develop Eco-fashion design model. First, a quantitative survey is conducted to investigate the design concept of Eco-fashion clothing among consumers. Statistical Package for Social Science (SPSS) version 23 is used, as well as a basic descriptive approach to

analyse online data is applied. Second, a qualitative interview with fashion experts in the Eco-fashion design is adopted, where it will develop an Eco-fashion design process model with related factors. All transcribed are analysed by creating trees and nodes via Nvivo 10. Finally, exploration of the Eco-fashion collection design as named "Eco capsule wardrobe" based on the proposed model is accepted through hold a workshop with sustainable fashion designers. Regarding this objective, the research develops an Eco model with supporting Eco-fashion material and Eco-fashion techniques toward the creation of an Eco-fashion collection.

**Phase Three.** The methodology of the third objective includes a qualitative interview with young women consumers to evaluate the Eco-fashion collection, where it is designed based on the proposed Eco-fashion design model. Hence, two focus groups discussion are conducted with women consumers to evaluate users' acceptance and perception of the design and quality of the Eco capsule wardrobe.

## 1.10 Limitation of Study

The designing and developing clothes, especially in the sustainability area are involved with some limitations such as consideration culture, religion, gender, age, and design features based on the different size, texture, colour, and shape.

Moreover, little literature exists regarding the Eco-fashion design model and their feedback in the fashion and apparel industry. For the geographical purpose, this study accepts to be performed in Malaysia and Iran as a location of doing the research. Owing to both countries are considered as developing countries, and in the last few years, they have been investing in sustainability and the environmental issues in the industries toward preserving the environment. Moreover, previous studies indicated that there is not a big

difference between Iranian and Malaysian culture. Therefore, some of the data collections are accomplished in Malaysia due to researcher's limitation to access the different countries and some of them are achieved in Iran because of the previous researcher's background and her accessibility to fashion and apparel designers.

For the first objective, the respondents are chosen in Malaysia due to the investigation of consumer's behaviour regarding disposal, consumption and purchasing activities. In addition, this study is not able to measure all variables related to the consumer's clothing consumption and purchasing. Regarding the study on designer's behaviour toward Eco-fashion design and due to the lack of designers those have knowledge in the sustainable and Eco-friendly design, so there is no limitation to respond's location. Besides due to the lack of investment in recycling programmes in the industry of developing countries, recycling companies are very limited. Hence, this study accepts only company located in Port Klang, Malaysia. Indeed, it is taken to investigate and observe the clothing waste collected and categorised. Additionally, visiting this recycling factory can help to identify and collaborate with other individuals and (non-government and government) organisations involved in sustainability activities in Malaysia.

For the second objective, since there is not enough knowledge on the Eco-fashion design in developing countries, as well as the limited design education even in universities, therefore, finding designers interested in this activity and interview with them is very difficult. Henceforth, only eight sustainable fashion designers are selected with more than 7 years of experience in Eco-fashion subject in Malaysia and Iran. Which at least it has been attempted to increase the reliability of the data collected and the accuracy of the contents.

Owing to the location constraints and lack of access to sustainable designers in Malaysia, this study conducts a collection design workshop in Iran.

For the third objective, this study is targeted young women's consumers to evaluate the Eco-fashion output designs since the capsule wardrobe is created all the essential clothes belong to young women's consumer with ages 20 to 30 years old. Additionally, this study is unable to assess the price of Eco-fashion output designs developed based on the proposed model. This study focuses on the consumer's willingness and acceptance of Eco-fashion clothing designed based on the proposed Eco-fashion design model. Regarding the evaluation of Eco-fashion output designs, this study explores among Iranian women's consumers who live in Tehran with age between 20 to 30 age to accomplish its aims and thus not above young people residing in Iran and other nations, the findings of this study cannot be generalized. In prospective research, there is a need to concentrate on certain areas and certain demographic groups, such as adults.

Although a mixed-method design is used in this study to increase the confidence in the findings, questionnaires are performed electronically so that they may be responsive to self-reported social desirability biases. Likewise, participants in these studies are randomly selected. According to Delice (2010), simple random sampling can be considered unbiased. Besides, the questionnaire is done once and for all so that the findings offer only a snapshot of the behaviour of people.

## 1.11 Definition of Terms

This section provides the terms of the fashion and apparel subjects especially in the field of sustainability that is defined as shown below:

**Apparel Designer** - Also called clothing or fashion designers, conceptualize and create items with some cloth.

**Apparel** - In general, apparel means clothing that may not be fashionable. Apparel is all categories of clothing that can be worn by women, men, and children.

**Biological Nutrient** - An environmentally composted material or substance which can return nutrients (McDonough & Braungart, 2002).

**Capsule Wardrobe** - Hsiao and Grauman (2018) stated that a capsule wardrobe is included essential clothes which are like a puzzle help to set and wear clothes into many different outfits.

**Clothing Collection** - An apparel or clothing collection is defined by the apparel items that a fashion and apparel designer put together for each season.

**Clothing Disposal** - The last phase after using clothes included several ways such as recycling, reusing, throwing away, donating to charity, family members or selling (Bianchi & Birtwistle, 2010).

**Clothing Waste** - Any clothes that are invaluable for people and they would not to wear again and decide to discard them (Domina & Koch, 1999)

**Clothing** - It is described as anything is created made from cloth for wearing the body. Clothing also is known as clothes and apparel.

**Cradle to Cradle (C2C)** - A design concept developed by McDonough and Braungart (2002) inspired by nature, regarding the principles of the environment protection in the production process. It is a closed-loop design process which is free of waste.

**Down Cycling** - It is a recycling of something into a material with a lower value or quality than the original item.

**ECO** - It is a prefix for ecology, usually used to express the sustainability about the concerns or environmental benefits.

**Eco-Fashion Clothing** - This kind of clothing is made of recycled materials, reused textiles and organic materials. Cotton and other materials have not been coloured with harmful chemicals are important choices to design such clothes (Joergens, 2006).

**Eco-Fashion Material** - Any type of materials applied in the fashion and clothing design regard to reducing environmental impacts, as well as improving consumer profits and the health of the community (Joergens, 2006). Additionally, organic, recyclable, and renewable materials are categorised under Eco-fashion materials. For instance, they can be found in fabrics made of cotton, wood pulp, and plastic bottles (Aaijaz & Ibrahim, 2010).

**Eco-Fashion Design** - It is about design clothes concerning protect the environment, people's health and well-being (Chan & Wong, 2012).

**Eco-Friendly** - A product or process insists to be as a protector of the environment but still harmful (McDonough & Braungart, 2002)

**Fashion** - Fashion is a currently popular style of clothing, or behaviour, etc. (Oxford dictionary). In the textile and clothing subject, fashion is a type of cloth or clothing and accessories can be worn at a particular time by special groups (Stone Collonge et al., 2012).

**Fast-Fashion** - It is a term of clothing that refers to low-cost, low-quality, and unlimited choices that are quickly produced to replicate catwalk trends.

**Green** - An additional term used for identifying sustainable products and processes for economic, human and animal protection (McDonough & Braungart, 2002).

**Life Cycle** - The lifetime of a product during the manufacture, usage and dispose of this item (McDonough & Braungart, 2002). It is a journey of a product makes from the extraction of its raw materials, production and usage to its disposal or recycling.

**Sustainable Clothing Collection** - It means an apparel collection which made of sustainable materials, for instance, organic material, recycled material and reused material such as H&M Conscious Exclusive (Joergens, 2006).

**Sustainable Fashion/Eco-Fashion** - It is named as a type of clothing designed based on specific components to prevent negative impacts on the environment and society during the life of the clothing. It includes all aspects of a clothing life cycle form of clothing production, manufacturing, consumer consumption and disposal (Black, 2008).

**Technical Nutrient -** An artificial material which can be recycled to the same degree of the quality as an original in a new product (McDonough & Braungart, 2002).

**Textile Waste** - It is the invaluable fabrics, yarns or fibres produced during the production of the clothes. They are deemed unusable for its original purpose by the owner.

**Vegan Fashion** - Vegan fashion is animal-free materials, it means no animal products were used in vegan fashion clothes and no animal was harmed (Choi & Yoh, 2013).

**Zero Fabric Waste Design** - A re-patterning technique introduced in clothing production in the pattern creation process without production fabric waste (Rissanen, 2008).

## 1.12 Chapter Summary

The aspiration of this study is enticed by a phenomenon where fashion and designers may face with sustainability subjects during their design work. According to Mete (2006), the sustainability subject in fashion is new, especially the Eco-fashion clothing style is going to be a new trend in the fashion society. Hence, concerning three main pillars of sustainability (economic, environment and society), designers need to learn how to open their eyes, improve their skill of observation, absorb the visual idea, incorporate them and turn into clothes which their consumers will like and need (Mete, 2006). Designers have insight into the practical, aesthetic, and economic needs of consumers, but they should assume responsibility for designing and manufacturing clothes which will work more Eco-friendly, reducing environmental effects and enhancing environmental sustainability. Designers require a clear and reliable approach that is yield meaningful outcomes, trustworthy and easy to follow, as well as be in line with their daily tasks and skills. Although designers have inherent abilities which cannot be constrained by rigid rules, a consistently versatile structure should be useful to develop design processes more effective and productive.

On the plus side, one of the most barriers is reported that the clothing waste and environmental issues are the results of the lack of awareness about sustainable decisions during consumption, purchasing, disposing and designing clothes in the society and do not consider the clothing life cycle issues. Hence, a few scholars highlighted the role of the intention-behaviour gap in sustainability practises (Wai Yee et al., 2016; Young Lee et al., 2013). Likewise, this research derives from the research gap of earlier studies by Payne (2011), (Jin Gam et al., 2009) and (Kozlowski et al., 2019) that showed there is no attention to the designer's behaviour as the heart of the design process in helping to reduce clothing waste. Additionally, the lack of information is the biggest reason that the designers do not

focus on creating sustainable development based on consumer's needs. They are not sure that the consumer's attitude will accept Eco-fashion clothes (Jin Gam et al., 2009).

Subsequently, this research proposes a research conceptual model with focusing on the phases of the clothing life cycle (material, designer, design process, consumer) that can influence on the sustainability pillars (economic, society and environment). On top of that, designers are able to control all phases involved in the design process. Indeed, the designer chooses the Eco materials during Eco design process to provide the consumer's needs to make a profit, protect the environment and human health. So, the four following concepts are followed in this study.

(1) Indeed, regarding the consumer phase, this research discovers and focuses on the important factors affect consumer's behaviour toward sustainability activities such as purchasing, consumption and disposal of clothing, as well as their willingness and acceptance of Eco-fashion clothes. Moreover, the consumer phase is one of the significant phases that affect the clothing life cycle, directly.

(2) As a point of view the designer's phase, this research investigates to discover criteria which affect the designer's behaviour to design with Eco-fashion materials and sustainable techniques as a trend to reduce the clothing waste. Moreover, the scope of this study determines the most related factors during the design process which can influence on the designer's decision-making.

(3) Concerning the material sourcing phase, this research focuses and proposes using Eco-fashion materials, especially recycled contents. According to Jin Gam et al. (2009), the materials used in the Eco-fashion design must be recyclable and returned to nature.

(4) According to the design process, this study investigates the development and design techniques in the Eco-fashion design process model. Besides, this model includes all the phases of the clothing life cycle. In addition, this study investigates the existing Eco-fashion and apparel design model and production and shows their strengths and weaknesses, therefore an Eco-fashion design model will be developed and proposed.

The new concept of the Eco-fashion design is based on the concept clothing life cycle, by switching the focus from preventing waste production to the maximum usage of the waste product regrading to the psychological subject. Indeed, psychological, or mental subject are forming based on the individual's perception and their behaviour. Therefore, using the phases involved in the clothing life cycle to develop and propose an Eco-fashion design model is the aim of this study. Hence, this research seeks to discover phases related to the life cycle of clothing which emphasis consumer, designer, design process and material with supporting the three main pillars of sustainability concept namely known as society, economic and environment in the Eco-fashion design.

Subsequently, the conceptual model of this study focuses on the phases involved in the clothing life cycle (with regards to psychological subjects); consumer (especially consumer's behaviour), designer (particularly designer's behaviour), process design, and materials, as well as their relationship. Individual's behaviour is contained attitude, subjective norms, and perceived behavioural control. According to the objectives of this study, a mixed-method is utilised to obtain data collections and analysis. Moreover, consumer's and designer's behaviour are measured through the Statistics Package for Social Sciences (SPSS) and Partial Least Squares Structural Equation Modelling (PLS-SEM, SmartPLS). The process design and materials are investigated by developing the Eco-fashion

design and creation of the prototype. The prototype aims to evaluate society's acceptance and willingness toward Eco-fashion design.

The three main issues in this particular research based-project are to explore consumer's and designer's behaviour on the making decision toward Eco-fashion activities; to develop an Eco-fashion design model with related factors to source Eco-fashion materials and create an Eco-fashion collection, and to evaluate society's willingness to accept the Eco-fashion outputs designed based on the clothing life cycle concept. In terms of the practical aspects of sustainability issues, the Eco-fashion model can be an alternative guideline to encourage designers interested in Eco-fashion design and manufacturers, as well as fashion industry by switching the focus from preventing waste production to the maximum usage of the waste product.

Also, this model is able to assist students and researchers those are encouraged to explore and adopt the proposed model to create innovative collections. Based on the proposed model of this study, all clothing can be recycled and used as a new material in the production process, instead of contributing to pollution. This is not only limited to cost-saving for purchasing materials but may also have benefits to preserve the environment and creating jobs for people.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Introduction

For developing the "Eco-fashion design model", this chapter reviews the literature based on the three objectives.

**(1) Objective one**; it reviews the literature on the consumer's behaviour toward the purchase of Eco-fashion clothing, consumption, and disposal in sustainable practices. Besides, it discusses the literature review on the designer's behaviour toward implementing activities for minimisation of waste in the Eco-fashion clothing design. In addition, this study reviews related factors and predictors toward the designer's intention of Eco-fashion design, as well as consideration social-environmental and economic-social perspective.

**(2) Objective two**; it discusses the literature review on the Eco-fashion and Eco-apparel design process and all phases related to the clothing life cycle (consumer, designers, design, and material) are studied. The review will discuss the background of the design, materials, and sustainable features. Hence, it reviews existing Eco-fashion and apparel design process models and the improvement in the design process to develop an Eco-fashion design model with consideration economic-environmental perspective and cost-saving issues.

**(3) Objective three**; it reviews the society's acceptance and factors which can affect consumers to tend the Eco-fashion clothing and consideration the social-environmental perspective.

In other words, it discusses the clothing life cycle phases (material, designers, design process and consumer) and their relationship as a border to support the three pillars of sustainability (society, environment and economic). Therefore, after the combination of the objectives' structures in the conceptual model (Figure 2.1), the two main parts of the literature are related to this research include.

(1) The theoretical background of Eco-fashion design strategies and understanding types of the existing Eco-fashion and clothing process models are reviewed. Also, the important factors affected to increase the sustainability in Eco-fashion design is studied.

(2) Then, the clothing life cycle and factors for discovering aspects in the Eco-fashion design are investigated. Also, how a model is developed based on the four most important subject in the clothing life cycle, material, designer, design process and consumer.

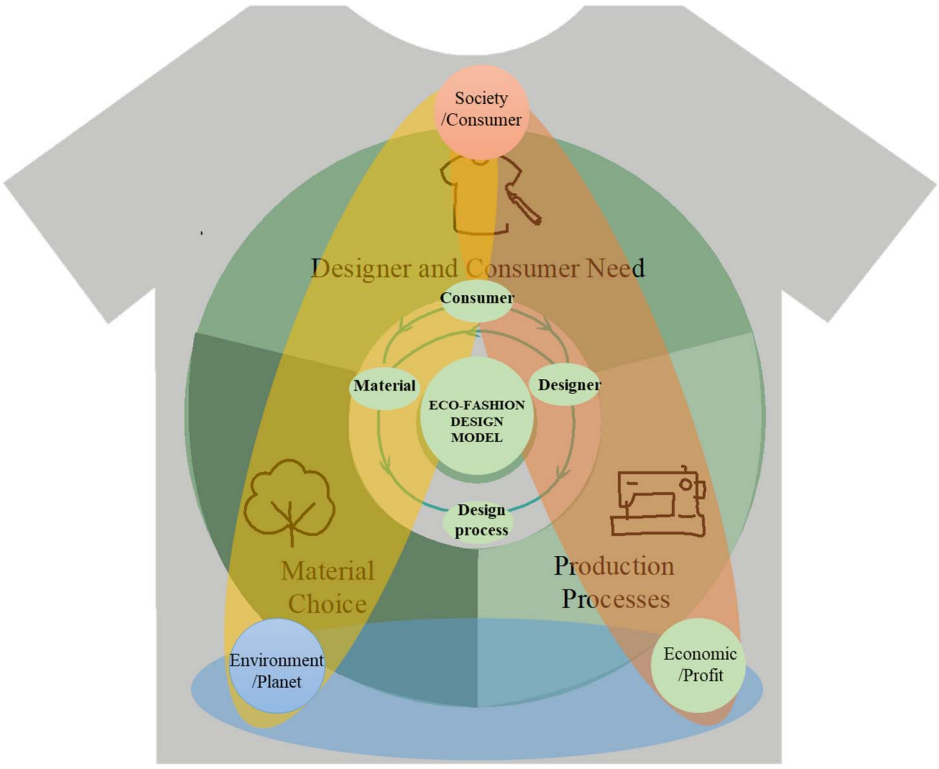



**Figure 2.1:** Proposed Conceptual Model of Research Work

## 2.2 Sustainability and Eco-Fashion

According to Elkington (1998) and Rodriguez et al. (2002), sustainability consists of three main pillars known as economic (profit), society (people), and environment (planet). In simple words, making profits through communication with people, and respect to environmental responsibilities.

Indeed, “people” refers to human those living in a society. People wear clothes and aware of the short and long-term consequences of environmental degradation to the clothing and apparel industry (Elkington, 1998).

Besides, “making a profit” is related to the relationship between the process of the organisational structures, facilities, technology, and ways of doing things in the industry to achieve benefit. Truly, all have implications for preserving the environment (Hethorn & Ulasewicz, 2008). Hence, the concept of sustainability in design needs to consider each three of these aspects (Rodriguez et al., 2002).

Additionally, all developments in sustainable design require to balance the impacts associated with environmental, economic, and social issues (Searcy et al., 2005). According to Kälkäjä (2016), there are different dimensions of design concept which support sustainability such as design for disassembly, design toward waste minimisation/zero-waste, design for slower consumption, design according to the end of the product’s lifespan and design for social well-being.

The importance of incorporating the sustainability issue into fashion and apparel subject shows effects on society, the process of making profits, and the environment. In terms of the fashion and apparel industry, it is a core responsibility to do business by

satisfying people, environment and government laws (Naz, 2019). According to Kozlowski et al. (2018), the sustainability concept in the fashion and apparel design process is defined as a related design concerning production, distribution, and disposal stage with focusing on the end of clothing lifespan. It can support the economic aspect with the minimising negative impact on both society and the natural environment.

There are a few terms used to explain fashion, apparel, and clothing toward sustainability. As stated, "Eco-fashion" term has become popular for advocated people in the Eco-friendly production of the apparel and textile items (Fletcher & Grose, 2012). Likewise, this term is the famous expression instead of "sustainable fashion" that brands and practitioners academics are using in the fashion world (Henninger et al., 2016).

### 2.2.1 Eco-Fashion and Apparel Design Models

An apparel design process model is completed by focusing on functional, aesthetic, and economic issues. Therefore, it is suggested that developing a research plan to study the consumer's needs and market needs may be the most critical part of the design process (LaBat & Sokolowski, 1999). On the other hand, the process of clothing production such as dyeing, finishing, pattern-making techniques can lead to environmental problems (Muthu, 2015). Also, cutting and sewing waste from apparel production is a significant issue (Harris et al., 2016). Therefore, fashion and apparel productions create large amounts of waste (McDonough & Braungart, 2002). If the fashion and apparel industry does not use appropriate solution systems to reduce waste, they can destroy the environment and threaten human health soon. Therefore, the structure of an Eco-fashion design which considers the environmental impact on the fashion product throughout its entire life (Niinimäki, 2006), can help to reach sustainability issues.

The clothes designed, manufactured, transported, consumed or recycled with the materials and techniques that represent environmental and social concerns are defined as Eco-fashion and apparel products (Meyer, 2001). According to Kozlowski et al. (2018), sustainable apparel design or Eco-fashion design is referred to as "the profitable design and production process with consideration of reuse and recycling actions in the disposal phase to minimise negative and maximises positive impacts on both society and the natural environment".

Rodriguez et al. (2002) suggested three-spheres; social, economic, and environmental of influence in the sustainability model (Figure 2.2). If the goal in two of the three spheres is combined then they will make the correlation together as environmental-social, environmental-economic, or economic-social. All the Eco-design concepts need to consider each three of these aspects based on the goals of the design (Ha Brookshire & Norum, 2011). This model explains a basic view of sustainability in sustainable or Eco-fashion design.

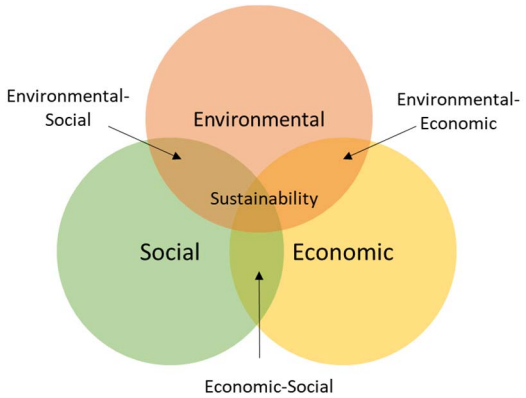



**Figure 2.2:** Three Pillars of Sustainability (Rodriguez et al., 2002)

Hence, some researchers have developed environmental and sustainable tools and concepts in fashion and apparel design process models specifically for use by fashion and apparel designers to improve and develop sustainable fashion such as; Cradle to Cradle Apparel Design Model (C2CAD) (Jin Gam et al., 2009), Considerate Design (CDT) (Black, 2012), Sustainable Fashion Bridges Ideation Toolkit (SFB) (Hur et al., 2013), Considered Take and Return (CT&R) (Aakko & Koskennurmi-Sivonen, 2013), Sustainable Fashion Design Model (SFD) (Gwilt, 2015) and Sustainable Design Cards DSKD (SDC) (Hasling & Raebild, 2017). All these tools are created based on various scale productions and different perspectives such as participatory and assessment.

Sustainable Fashion Bridges Ideation Toolkit (SFB) is developed by Hur et al. (2013). The SFB toolkit is a design thinking tool for inspiration designers to recognise sustainable development from the onset of the design process. It involves an organized process that helps the designer reach a result: designers begin by empathizing with the user, defining the problem, ideating solutions, creating a prototype, testing, and finally implementation. This resource contains a series of sixty cards with the concept of "co-design approach" used by fashion and apparel designers and highly engaged consumers during the design process ideation phase. This ideation toolkit is considered as a participatory tool in the sustainable design process.

Sustainable Design Cards DSKD (SDC) is created by Hasling and Raebild (2017). A series of design cards built to improve the sustainability of an apparel product through longevity. This tool is created as part of a collaborative case study between Design School Kolding (DKSD) and a local fur manufacturer, Kopenhagen Fur. These participatory cards are free downloadable and are intended for fashion designers. Considerate Design (CDT) is

developed by Black (2012) that is a simple visual and participatory method for the designer approach for evaluation of environmental impacts in a specific product or design on eight components: design of the concept, choice of material, development manufacturing, configuration, personalization, functionality, transportation and end-use.

Considered Take and Return (CT&R) is developed by Aakko and Koskennurmi-Sivonen (2013) that is created from the view of a designer, particularly for small scale production. This participatory tool is developed based on the cradle to cradle and slow fashion design. This model defines a core category into all other incorporated categories as called "considered take and return". Sustainable Fashion Design Model (SFD) is developed by Gwilt (2015). This model helps designers to incorporate sustainability approaches into the fashion and apparel design process. This model is formed based on the assessment tool that requires designers to recognise negative impacts and use effective techniques to minimise the effects of small-scale production.

Also, to provide guidance for the sustainable production to help environmental and human health issues in the design process, Jin Gam et al. (2009) developed the Cradle to Cradle Apparel Design Model (C2CAD) by integrating a sustainable assessment development tool, Cradle to Cradle (McDonough & Braungart, 2002), into current apparel design and production (LaBat & Sokolowski, 1999; May Plumlee & Little, 1998).

According to Kozlowski et al. (2019), the assessment tools are easier and more realistic to use at different stages of the design process regarding recognise and minimise negative environmental and social effects in production processes, as well as consideration clothing life cycle. Moreover, the assessment tools should be comprehensible and step by step applicable from a designer's viewpoint even in the large scale production (Kozlowski

et al., 2018). Henceforth, based on the aims of this study, Cradle to Cradle Design Model is accepted as a guide to developing the Eco-fashion design process model in the fashion and apparel industry. As shown in Figure 2.3, it consists of four steps, problem definition and research, sample making, develops solution collaboration and production (Jin Gam et al., 2009). In the first stage, designers define problems and analyse the market to understand the consumer's need. In the next stage, designers assess materials based on their feasibility as biological or technical nutrients. Throughout stage three, designers and manufacturers will collaborate with other supply chain companies to solve production issues and promote sustainable materials and products. Finally, the last stage is the production and the final product.

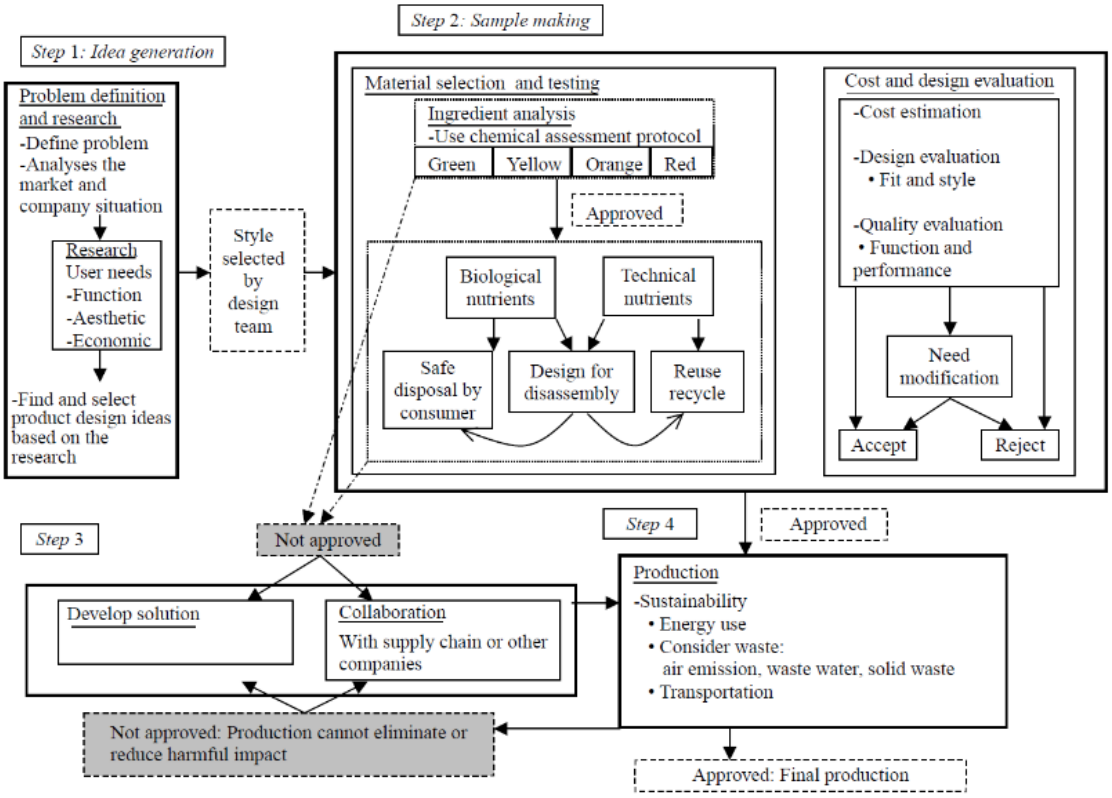



**Figure 2.3:** C2CAD Model and Production (Jin Gam et al., 2009)

The significant concept of C2CAD model is that sustainable features are considered to make decisions during the design process and also it is categorised through clothing life cycle phases (Kozlowski et al., 2019). By using this model, three sustainability pillars are addressed during the clothing design process (Jin Gam et al., 2009). This process can be economic through prevent pollution and social development. This will also offer a healthier and better environment such as a good living quality (Jin Gam et al., 2009). Designers and manufactures choose materials and fabrics with utilising the C2CAD model focused on their inherent health and protection for humans and the community. This model is applied successfully in the design of children's knitwear (Jin Gam et al., 2009) in a knitwear manufacturer in the Kyunggi, Korea and the design of a men's jacket (Jin Gam et al., 2011).

As mentioned, in C2CAD model, all materials chosen are recyclable (Cao et al., 2014). Therefore, materials are needed to be a technical or biological nutrient. Furthermore, in the recycling process from the post-consumer clothing, the blend of two different materials in the fibre's construction is a major problem and this can be one of the main reasons for not paying attention to much in recycling programmes (Jin Gam et al., 2009). Therefore, design for disassembly toward easy recycling is a significant subject in the Eco-fashion design process to be considered. In the next section, the main steps in fashion and apparel design process toward sustainability are discussed.

### 2.2.2 Steps in Eco-Fashion and Apparel Design Process Model

Based on the literature review, an Eco-fashion design model should be designed based on the engineering design. According to Kozlowski et al. (2012), an important factor in the design phase of the fashion industry can challenge the designer to integrate sustainable development dimensions into the design process with using a scalable and flexible

framework. Koberg and Bagnall (1972) believed that the two different stages; analysis and synthesis will emerge in the design process. The synthesis phase consists of think, select, implement, while the analysis phase persists intact (Figure 2.4).

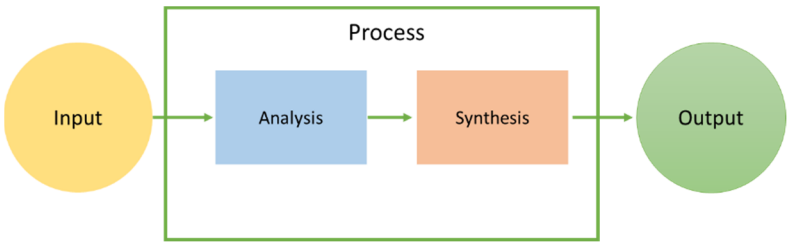



**Figure 2.4:** Design Process Model (Koberg & Bagnall, 1972)

However, Lawson (1980), Akin (1984) and Eastman (1970) showed that for the designers, it seems that the analysis of the problem is more integrated with the synthesis of a solution. Akin (1984) presented a systematic approach to the design process for generating new goals and rendering limitations among designers. So, the analysis is a part of all design phases and synthesis is only found at the earlier of the process.

- **Phase One: Discover Problem**

The first step of the Eco-fashion design process is related to discover problems. For a fashion and apparel designer, this is the identification of the target market (Orlando, 1979), type of clothing collection and other elements (French et al., 1985). Moreover, this stage includes general objectives that must be met in developing a successful Eco-fashion design (LaBat & Sokolowski, 1999; Lamb & Kallal, 1992).

The problem is introduced through a request for a clothing design (Jin Gam et al., 2009). This initial step familiarises a designer with the design problem by briefly describing the wearer's need (Bailey, 1999). Obviously, the designers want to create Eco-fashion

garments must consider the needs of consumers, indeed for whom they are designing (Irick, 2013; Regan et al., 1998). The output of the analysing is a statement of the problem, and French et al. (1985) and Watkins (1988) believed that it consists of three elements; a statement of the design problem, limitations mapping the solution and the excellence standards to do. Therefore, designers will seek to practise environmental accountability and discover alternatives to emerge challenges since the product's attribute are determined by designers (Pahl & Beitz, 1996).

- **Phase Two: Define and Generate Idea**

Lamb and Kallal (1992) and Cross (2003) explored that the generation of a concept by the designer is created immediately after some initial exploration of the problem. Koberg and Bagnall (1981), and Hanks et al. (1992) stated that the designer is asked to get motivation and find reasons to resolve a problem, then discover everything possible about the problem. Therefore, the second stage of Eco-fashion design defines and generate an idea which is the most creative stage for a designer to find design solutions to the problem (Lamb & Kallal, 1992; Watkins, 1988). Therefore, it involves brainstorming, sketching, researching to be an idea-generating step in Eco-fashion design process (Watkins, 1988).

Generally, developing a research plan to study the consumer's need, the market needs and product characteristics are included to generate an idea (Lamb & Kallal, 1992). So, the Eco-fashion and apparel design start with a need or an idea (Jin Gam et al., 2009). Indeed, it supports designers to undertake tasks sequentially (Kroll & Director, 2004). According to Cho (2009), ideas are formed thorough review of problems to clarify original goals and to determine which choices are able to keep the idea. In addition, considering several ideas before implementing a plan is an important step in clothing design, particularly Eco-friendly

clothing (Jin Gam et al., 2009). Therefore, LaBat and Sokolowski (1999) stated that the creative exploration process in the clothing design requires designers that can generate as many preliminary ideas as possible and imposing limitations on the design refinement toward sustainability (Jin Gam et al., 2009).

- **Phase Three: Design Criteria**

Once designers are aware of the needs and desires of an individual, they have the means to establish design criteria for the specific design problem which they face. Hence, according to Kjaerheim (2013) and LaBat and Sokolowski (1999), after selected the best idea, the discovery of design criteria can be formed. So, the designer sets further priorities to the selective idea such as quality, cost, style, and sustainability specifications. Hence, designs are created in the preliminary idea stage are modified or further developed based on the design criteria in this step (Jin Gam et al., 2009).

Therefore, consideration of the design criteria is one of the critical steps in Eco-fashion design (Kjaerheim, 2013) due to it offers the opportunity to resolve some conflicts before samples are made which may have cost implications (LaBat & Sokolowski, 1999). Functional, expressive, and aesthetic factors with consideration consumer's need are basic design criteria in the fashion and apparel design (Lamb & Kallal, 1992). However, according to LaBat and Sokolowski (1999) and Jin Gam et al. (2009) focus on only functionality, aesthetics and economic gains, may lead to leaving out the designer's role towards sustainability. Lamb and Kallal (1992) and Howarth and Hadfield (2006) stated that designers become aware of the consumer's concerns involved with products.

A previous study by Gam and Banning (2011) claimed criteria of sustainability are related to the selection and use of the sustainable materials such as organic, renewable fibre

and natural dyes, as well as consideration of renewable energy and the recycling of materials linked to the cradle to cradle concept (McDonough & Braungart, 2002). Therefore, to achieve sustainable development in the fashion and apparel design, environmental effects need to be understood and environmental consciousness integrated into the design by designers (Holdway et al., 2002). Indeed, sustainable development concepts in the clothing and other product design allow designers to rethink "how they design, what they produce, how they use materials and resources, and what processes they implement in a way that is equally beneficial to the environment and its inhabitants" (Young et al., 2004).

According to Howarth and Hadfield (2006), the designer should define the use and disposal of clothes and chooses the raw materials which have the least environmental damages when issuing the design criteria. Moreover, Kjaerheim (2013) believed that within this stages, the specifications of a design are decided upon, concepts created, functions determined and audience targeted. Therefore, the sustainability criterion should be developed based upon other sustainable design tools, processes and own experiences working with designers (Kjaerheim, 2013).

- **Phase Four: Design Product**

Gam and Banning (2011) stated that after issued the criteria, a sample making step can help companies to assess the design before investing money and time into the mass production. Therefore, designers and manufacturers determine chemical ingredients and test based on the chemical assessment protocol procedure regarding the concept of the cradle to cradle, where the viability of materials should be biological or technical nutrients (McDonough & Braungart, 2002). According to McDonough and Braungart (2002), the biological nutrient is a material which can be composted returning nutrients to the earth. On

the other side, the technical nutrient inside the artificial material can be recycled into a new product of the same quality level as the original. Moreover, Kroll and Director (2004) emphasised that making functional prototypes can lead to a review of the detail design and test phases into repetitions before investment to the mass-production.

According to Jin Gam et al. (2009), designers are the decision-makers in each step production process and also the cradle to cradle concept (McDonough & Braungart, 2002) indicates the designer's role in achieving sustainability. Irick (2013) reported that garments could be disposed of responsibly by the consumer, reclaimed or returned to the manufacturer for recycling, following the release of Eco-fashion style information.

- **Phase Five: Product Evaluation**

Lamb and Kallal (1992) emphasised that evaluation is necessary after making prototypes, where the Eco-friendly clothing is assessed according to the objectives determined in the problem identification stage. If the evaluation shows that the selected solution is not strong, the whole process or part of the process may be repeated (Koberg & Bagnall, 1972).

Constant evaluation of the quality and design is an essential part of the Eco-fashion design process (Kjaerheim, 2013). In particular, the quality and design evaluation consist of the clothing quality of the design, functionality, appearance, detail design and quality of the material (Jin Gam et al., 2009). Irick (2013) and Bailey (1999) believed that the designers who referenced the themes of quality, uniqueness and cost took into the choosing Eco-friendly materials, therefore their evaluation of clothes when setting a price goes into the quality and design.

- **Phase Six: Product Development**

According to Regan et al. (1998), after evaluation of the Eco-fashion clothing, there is an opportunity for additional modifications or, perhaps, a clothing style will be eliminated from the collection in development prototype. Therefore, the next part of the process is development. Design outputs are developed to determine the relatedness of the design (Jin Gam et al., 2009). Eco-fashion clothing standards can be evaluated and modifications applied (Lamb & Kallal, 1992). According to Kozlowski et al. (2012), designers should address phases such as a disposal, apparel construction, and consumer use as design conceptualization acts.

- **Phase Seven: Implementation**

The final stage of Eco-fashion design process is implementation. This stage may not occur until the design is modified or re-modified to a refined stage and then it is executed on a mass or limited scale (Cao et al., 2006; Jin Gam et al., 2009). According to LaBat and Sokolowski (1999) and Lamb and Kallal (1992), all of the stages in the apparel design process are interrelated toward implementation, though designers may not be aware of the stages followed in the design process, they are encountered even if it is subconsciously. Based on the review of literature, a schematic of the Eco-fashion and apparel design process with focusing on sustainability is illustrated by the researcher (Figure 2.5).

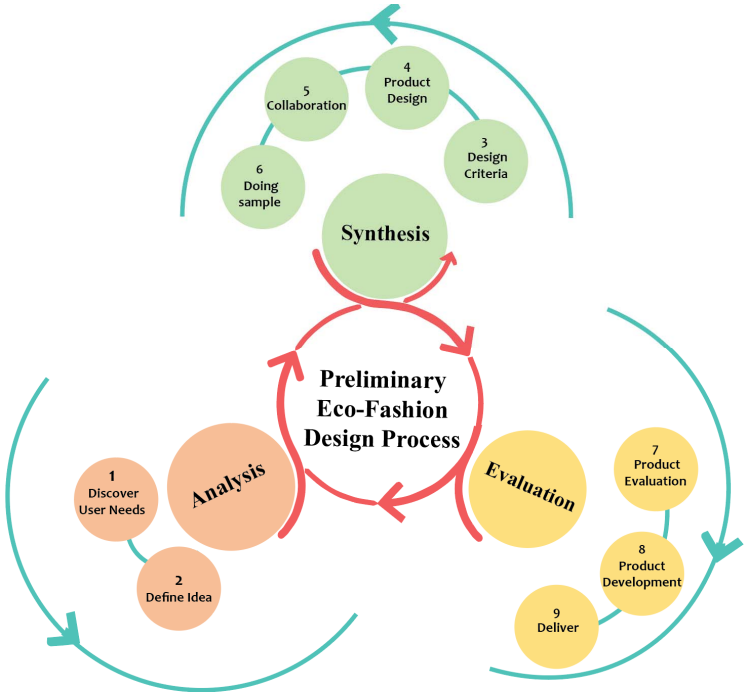



**Figure 2.5:** Proposed Schematic of the Preliminary Eco-Fashion Design Process

Table 2.1 shows the steps of the preliminary Eco-fashion design process model with detail and supporting literature. Henceforth, designers are the centre of the Eco-fashion design process model that can control all the steps.

However, Kozlowski et al. (2018) stated that most of the fashion and apparel designers are not aware of Eco-fashion and apparel models mentioned before. However, there is a lack of knowledge among designers where Eco-fashion, apparel models, and sustainable techniques can be useful and applicable (Kjaerheim, 2013; Kozlowski et al., 2019). Any sustainable tool and technique created to encourage sustainability must allow designers to quickly understand and get updated with news on sustainability practises and related factors toward applying on their design works (Kjaerheim, 2013).

**Table 2.1:** The Explanation of Steps in the Preliminary Eco-Fashion Design Process

| Steps | | Specification | Research Resources | Description |
|---|---|---|---|---|
| Step One: Problem Definition & Research (LaBat & Sokolowski, 1999) | Define User Needs | Problem Identification | (Jin Gam et al., 2009; Lamb & Kallal, 1992; Orlando, 1979; Regan et al., 1998) | Designers can decide to develop a problem statement. They need to know the consumer/user's demand regarding functional, aesthetical, and economic issues, as well as the market needs. Therefore, mapping research to focus on these needs and generating ideas are necessary. Hence, a designer can create meaning or concept into a design. In this way, the sources of inspiration are the motivations that help to generate useful ideas toward sustainability. |
| | | Analyse Definition | (Watkins, 1988) | |
| | | Search for Alternative | (Regan et al., 1998) | |
| | Define Idea | Generation a concept | (Lamb & Kallal, 1992; Watkins, 1988) (Pahl & Beitz, 1984) | |
| | | Select Definitive Idea | (Jin Gam et al., 2009; Pahl & Beitz, 1984; Watkins, 1988) | |
| Step Two: Creative Exploration | Design Criteria | Design Criteria | (Jin Gam et al., 2009; Kjaerheim, 2013; Lamb & Kallal, 1992) | Designers develop design criteria, drawing sketches and detail design based on the concept of cradle to cradle protocol which is |

**Table 2.1** continued

| | | | | |
|---|---|---|---|---|
| Step Two: Creative Exploration (LaBat & Sokolowski, 1999) | Product Design | Conceptual Design | (French et al., 1985; Kjaerheim, 2013; Pahl & Beitz, 1984) | everything comes back to nature. Thus, materials are selected to support protecting the environment. Designers can collaborate with other companies to choose the material based on the environmentally subject. After choosing materials, the sample making can help designers and manufacturers to evaluate it. |
| | | Embodiment Design | (French et al., 1985; Pahl & Beitz, 1984) | |
| | Collaboration | Collaboration | (Jin Gam et al., 2009) | |
| Step Three: Implementation (LaBat & Sokolowski, 1999) | Evaluation | Cost& design Estimation Market research | (Jin Gam et al., 2009; Lamb & Kallal, 1992; Orlando, 1979; Regan et al., 1998) | Designers consider the produce novel approaches to developing a design solution with supporting design refinement. In this step, design needs are weighed and ranked according to their importance in establishing priorities. |
| | Development | Prototype Development | (Jin Gam et al., 2009; Lamb & Kallal, 1992; Orlando, 1979) | |
| | Deliver | Implement | (Lamb & Kallal, 1992; Watkins, 1988) | |

Additionally, Lindahl (2006) and Gehin et al. (2008) stated that fashion and apparel designers need simple and related methods that easy to adopt and can be applied to their skills to make aesthetic styles. Moreover, Hur and Cassidy (2019) emphasised that the lack of consideration to criteria such as aesthetic styles and fashion trends in Eco-fashion design is identified as one of the most barriers in implementing of sustainability in fashion and apparel industry. Furthermore, Watkins (1988) suggested that applying more knowledge and related factors into the framework of the Eco-fashion design process is valuable. Hence, techniques in Eco-fashion design models, as well as structures of sustainability can help designers to find a solution (Curwen et al., 2013). Moreover, if the practice of the mass clothing market toward sustainability is to become more common, putting on knowledge and design techniques in the Eco-fashion and apparel design model production will be needed in the large-scale (Payne, 2011). According to Broega et al. (2012), the Eco-fashion design is responsible for maximising the value of a piece of clothing in the search for minimising its environmental and socio-economic impacts.

Therefore, the main steps in the Eco-fashion design process are shown in Figure 2.6 based on the previous researches. Hence, the Eco-fashion design process model is developed in detail with consideration of environmental features by the researcher that the three main phases are adopted from LaBat and Sokolowski (1999) and Jin Gam et al. (2009); problem definition and research, creative exploration and implementation. Indeed, the Eco-fashion design process model is developed based on the concept of C2CAD model (Jin Gam et al., 2009). Taking on the essential principle of the C2CAD model, environmental aspects are considered in the design process to make decisions. By using this model, three sustainability pillars (society, economic and environment) are addressed during the clothing design process.

On the other hand, many sustainable fashion and apparel designers have a financial barrier, and while assessment tools in the sustainable model may consider only large enterprises. On top of that, using cradle to cradle assessment tool in C2CAD model may lead to requiring training or learning for use. It does not therefore explicitly link and speak to designers and may be challenging to use and frustrating (Kozlowski et al., 2019) as cited as being too technical and scientific. Therefore, focus on the "Design phase/Design technique" in developed Eco-fashion design model is valuable rather than material assessment tools as the designer's perspective. Also, the previous studies showed that factors on Eco-fashion design are a notable subject, especially in the design phase.

Nevertheless, from the point of view of a designer, it means that the product interacts with the environment in material production, manufacture, transportation, packaging, use, and disposal would seek. It means that one of the related factors and essential tool of the Eco-fashion design is related to the investigation of the clothing life cycle (Fletcher, 2008). Hence, the investigation of the phases involved in the clothing life cycle needs more consideration into the enhancement of sustainability (Kozlowski et al., 2018).

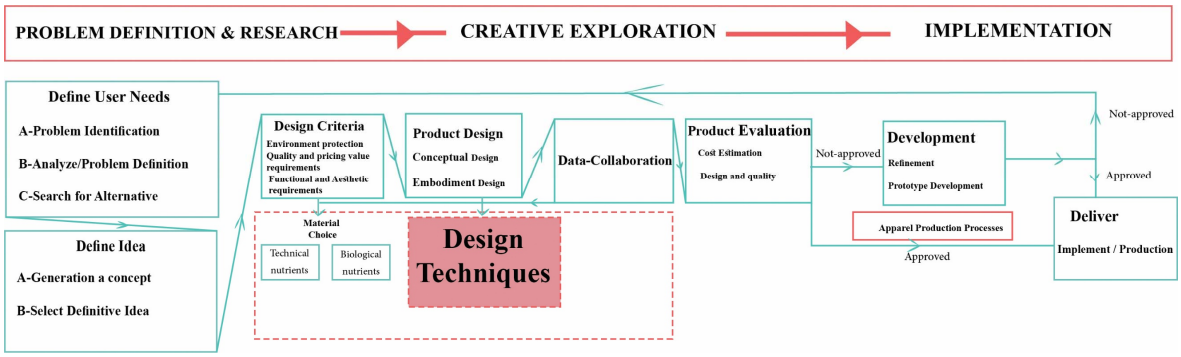



**Figure 2.6:** Proposed Eco-Fashion Design Process Model

## 2.3 Clothing Life cycle

In the mass market, the clothing life cycle begins in the design room and ends on the retail floor (Payne, 2011). According to Muthu (2015), the life cycle of clothing is a concept. This concept is included the clothing's impact on the environment during all usage of clothing, from the manufacturing process until disposal of the clothing. In another expression, the series of changes in the lifespan an item of clothing through from the beginning of life until death can be named as "clothing life cycle".

By analysing the life cycle in clothing can utilise the philosophy of Cradle to Cradle (C2C) (McDonough & Braungart, 2002). McDonough and Braungart (2002) claimed that most of the products are designed based on the one-way that the life of the products is no longer considered after use. It means cradle to the grave which increases waste. Hence, following the C2C concept, designers can choose materials made of biological nutrients or technical nutrients that are recyclable after use. Therefore, they can be composted or recycled for further purposes (McDonough & Braungart, 2002).

According to Braungart et al. (2007), this concept focuses on the whole life cycle of products and provides a functional design framework for creating products with consideration ecological health and long-term economic growth in industrial systems. Based on the study by Rodriguez et al. (2002) and Loker (2008), five steps in the clothing life cycle is controlled by fashion and apparel designers shown in Figure 2.7. Moreover, Koo et al. (2014) stated that designers are at the centre of the design process, therefore, designers need to consider all phases during the design process.

This model considers all three pillars sustainability: social, economic, and environmental. The first phase is a material selection which can support sustainable methods

such as using Eco-fashion and high-tech materials. The second phase is clothing manufacture and design process through choosing sustainable design techniques such as zero-waste design to reach this goal. In the third phase, all activities are related to packaging, distribution, transportation, and retail. The fourth phase is named as consumer use phase. It is about the consumer's behaviour concerning sustainable activities regarding increasing clothing lifespan. Finally, the end of life is the last stage in the clothing life cycle model.

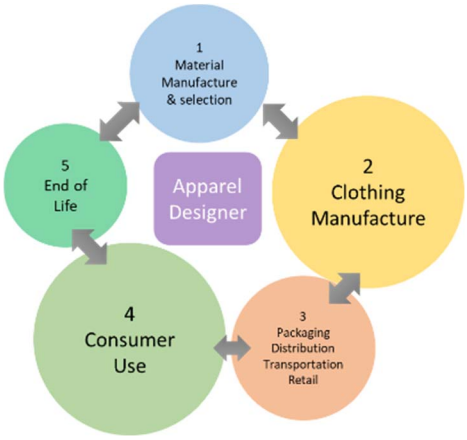



**Figure 2.7:** Clothing Life Cycle Model Rodriguez et al. (2002) and Loker (2008)

In addition, the role of fashion and apparel designer to create a prolific product and encourage sustainable innovations by respecting the environment is a noticeable subject (Koo, 2012). According to Howarth and Hadfield (2006), a designer should define the use and disposal of products and clearly chooses the appropriate materials with minimal environmental pollution. Also, designers are able to create a significant relationship between the production phase and the consumer's need to promote consumer's behaviour toward sustainability (Loker, 2008). The designer does not need to discuss the life cycle linearly from raw materials to disposal. Kozlowski et al. (2018) claimed that designers should address phases which consumers are involved in this design conceptualization.

Additionally, McDonough and Braungart (2013) emphasised that consumers are able to change living standards with a shift in decision-making toward more sustainable attitudes. Thus, designers need to consider consumer's behaviour as a successful key in sustainability issues in society. Koo et al. (2014) illustrated the transformable clothing life cycle as a named consumer and transformable garment circulation (CTGC) model (Figure 2.8). It is highlighted that there is not an understandable connection between the stages of the clothing life cycle which is solved by findings of this study. Hence, CTGC model is accepted to develop a conceptual model based on the phases in clothing life cycle in this study.

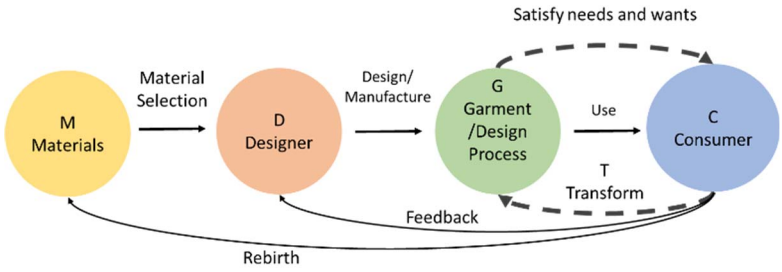



**Figure 2.8:** The CTGC Model (Koo et al., 2014)

Indeed, the clothing life cycle can be found in the relationship between materials, designers, design, and consumer concerning support three pillars of sustainability. Following this framework, these four principles in the Eco-fashion design are discussed below: (1) material, (2) designer, (3) design process and (4) consumer and their relationship.

### 2.3.1 Material Phase in Life Cycle of Eco-Fashion Clothing

According to Curwen et al. (2013), the selection of materials is a paramount phase in the clothing life cycle, as well as sustainable product design. Also, Kozlowski et al. (2018) stated that the majority of the fashion and apparel designers stress to find sourcing sustainable materials, especially in locating and obtaining information. All materials in

sustainable product design will need to meet the criteria to be recycled (McDonough & Braungart, 2002; Rumsey, 2009).

As mentioned, according to McDonough and Braungart (2002), sustainable materials are defined as either biological nutrients or technical nutrients. Moreover, Ramirez (2014) investigated that material sourcing is also another term that had a similar division. According to Ramirez (2014), the first one of material sourcing refers to the use of more sustainable and socially responsible materials which includes Eco-friendly, natural, renewable, second-hand, fair trade, low impact, and reduced-impact materials on the environment.

The second one of material sourcing refers to the use of recycled, reusable, and re-designable materials in the designing of the clothes. Likewise, McDonough and Braungart (2002) claimed that manufacturers test the products as biological or technological nutrients based on their viability. As mentioned before in the recycling process, the technical nutrients can be developed into yarns, fabrics and eventually become clothes. Consumers can wear, then after a while, because they are made of synthetic fibres can be broken down to be recycled again. Hence, maintain their usefulness in a closed-loop (McDonough & Braungart, 2002; Nederlof & Frijns, 2010).

According to McDonough and Braungart (2002), the biological nutrients are environmentally composted material or substance which can be composted returning to nature without destroying the environment. Another point is the organic material must have nothing negative affecting the natural environment once the organic materials are used (Jin Gam et al., 2009; Lange, 2002). In order to keep the organic state, the procedure for making organic fibres into end products should not allow the use of material that is negative for the environment (McDonough & Braungart, 2002).

One of the ways to achieve sustainability is using Eco-fashion materials in fashion and apparel design which is become very popular. Eco-fashion materials are made of organic, recyclable and renewable materials (Aaijaz & Ibrahim, 2010). According to Joergens (2006), Eco-fashion clothes are defined as any type of clothes designed with Eco-fashion materials to minimise environmental effects toward improving consumer's profits and the community's health.

Most studies are investigated cotton, polyester and recycled polyester as Eco-fashion materials for reusing and the recycling purposes (Sandin & Peters, 2018). Indeed, Eco-fashion materials, especially recycled contents are a win-win: they help to stop waste to landfill and a reduction in virgin raw material, chemicals, energy, and water consumption (Joergens, 2006). However, in the clothing recycling process, the blend of two different materials in the fibre's construction is a major problem. Almost 80% of all clothing and textiles are made of blended cotton and polyester fibres. Hence, this can be one of the main reasons for not paying attention to recycling programmes (Jin Gam et al., 2009).

The principles of Eco-fashion design are well researched. Additionally, material innovations and technological development are provided with a new concept regarding Eco-fashion material and clothing design (Scaturro, 2008). According to Braudel (1981), technology is indeed a queen: it does change the world. Using technology in the process is noted to be particularly important for textile, fashion and apparel development in the industry (Ma et al., 2017). Indeed, the role of technology in the Eco-fashion design is divided into two main areas: the improvement of materials in Eco-fashion clothing design and the digital domain (Scaturro, 2008).

Hence, recently H&M Foundation in collaborated with the Hong Kong Research Institute of Textiles and Apparel (HKRITA) found a chemical process that can separate cotton and polyester contents in fibres through the hydrothermal process. In addition, new technology is introduced by Worn Again Technologies (2017) that it can separate and extract polyester polymers (from polyester) and cellulose (from cotton) from waste textiles to go back into new fibres and fabrics, as well as save energy.

Therefore, in Eco-fashion design subject, the designer's team must have strong knowledge about new technology to develop a design solution that meets all the specifications required in the sustainable design (Cunha & Broega, 2009). Curiosity and the desire to avoid the impacts of producing cotton and current synthetics drive the development of new fibres (Negishi et al., 2012). Table 2.2 shows the summary of the Eco-fashion materials made by applying new technologies that are being referred to below.

**Table 2.2:** Eco-Fashion (Especially Recycled) Fabric Types in Eco-Fashion Design

| **Fabric Types** | | **Source** | **Usage** | **Advantage** | **Resources** |
|---|---|---|---|---|---|
| Synthetic | Recycled Polyester | Made of Oil-Based Waste: Pet Plastic Bottles, Plastic Bags, Shampoo Bottles, and Plastic Containers | Sportswear, workwear, outdoor wear, and jackets | -Preventing plastic waste.<br>-75% lower carbon footprint, 90% less water and 70% less energy than virgin fibre production | (Payne, 2011; Yuksekkaya et al., 2016) |

**Table 2.2** continued

| | | | | | |
|---|---|---|---|---|---|
| Synthetic | Recycled Polyamide; ECONYL® | Made of Oil-Based Waste, such as Old Fishing Nets and Carpets. | Wedding dress, underwear, and tights, but also outerwear | -Saving natural resources<br>-Reduce what ends up in landfills | (Gould, 2017; Shen, 2014) |
| | Recycled Glass | Made of unused Glass | Beads used for embellishments for clothes and accessories | -Saving natural resources such as sand or limestone. | (Payne, 2011) |
| | ECONYL® | Recycled Nylon Fiber made of items like Fishnets. | Wedding dress | -Reduction of negative impacts<br>- Save energy | (Gould, 2017; Shen, 2014) |
| | Recycled Silver | All Industrial Scrap and Old Silver Products- such as Candle Holders, Coins, and Scrap Jewellery | Wedding dress | -Reduction of negative impacts<br>-Save energy | (Shen, 2014) |

**Table 2.2** continued

| | | | | | |
|---|---|---|---|---|---|
| Organic | Recycled Cotton | Old Cotton Garments and Cotton Fabric Leftovers | Fashion and home products where the strength of the fabric is less. | -Saving on raw materials<br>-Stop old clothes from going to waste | (Shen, 2014; Vadicherla & Saravanan, 2014) |
| | Lyocell | Made of Wood Pulp into Cellulosic Fibers. | Sports and casual wear, better feel and drape features compare to viscose rayon. | -Little or no irrigation or pesticides | (Gould, 2017; Shen, 2014) |
| | Recycled Wool and Cashmere | The Waste or Cut-Offs created during production | Knitted sweaters, hats, gloves, and scarves. | -Saving raw materials.<br>-Reduce what ends up in landfills. | (Davaadorj et al., 2016; Leonas, 2017; Russell et al., 2016) |
| | Qmilk | Made of Waste Milk by German Qmilch company | Fashion clothes | -Being compostable and hypoallergenic | (Negishi et al., 2012) |
| | Re: Newcell | Viscose Fiber Made of Re: Newcell Pulp Recycled Cellulosic | Dresses, t-shirt, children's pyjamas, and scarf | -Reduction of negative impacts<br>-Save energy | KTH, The Royal Institute of Technology |

### 2.3.2 Designer Phase in Life Cycle of Eco-Fashion Clothing

As discussed in previous literature, designers play a significant role in forming of the clothing life cycle toward sustainability. Designers have the opportunity to growth Eco-friendly issues in all phase of the clothing life cycle during the design process (Fletcher & Grose, 2012). Papanek and Fuller (1972) showed that in mass production, designers have become the most powerful creator for Eco-friendly products. In addition, the role of the designer is not only creating clothes (Kozlowski et al., 2019); most of the fashion and apparel designers often fulfil multiple roles (Kozlowski et al., 2018).

According to Cuc and Vidovic (2011), fashion and apparel designers should be aware and use the following; the extensive use of natural environmental protection fabrics, low-impact dyes, and recycled fabric to design, through the creative design concept of clothing guide consumers to improve their understanding of Eco-fashion clothes, use from old clothes for new work to reduce the waste of resources, and design for zero waste.

Moreover, fashion designers are encouraged to practise and design by Eco-fashion materials such as recycled components or re-use of post-consumer products (Unruh, 2010). However, Niinimäki (2009) stated that the attributes considered by the designer to use Eco-fashion materials are quality (durable materials and high manufacturing quality), functionality (suitability in use and satisfying use experience), and aesthetic attributes (beauty, style, colour, and comfortable materials). Indeed, they should design and assist in the production of clothing, shoes and accessories, identify trends and selects styles, fabrics, colours, prints and trims for a collection.

Hence, understanding of designer's behaviour toward sustainability issue and Eco-fashion design is a notable issue (Li et al., 2015).

#### 2.3.2.1 Designer's Behaviour

Some studies have focused on the predictors of the individual's behaviour to products in general and Eco-fashion clothes in particular (Åkermark, 2003; Jimenez, 2016; Zheng & Chi, 2015). However, a few research and private data sources have shown studies of designer's behaviour toward Eco-fashion product design.

These studies have found that physiological factors have a significant association with the designer's attitude (Haug, 2017; Lawson, 2006; Li et al., 2015; Murtagh et al., 2016; Payne, 2011). Several authors have sought to investigate the various designer's behaviour related to Eco-fashion design (Murtagh et al., 2016) that showed attitudes are important in this case. Such research found a positive relationship between the designer's attitude and designer's waste minimisation behaviour (Lawson, 2006) which most of them were women with a higher level of education (Payne, 2011).

In addition, direct instruction can influence attitude formation. The Centre for Sustainable Fashion (2008) found that although fashion and apparel designers are becoming more aware of designing sustainable clothing products, they are still the lack of knowledge issues related to sustainable design.

Hence, one of the major barriers which not persuade designers toward sustainability is the lack of environmental knowledge (Moon et al., 2015). Ramsey and Rickson (1976) stated that increase of knowledge about environmental threats leads to improve attitude for helping the environmental protection.

Environmental knowledge provides general knowledge of how materials interact with the environment and people, thus it may develop sustainability issues (Ohtomo & Hirose, 2007). In addition, to achieve sustainable development, designers need to be aware

of environmental impacts. It leads to the design by focusing on environmental protection (Holdway et al., 2002).

Gam and Banning (2011) reported that the lack of environmental knowledge among designers served as psychological barriers in their attitudes to accept Eco-fashion design. Furthermore, attitudes are formed by perception, therefore, the perceived quality, as well as the price of sustainable products, can lead to judge and acceptance about the superiority of an attitude toward a product (Zeithaml, 1988).

Perceived price and quality are not the real monetary price and quality of the product. These factors originate through subjective perceptions. When individuals compare products, the perceived price and quality help them to identify the price of the product is fair or the product's quality is acceptable (Cheng Ping, 2017).

Besides, a common attitude regarding the appearance of Eco-fashion reports visibility of the Eco-values in the Eco-fashion clothes (Wagner, Curteza, et al., 2018), as known as the aesthetics of the Eco-values. Aesthetics is a style and 'taste' scientific analysis.

Hence, the perceived functional and aesthetic features of Eco-fashion materials can encourage attitudes of both designers and consumers to design and accept Eco-fashion clothes, respectively (Jin Gam, 2011; Joergens, 2006). Furthermore, Ma et al. (2017) showed that there is a relationship between the perceived ease of use and usefulness of technology with the attitudes toward the Eco-fashion design. The initial review of the relevant literature shows a good understanding of psychological variables which can predict the designer's perception in the study scenario.

In order to explore fundamental preconditions for the use of Eco-fashion materials in the designer's decision making, the theory of reasoned action (TRA) developed by Fishbein and Ajzen (1975) is employed as a framework.

TRA provides a theoretical foundation for understanding the designer's attitude and subjective norm which are important predictors of behaviour (Fishbein & Ajzen, 1975). Therefore, it is a plausible explanation of the designer's behaviour toward Eco-fashion design based on TRA.

The TRA is successfully applied in the various domains of Eco-friendly behaviour such as sustainable apparel consumption behaviour (Zheng & Chi, 2015), green purchasing behaviour (Jaiswal & Kant, 2018) and designer's behaviour toward sustainability (Li et al., 2015). According to Han et al. (2015), designers have a highly centralised role within a sustainable design technique organisation. Indeed, they manage all duties from the sourcing, design, and production to promotion and retail, indirectly.

### 2.3.3 Design Technique Phase in Life Cycle of Eco-Fashion Clothing

According to Hanks et al. (1977), the design technique is a phase of creating a border around a problem, reducing external variables and finding the best solution. The design process in clothing and apparel includes all facts of the process undertaken in the progress of collecting, creating and marketing fashion (Bye, 2010). Fletcher (2008) stated that an essential tool in the design of Eco-fashion is related to the clothing life cycle.

Moreover, Kozlowski et al. (2018) stated that using a flexible design framework can challenge the fashion designer to involve sustainable development into the design process. Sometimes, fashion offers opportunities to apply sustainable practices (Hethorn &

Ulasewicz, 2008) and designers are also keen on implementation them to create more sustainable clothing.

Besides, the design technique phase is the related tools into environmental and social consequences of fashion products (Fletcher, 2013; Manzini & Vezzoli, 2002; Niinimäki & Hassi, 2011). According to de Macedo Guimarães (2012), a structured method of ideas for sustainable development should happen during design activity, particularly during the preparation process and the product concept. Therefore, related techniques in the development of Eco-fashion design and offer to the designers leads to more sustainable products.

Researchers suggested several ways to expand the clothing's lifespan such as reusing and recycling toward sustainability (Allwood et al., 2015; Fletcher, 2008; Gwilt & Rissanen, 2012; McQuillan, 2011). Henceforth, some of the design technique during the end of clothing lifespan are discussed below.

#### 2.3.3.1 Design Technique During End of Clothing Lifespan

There are several ways called the Eco-efficiency approach (Fletcher, 2008) to improve value from waste toward wearing products such as reuse, recycle, upcycle, redesign and remanufacture (Govindan et al., 2015; Wang & Hsu, 2010). From this process, the waste clothes will go back into the industrial process. Woolridge et al. (2006) claimed that recycling or using donated and second-hand clothing are resulted in decreasing the environmental problems compared to purchasing new clothing made from virgin materials. The summary of these Eco-efficiency techniques for the end of clothing lifespan based on the previous studies shows in Figure 2.9.




**Figure 2.9:** Eco-Efficiency Techniques for the End of Clothing Life

As seen in Table 2.3, Eco-efficiency techniques by previous researchers, showed that upcycling and recycling process have profits for the environment and society. With accordance to Manik (2017), recycling refers to convert waste into reusable material. In the recycling phase process, waste is transformed into reusable and new materials. LifeLine Clothing is a local textile recycling company (Malaysia) that collects and supplies excess or used textiles from Malaysia and overseas and has a different plan for collection items (Figure 2.10). These three categories represent the most conditions that goods have when receiving:

i. Good condition items are sorted then exported to developing countries in Africa and the Pacific nations, where they are sold at retail outlets as second-hand clothing.
ii. Unwearable items are cut up into rags for selling to industries as cleaning cloth.
iii. Too damaged items are sent to the different factory to break down into fibres for blankets or converted into biofuel to power industrial boilers and generators.

**Table 2.3:** Eco-Efficiency Techniques for the End of Clothing Lifespan

| | | Define | Advantage | Source |
|---|---|---|---|---|
| Up-cycling | Reuse | It is when a good quality fabric or clothing in good condition which can be reused as a new purpose or usable material. | - Resource recovery at minimum cost and energy consumption.<br>- The number of times a garment is worn doubled on average, it would reduce by five per cent carbon and waste generation.<br>- Using less energy than down-recycling. | (Cassidy & Han, 2017; Pal, 2016; Wang & Hsu, 2010) |
| | Redesign | It is a process of designer clothes with a new look from worn garments toward improving functionality or aesthetic value. This process starts with deconstructing garments and then reconstructing into new designs. It includes five techniques: | - Provides opportunities for further training in the fashion industry.<br>- New looks and higher aesthetic value.<br>- Combination of traditional craftsmanship and technology.<br>- Increase the economic benefits for garment enterprises.<br>- The ecological perspective with reducing the waste of resources.<br>- Solve the problem of clothing inventory backlog. | (Brown, 2010; Dervojeda et al., 2014; Fraser, 2015; Manik, 2017; Pal, 2016) |

**Table 2.3** continued

| | | | | |
|---|---|---|---|---|
| Up-cycling | Redesign | Addition: Using fabric printing, embroidery, dyeing, hand-painted, bronzing, coating to add the fabrics.<br>Subtraction: With some techniques such as tearing, hollow and fray, to remove and destruct parts of the materials and fabrics.<br>Deformation: Make the fabric shapes and forms change with using crease, shrink seam, pleat seam, tie knots and winding.<br>Splicing: Different fabrics are cut into various shapes, and then putting them together again will produce unexpected results.<br>Combination: Using the different fabrics through the patchwork, sewing hook, weaving, stacking, stuffing, and other methods. | | |
| Down-cycling | Recycle | The process of transforming the relatively less-valued material into a material of higher value (synthetic fibre) is defined as recycling. It is a process of making new fabrics from waste made of poor-quality garments (shabby, pilled, matted, faded, holey, torn and stained). | - Save the cost of manufacturing products.<br>- Creation jobs to lower economic groups.<br>- Recycled polyester fibre is the same quality as the original with low price.<br>- To provide good quality recycled cotton, blending recycled cotton with polyester to be 30 – 40% cheaper than virgin fabric.<br>- Reduces the number of pesticides used in growing cotton and greenhouse gases released into the environment. | (Bhatia et al., 2014; Fraser, 2015; Pol, 2010) |

Besides, they collaborate with companies, local councils, and charity organisations by providing the logistics and infrastructure for their textile recycling programmes, as well as to conduct awareness programmes on environmental and recycling issues. For example, Kloth Malaysia Sdn. Bhd. Malaysia is a social entrepreneurship movement launched in 2016 to keep fabrics out of landfills. Particularly, Figure 2.10 illustrates the journey of the clothing waste when they are sending on the textile and clothing recycling bin to make a new product from them (chemical processing). Figure 2.11 shows the ways to dispose of unwanted clothing (clothing waste).

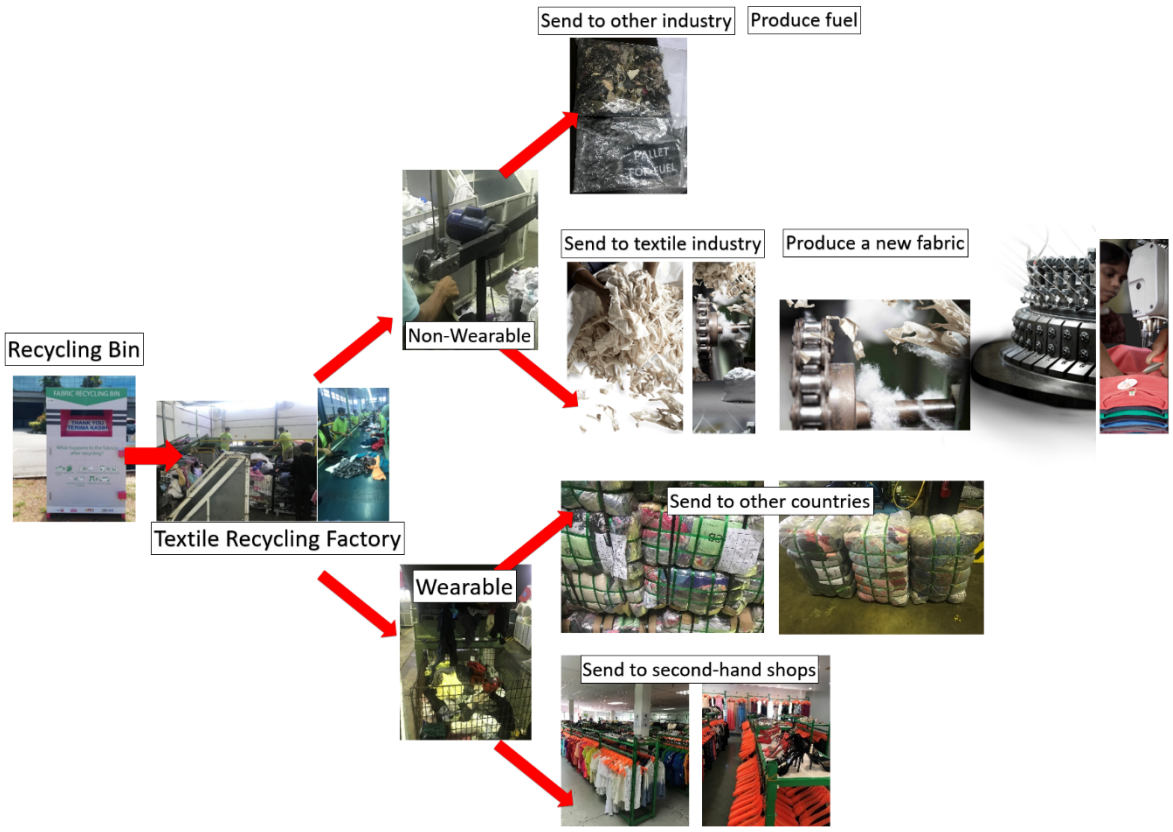



**Figure 2.10:** Production Process of Converting Unwanted Clothing to a New Product

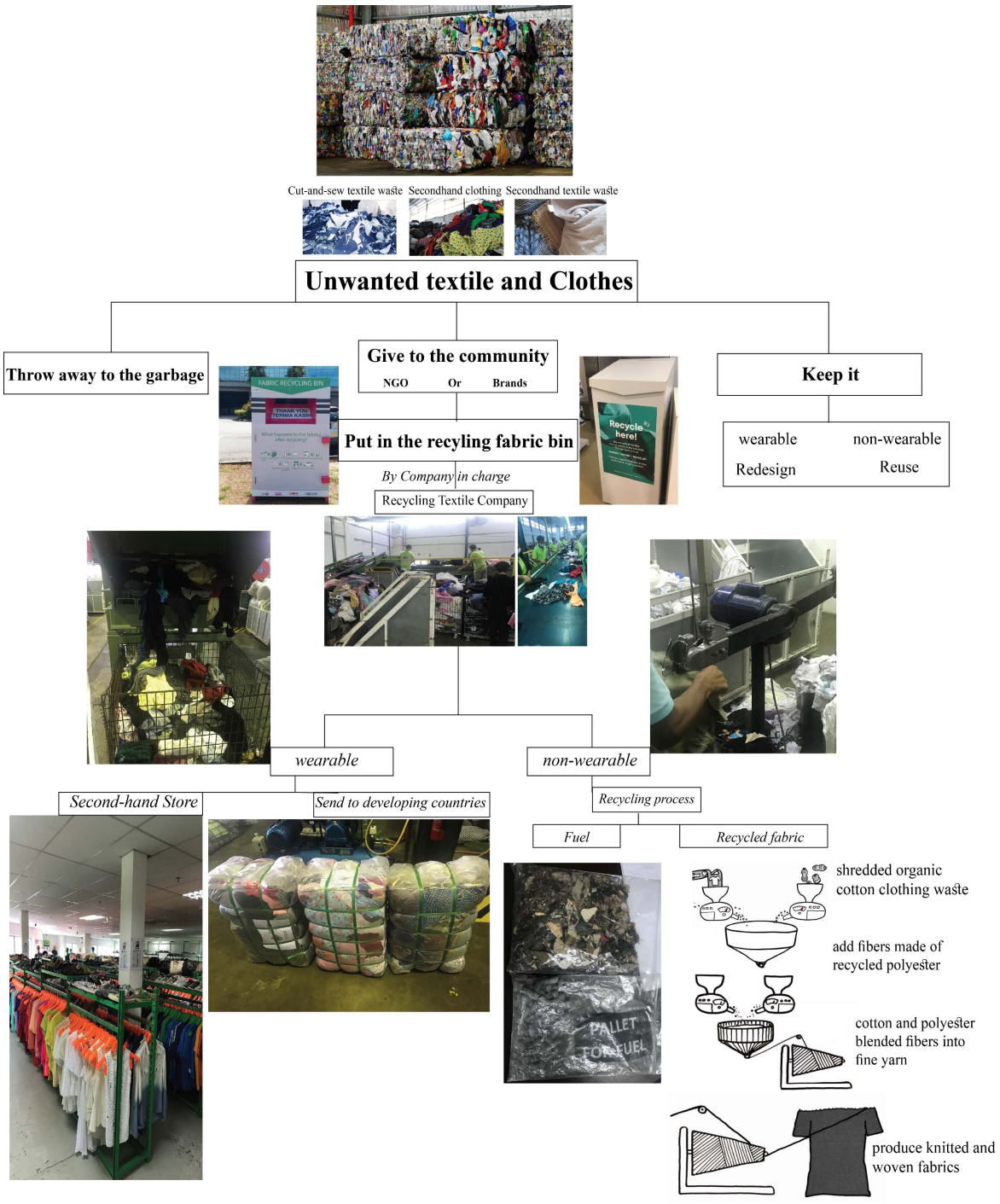



**Figure 2.11:** Workflow of Disposing Unwanted Clothing

#### 2.3.3.2 Development of Sustainable Technique in the Clothing Design Process

As mentioned, development in Eco design allows designers to think about the design process and choose the best way to economic benefits in the environment during the design phase. It can help designers to rethink about how they design, what they produce, how they use materials and resources, and what processes they choose (Young et al., 2004).

Regarding promote Eco-fashion design and reduce the waste, designers are thinking to new design concepts such as zero waste designs (McQuillan, 2011; Rissanen, 2008), design for disassembly (Jin Gam et al., 2011) and transformable designs (Fletcher, 2008) which are discussed below.

Besides, the use of technology in the design phase improves sustainability (Sinclair, 2014). Following Poyner and Simon (1995), computer tools can assist designers in the varying and complex responsibilities involved in the detailed design of products. It is a development idea as a tool for analysing certain aspects of product design and advising on environmental improvements.

There is several 3D design software in which patterns of clothing can be imported and virtually stitched. Then, a simulation of making clothes on a body called an avatar is represented (Gobble, 2012). Besides, to save money and time, one of the advantages of these tools is a better understanding of the product rather than with 2D drawing.

Ramirez (2014) proved that using CAD programmes in fashion and apparel design would reduce the waste created when producing prototypes. Moreover, Gupta (2011) said that the designers should shift from conventional 2D modelling to 3D with the developing of materials into clothing production systems. The production of Eco-fashion clothing will be made in an effort toward sustainability in mass production. Thus, all patterns of clothes

can be designed by utilising CAD which is a necessary step for any product to be produced on a large scale (Dāboliņa & Viļumsone, 2012).

- **Zero Waste Technique for The Pattern-Making Process (Jigsaw Puzzle)**

In the Eco-fashion design process and production, reducing fabric waste is one of the main challenges toward sustainability (Rissanen, 2013). The pattern-making process becomes an essential trend of the fashion design process to create sustainable clothes (McQuillan, 2011). Hence, to reduce fabric waste, some techniques in the pattern-making process is known as named zero fabric waste design. Zero fabric waste design is a technique based on re-patterning implemented during the pattern-making process in clothing production (Rissanen, 2008).

The zero-fabric waste pattern-making process is started by the size of the fabric since in this technique the whole of the fabric will be used. Accordance with Kälkäjä (2016), designers can limit a variety of challenges to the product and increase the sustainability of their designs. As noted by Rissanen and McQuillan (2016) in the book "Zero Waste Fashion Design", there are several ways to approach the aim of zero-waste clothing design through pattern making. Additionally, McQuillan (2011) showed approaches for the zero waste as following; tessellation, jigsaw, embedded jigsaw, and multiple cloth methods. As seen in Figure 2.12, Rissanen and McQuillan (2016) designed a dress based on the zero-fabric waste technique.

Rissanen (2008) showed that this design provides tactics to cut a whole of fabric in two-dimensional toward making clothes in three-dimensional without waste. Following the project of Rissanen (2008), some scholars have investigated zero fabric waste in the fashion

design process toward sustainability (Bye, 2010; Fletcher, 2008; McQuillan, 2011). The jigsaw puzzle is one of the best zero-waste fashion techniques (Rissanen, 2013).



**Figure 2.12:** Zero-Waste Technique (Rissanen & McQuillan, 2016)

In this method, a designer can design with a single piece of the fabric all big pieces (bodice and sleeve) and small components (pocket, cuff, and collar) without any fabric waste. So, the designer calculates the size of the fabric and start to place pieces for making a new style (Rissanen, 2013). All pieces are placed next together like a puzzle, a geometric area is fixed to create clothes with minimum or zero fabric waste (Saeidi & Wimberley, 2018). Hence, the ability to incorporate the Eco-fashion design with the jigsaw puzzle technique in mass production is possible to implement only under collaboration with the technical concepts. Although many designers have problems in the grading patterns for a different size in zero fabric waste technique (Carrico & Kim, 2014).

- **Multifunctional Design Technique**

Apart from the concept of zero-waste fashion design, people expect improved aesthetic designs (Joergens, 2006). However, the perception of sustainable garment or Eco-fashion clothing is seen to be unstylish and unfashionable (Moon et al., 2015). The idea of

sustainable clothing needs a specific style based on the Eco-fashion design approach discovered by Wagner, Chen, et al. (2018). Hence, transformable designs are one of the new styles in the latest Eco-fashion (Cunha & Broega, 2009), which aims to create Eco-fashion design from an innovative idea.

Koo et al. (2014) claimed that transformable clothes are designed with small pieces that can be worn, detached, and replaced with other parts individually, where the number of clothes in the wardrobe will be decreased. Hence, to promote Eco-fashion and reduce clothing waste, designers can develop Eco-fashion clothes more functionality (Rahman & Gong, 2016) with new concepts such as zero-waste design (Rissanen, 2013) and technology-enabled design (Loker, 2008) for encouraging consumers involved in sustainable practices and contribute to reducing clothing waste.

According to Farrer (2011), if designers can invite consumers to challenges with clothes toward sustainability, it leads to affect much deeper than typical solutions. One of the challenges is transformable apparel as innovative thinking in design in the last century (Cao et al., 2014). Therefore, clothing that can change, adapt, or evolve may develop the relationship between the wearer and the clothing toward sustainability (Cao et al., 2014).

Owing to the transformable clothing can be worn for longer periods in different occasions, thus minimising waste through reduction the consumer's purchasing to additional clothes and decreasing materials flow in the fashion industry can occur (Koo et al., 2014). Koo et al. (2014) stated that transformable clothing can convert aesthetics and functionality of clothes into multiple looks and functions based on consumer needs, therefore it can lead to more satisfaction. As seen in Figure 2.13, transformable clothes with twenty different pieces are designed by Rahman and Gong (2016), where can be worn in twenty-eight styles.

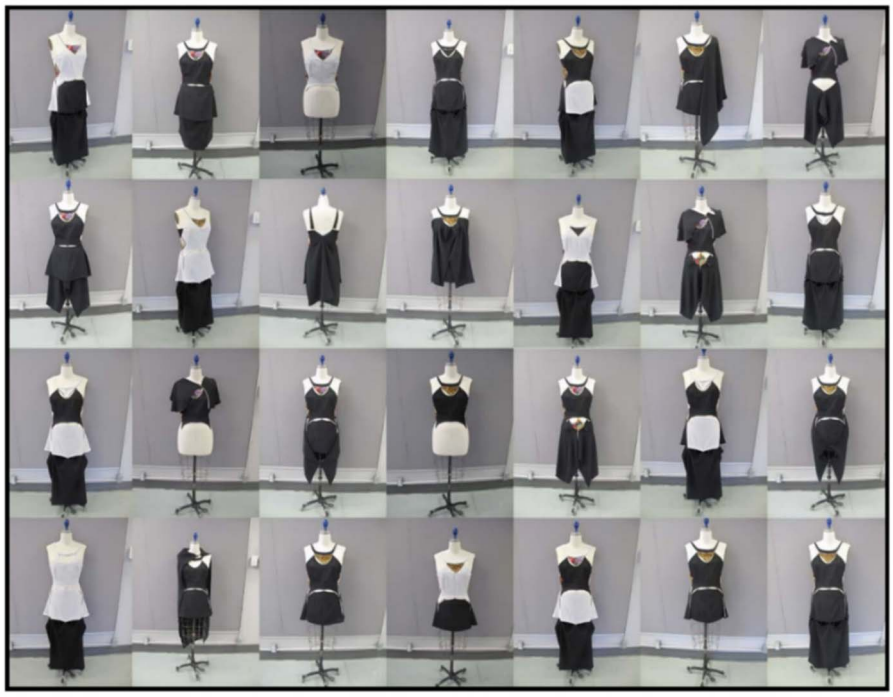


**Figure 2.13:** Transformable Clothes (Rahman & Gong, 2016)

Therefore, using such clothes may increase the number of wearing, postpone disposal, and ultimately expand the clothing life cycle (Koo et al., 2014). Lastly, the uni-sex and the uni-size clothes designed to fit either gender or a variety of sizes thus increasing the amount of usage each piece receives. These designs provide greater versatility and opportunity for the clothes to be shared or handed down for someone else while holding additional intrinsic value for the user and possibly leading to keep it longer (Clark, 2008).

According to Koo (2012), the transformable clothes are categorised into four types: (1) reversible and folded designs (multi-lives designs), (3) smart clothing, (4) do it yourself (DIY) and finally (4) modular designs. The modular design is about shape and structure in clothing production they are supposed to disassemble into two or more than two modules (Koo, 2012). Hence, each part of the module is having specific functions. Here, following

Koo (2012), the component modules are refined into two categories: single function module and multi-function module.

The modular design is often integrated into the "multifunctional design" concept (Fletcher, 2013). Multifunctional convertible designs are one of the new styles in the latest Eco-fashion (Cunha & Broega, 2009), which aims to create Eco-fashion design from an innovative idea. The term multifunction refers to a garment's ability to be flexible in its configuration and function. By using the multifunctional design platform, the clothes have removable or exchangeable parts which allow for adaptation as well as upgradeability (Cao et al., 2014). Therefore, functional products have more performance ability. The multifunction design intends to reduce the use of materials, pollution, and waste (Connell, 2010).

Cao et al. (2014) suggested that using *railroad* buttons, *snaps*, *hook-and-loop,* or combination of them in the multifunctional design leads to sustainability benefits of the garment. It is seen as one possible solution that the clothing life and fulfiling the consumer's needs increase with fewer items which have more flexibility. The utilisation of this kind of clothes in society is resulted in the reduction of clothing consumption, as well as preventing waste (Cao et al., 2014; Koo et al., 2014; Rahman et al., 2014; Rhee & Johnson, 2019).

- **Design for Disassemble Technique**

As mentioned, clothes made of different materials are difficult to disassemble, hence, recycling in the clothing industry is sometimes problematic (Niinimäki, 2012). Furthermore, the recycling of clothes includes buttons, zippers, hook and loop tape is reported very difficult (Jin Gam et al., 2009).

Jin Gam et al. (2011) explored the sustainable technique during clothing design such as using buttons to hold the lining to the shell instead of using adhesive. Therefore, design for disassembly toward easy recycling in the apparel and clothing design is a significant subject. Design for disassembly is defined as a kind of design which multiple components of products can be disassembled easily at the end of life into recycling (McDonough & Braungart, 2002). In addition, Rumsey (2009) suggested using buttons between fabric layers to help disassembly at the end of clothing life.

According to Durham et al. (2016), designers should consider during the Eco-fashion design process what parts want to be disassembled. This consideration may help to disassemble easily at the end of life or reconfigured during the use phase. Moreover, the complete disassembly of the clothing is also beneficial to allow similar parts of the clothes to be achieved for further activities such as recycling.

Durham et al. (2016) stated that in a woollen jacket, the potential to remove polyester lining fabric and buttons from the outer woollen layer at the end of life allows each layer to be recycled separately. As a side note, McDonough and Braungart (2002) stated that clothing may be made of sustainable textile, however, the dyes, fabric treatments, and closures may destroy the fact of sustainability. Hence, the need for development in sustainable components and considering on details can be a significant point in Eco-fashion design for disassembly and recycling (Jin Gam et al., 2011; McDonough & Braungart, 2002).

Additionally, new technology as Wear2™ is introduced that allows the seams to be easily disassembled at the end of clothing life (Wear2, 2014). This technology applies microwave energy to separate the seam through by thermal decomposition (Durham et al.,

2014). Table 2.4 shows the summary of the sustainable design techniques in the clothing design process.

**Table 2.4:** Summary of Using Sustainable Design Technique in the Fashion Design

| Author(s), year | Concepts | Key Findings |
|---|---|---|
| (McQuillan, 2011; Rissanen, 2008), (Bye, 2010; Fletcher, 2008; McQuillan, 2011). | Zero waste design | -Reduce fabric waste<br>-Implementation in mass production<br>-Collaboration with technology |
| (Jin Gam et al., 2011), Durham et al. (2016), (Durham et al., 2014) | Design for disassembly | -Beneficial to recycling easily<br>-Recycling each layer separately<br>-Collaboration with microwave energy through thermal decomposition |
| (Fletcher, 2008), Koo et al. (2014), (Loker, 2008) | Multifunctional design | -Number of clothes will be decreased<br>-Minimising waste through reducing the consumer's purchasing<br>-Increasing the number of clothing wear<br>-Postpone disposal and ultimately expand the clothing life cycle |
| (Gobble, 2012), Ramirez (2014) | 3D design | -Save money and time<br>-Reduce fabric waste<br>-Ability to adapt to mass production |

### 2.3.4 Consumer Phase in Life Cycle of Eco-Fashion Clothing

Finally, one of the most important pillars in the clothing life cycle is related to the consumer and how they interact with clothes. Fast fashion allows consumers to fill their clothing closets by spending a little money. Cline (2013) believed that low prices and fast trends make clothes disposable items. Here, the main issue is the increase in consumption and purchasing clothes only for one event and dispose of them in good condition (Cao et al., 2014).

Therefore, thinking about the increase in purchasing clothes with short lifespan can damage the environment in both the production and disposal phase related to the sustainability issues directly (Rhee & Johnson, 2019). Hence, the critical problem is clothing waste. Indeed it relates to the lack of awareness and thinking about the consumption (Cowan & Kinley, 2014; Rhee & Johnson, 2019).

Fishbein and Ajzen (1975) believed that the individual's behaviour is formed through past experiences, concerns, knowledge, and social pressure. Therefore, understanding the consumer's environmental concerns, needs, beliefs and attitudes are essential to understanding their behaviour, as well as the willingness and purchasing decisions toward the Eco-fashion clothing and their sustainable behaviour.

In addition, for developing successful sustainable products, it is essential to understand how consumers perceive and evaluate new Eco-fashion products and what evaluative criteria they use to purchase such products (Ghalachyan, 2018). Several factors affect consumer's behaviour regarding Eco-fashion clothing based on the findings of Gam et al. (2010) are discussed on the next page.

#### 2.3.4.1 Consumer's Willingness

Consumer's willingness under personal behaviour is one of the essential factors that lead to pursuing consumer's toward thinking about the Eco-fashion subject (Gam et al., 2010). According to Mowen and Michael (2000), product involvement and consumer's willingness to possess the product is part of the individual's behaviour, thus different levels of willingness to clothes and product involvement are seen from diverse consumers. Jin Gam (2011) stated that attitudes toward Eco-fashion clothing products affect the level of consumer's willingness and acceptance in such clothes.

Consumers have a different feeling to the willingness of products and different product involvement, especially the Eco-fashion clothing and this particular feeling is formed through their behaviour (Gam et al., 2010). Additionally, the relative importance of the Eco-fashion category and the perceived difference in such clothes attributes are caused by differences in product involvement (Solomon & Rabolt, 2004).

- **Product Performance and Aesthetic Features**

Moreover, in the fashion and apparel subject, function and aesthetics features of the products are the main factors that decide whether clothing is well-designed and thinking about possessing and willingness them (Kälkäjä, 2016). Hence, it is seen that consumers evaluate Eco-fashion clothes based on the quality, design and style (Jin Gam, 2011; Wagner, Chen, et al., 2018) if it is based on their needs, therefore the willingness to buy will raise (Tu & Hu, 2018).

Fabric texture and materials used in the fabric are other inherent attributes that can be perceived through touch and vision of sustainable clothes (Ghalachyan, 2018). Similarly,

Stone and Farnan (2018) claimed that the appearance and design feature is one of the most important product aspects used by consumers to evaluate Eco-fashion clothes.

Hence, the consumer needs to assess the quality of materials and the design features of Eco-fashion clothing before deciding to possess and willingness them (Völckner, 2008). Likewise, one of the reasons that consumers are not buying Eco-fashion clothes is that they evaluate the design at first glance. Based on the finding of Moon et al. (2015) and Sisco and Morris (2012), the perception of such clothes is observed to be unstylish and unfashionable to consumer's need. Therefore, the tendency to purchase Eco-fashion clothes are scarce in society.

However, according to the findings of Van Nes and Cramer (2005) and Cao et al. (2014), consumers have also shown willingness to wear functional and flexible sustainable clothing, recently. Gam et al. (2010) investigated that price, product functionality and appearance significantly impacted the evaluation and acceptance of the Eco-fashion clothing rather than product involvement.

- **Environmental Knowledge and Concern**

Environmental knowledge and concern are one of the important factors which can support sustainable consumption behaviour in society (Butler & Francis, 1997; Kim & Damhorst, 1998). Previous literature shows that conscious consumers would willingness to purchase more sustainable products (Diamantopoulos et al., 2003).

Recent research also stated that due to the improved social level and more information access about environmental impacts, people are more conscious of negative health from the pollution in the environment (Gleim et al., 2013; Ma et al., 2017), therefore,

these attributes can promote individuals to the willingness to attend and the acceptance of sustainable activities (Gam et al., 2010).

According to Rhee and Johnson (2019), sustainable activities must be promoted to the society by purchasing items produced with high-quality based on the sustainability issues and disposing of them such as donating, recycling, selling, swapping and repurposing instead of throw away.

#### 2.3.4.2 Consumer's Clothing Purchase

Clothing purchase behaviour under consumer's behaviour is a notable issue toward sustainability in society. In fact, shopping is seen as entertainment in routine life, as well as a way of looking at the trend in the market (Friese, 2000; Woodruffe Burton et al., 2002).

Generally, young consumers with following the latest fashion trends and mostly living on restricted budgets are interested in fast fashion products (Birtwistle & Moore, 2007). As mentioned beforehand, several factors such as quality, price, design and style are significant issues during the evaluation of the Eco-fashion clothing, as well as making-decision to purchase such clothes (Jin Gam et al., 2009).

Sometimes, the price may lead to prevention of purchasing Eco-fashion products. (Jimenez, 2016). Hines and Swinker (1996) showed that consumers are only willing to purchase the Eco-fashion products made of recycled content when the price is equal to or lower than the non-recycled products. Hence, the consumer's willingness to pay greatly influences the purchasing decision, even for the conscious consumer of environmental impacts (Young et al., 2004).

Stone and Farnan (2018) claimed that appearance is one of the most important product aspects used by consumers to evaluate Eco-fashion clothes. Style is another important essential evaluation attribute of Eco-fashion clothes (Stone & Farnan, 2018). In general, style refers to the unique appearance of the product achieved through a combination of features (Rahman et al., 2014; Stone & Farnan, 2018).

In general, Meyer (2001) stated that high prices, limited choice, aesthetic and functional disadvantages, lack of knowledge about environmental impacts are main reasons which lead to consumers not consider sustainability issues amid making-decision in purchasing clothes.

Furthermore, there is a limited number of studies on perceptions and consumer's need toward Eco-fashion clothes attributes; consumer's perceptions of fast fashion sustainable brands (Hill & Lee, 2015), consumer's attitude toward slow fashion clothes (Pookulangara & Shephard, 2013) and criteria to evaluate of Eco-fashion products (Ghalachyan, 2018; Henninger et al., 2016).

#### 2.3.4.3 Consumer's Clothing Consumption

Clothing consumption behaviour under consumer's behaviour is a significant issue toward more sustainable in the environment and society. There are few studies today with the focus on ethical consumption, but a study done by Niinimäki (2010) which showed there is an increasing level of environmental concerns among consumers regarding fashion.

Niinimäki and Hassi (2011) developed a study to openly discuss the opportunities for change within the apparel industry that could cause a shift towards promoting more sustainable practises. Additionally, designers can create future-oriented Eco-fashion designs which can transform consumption patterns towards more sustainable ones (Niinimäki,

2012). With accordance to Fletcher (2013), the lifespan of clothing can be extended with Eco-fashion solutions.

On the other side, the outfit style is not the only decision that people have to make during the day (Heger, 2016). Heger (2016) showed that there are motivations to manage the clothing consumption and possess a "Capsule Wardrobe" toward increasing the extent of the clothing life through reduce decision fatigue, create more space and time, and the most important issue is reduction clothing consumption. Furthermore, a poor decision on an outfit can affect the wearer's confidence and feel (Banim et al., 2001). Therefore, to possess sustainable pattern consumption, the capsule wardrobe's concept can help people try to decrease the number of decisions.

This concept is mostly known in western societies and recently eastern countries. Generally, it is done by women especially young age group and a small collection of pieces everyone loves (DeLong et al., 2019). Hsiao and Grauman (2018) stated that the capsule wardrobe is included a set of a few essential clothing items and accessories like a puzzle that can be mix and match well into many visual outfits.

The consideration of the capsule wardrobe can lead encouraging consumers to change their habits toward minimising excessive consumption habits (Heuer & Becker-Leifhold, 2018). Moreover, Heger (2016) showed that creating a capsule wardrobe makes less stress, as well as saving time and money which are beneficial for the capsule wardrobe adoption (Martindale & Lee, 2019). There is no sufficient emphasis on the decrease in clothing consumption in the design process (Rhee & Johnson, 2019). Following Fletcher (2013), increasing the number of times that clothing is worn and renewing the lifespan can be a valuable solution toward sustainable consumption, as well as disposal.

Heger (2016) stated that there are motivations among consumers to possess a capsule wardrobe toward increasing the extend of clothing lifespan, as well as reduction of clothing consumption. Therefore, the concept of a capsule wardrobe helps consumers, especially women to limit and manage the necessary number of clothing in the wardrobe. Hsiao and Grauman (2018) specified that a capsule wardrobe is included essential clothes that resemble a puzzle for helping to set and wear clothes into many different outfits (Figure 2.14).




**Figure 2.14:** Concept of the Capsule Wardrobe (Hsiao & Grauman, 2018)

The closet often includes a physical and psychological activity to pick and to fit clothes (Maldini & Stappers, 2019). Maldini and Stappers (2019) stated that making the individual wardrobe is depended on the characteristics and consumer's behaviour, though it can provide the basic information with helping sustainable design approaches to specify the most important clothes in the wardrobe.

On the other hand, a capsule wardrobe is part of fast fashion and may lead to environmental problems during production, consumption as well as the disposal (Bhardwaj

& Fairhurst, 2010). Although available clothes are listed as Eco-friendly products in the fashion industry, the process used to dye fabrics may not have sustainable characteristics. These clothes often utilise some synthetic materials to create the desired support or structure of the design, though it harms the environment (Rumsey, 2009). Hence, the need for Eco-fashion clothes with consideration the clothing lifespan is a significant issue (Rahman & Gong, 2016). Therefore, the development of the capsule wardrobe toward more sustainability is understandable (Heger, 2016). According to McDonough and Braungart (2002), for fashion designers, Eco-fashion materials are the best environmentally sound contents.

#### 2.3.4.4 Consumer's Clothing Disposal and Recycling (Sustainable Behaviour)

Clothing disposal behaviour under personal habit is a significant issue that can lead to support the recycling and Eco-fashion programmes in society and the industry. A study by Morgan and Birtwistle (2009) showed that the majority of consumers are unaware of the environmental impact caused by clothing waste. Furthermore, consumers did not have any idea of how long they can wear and keep the clothing (Bianchi & Birtwistle, 2010).

Hence, an effort to improve consumer awareness that addresses sustainable practises is needed. For this reason, research on the consumer's behaviour at the end of the clothing life cycle is a significant issue and needs more scholarly attention (Birtwistle & Moore, 2007).

As a response, large-scale retailers such as H&M and Zara have invested and produced toward sustainability activities such as "Bring It". It is a universal garment collecting programme in the Eco-fashion design process (Gould, 2017). Nevertheless, there is no emphasis on the Eco-fashion design process to decrease consumption. It only helps to

dispose of clothes and clothing recycling programme. According to Gam and Banning (2011), for developing in the fashion and apparel design toward more sustainable, understanding the consumer's behaviour and their acceptance is the obligatory factor which should be investigated.

Likewise, Irick (2013) expressed that there is a lack of research regarding consumer's purchase behaviour and their needs toward Eco-fashion clothes, especially made from recycled contents. With accordance to Heron (1977), the human being has needs, there is virtually no genetic programming of behaviour to meet these needs. In fact, consumer's needs drive behaviour toward the goal. Hence, investigation of elements related to the consumer's behaviour in the field of Eco-fashion clothing such as purchase, consumption and dispose of clothes are notable subject toward sustainability.

According to Fishbein and Ajzen's theory of planned behaviour (1975), the individual's beliefs and needs are formed through observations made by the person himself /herself and information received from outside sources. Hence, beliefs and needs influence attitudes, directly. Furthermore, attitudes are related to the intention of performing the behaviour. The basic framework of the Theory of Planned Behaviour (TPB, Fishbein & Ajzen, 1975) is used to this study for examination the consumer's purchase behaviour of Eco-fashion clothes. Moreover, several researchers used TPB for understanding the purchase intention concerning environmental issues (Kumar et al., 2017; Moser, 2015; Zhang et al., 2018).

There are many factors which impact the consumer's motivation to become involved in environmentalism behaviour (Biel & Thøgersen, 2007). A person needs to be made aware of environmental threats which can help he/she to show intrinsic behaviour towards the

preservation of the natural environment (Verhoef et al., 2008). Moreover, it is also important to understand that the behaviour in a particular activity toward sustainability, for instance, clothing disposal, may help in shaping attitude and intentions toward other sustainable activity such as purchasing clothes (Young Lee et al., 2013). Therefore, the study contemplates essential components of the TPB, namely, attitude (A), subjective norms (SN), perceived behavioural control (PBC) along with perceived behaviour to dispose of clothing (PBD), and tests these in the context of purchase intention (PI) as well as purchase behaviour (PB) of Eco-fashion clothes.

- **Attitude Toward Eco-Fashion Clothes and Purchase Intention**

Attitude is defined as a mental state of enthusiasm, affects the response to all purposes and conditions (Allport, 1935) and strengthening the intention to perform a behaviour. Mainly, the concept of sustainability focuses on the usage of Eco-materials for reduction the environmental issue; nevertheless, according to Wagner and Curteza (2018), the attitude of Eco-fashion is still linked with a misunderstanding about quality and design that needs improvement. Eco-fashion clothes are made from recycled or reused materials that have not been coloured with harmful chemicals (Aaijaz & Ibrahim, 2010).

In addition, Saricam and Okur (2019) and Wai Yee et al. (2016) investigated that the consumers have positive feelings and beliefs about the Eco-fashion products but the reason why they avoid purchasing them are related to the negative attitude of the quality, high prices and unfashionable features. Maloney et al. (2014) showed that there is a strong relationship between attitude toward Eco-fashion clothes and behavioural purchase intentions. Reiley and DeLong (2011) found that participants who sought and wore clothing from recycled sources perceived their appearance as unique more than those acquired their clothing from

only new sources, therefore this attitude makes them interested in buying these types of clothes. Furthermore, an economic attitude for saving money is a powerful motivation which influences purchase behaviour (Joung & Park-Poaps, 2013).

Moreover, a recent study to investigate the factors of an Eco-fashion design (Chang & Watchravesringkan, 2018) suggested that price is considered as an indicator of quality for the majority of Eco-fashion products. Indeed, consumers have this attitude that Eco-fashion clothes have less quality compared with clothing made of virgin materials (Cervellon et al., 2012). Therefore, consumers are only willing to purchase them when the price is equal to or lower than virgin products. Likewise, the appearance of Eco-fashion product is an important factor in consumer attitude (Wagner, Curteza, et al., 2018). The design is the primary element that determines whether a cloth is worth purchasing (Kälkäjä, 2016). Thus, a positive attitude can ensure the success of purchasing Eco-fashion products (Moon et al., 2015; Wagner, Curteza, et al., 2018).

- **Subjective Norms Toward Eco-Fashion Clothes and Purchase Intention**

Subjective norm is defined as the perceived social force to show a particular behaviour (Fishbein & Ajzen, 1975). The subjective norm can be introduced as a kind of opinion that people approve or disapprove about certain behaviour which is undertaken and performed. Consumers not only behave under social force, but the subjective norm also offers them facts about the correctness of behaviour under consideration (Jager et al., 2000). Wiriyapinit (2007) discovered that the family norm instructed by parents can influence purchase intentions of products in Thailand. The literature on this aspect also indicates that subjective norm as a perceived social demand for executing a particular behaviour has a

positive influence on behavioural purchase intention of Eco-fashion products (Kumar et al., 2017; Tu & Hu, 2018).

- **Perceived Behavioural Control and Purchase Intention**

According to Fishbein and Ajzen (1975), the people's attitude of their capacity to adopt a behaviour is named perceived behavioural control. Perceived behavioural control includes features toward the availability of resources such as money and time for representing behaviour and consumer's confidence in carrying out the behaviour (Fishbein & Ajzen, 1975). Consumers perform a particular behaviour if they have both the ability and confidence. Maloney et al. (2014) and Zhang et al. (2018) showed that perceived behavioural control is positively associated with purchase intention for Eco-fashion clothes made of organic materials, though it has less influential factor on the purchase intention. In addition, Paul et al. (2016) discovered that the attitude and perceived behavioural control influence purchase intention, while subjective norms do not have any effect.

- **Perceived Behaviour to Dispose of Clothing, Purchase Intention, and Behaviour**

Sustainable disposal behaviour is a new subject in the consumer behaviour literature. This behaviour involves reusing clothes, recycling clothes, donating to charities, giving them away to the second-hand store, but unwearable clothes in the recycling bin, etc (Bianchi & Birtwistle, 2012). Brosdahl and Carpenter (2010) claimed that the knowledge of the environmental impacts leads to concern for the environment which influences the behaviour toward disposal, consumption, and purchasing. Moreover, the result of a study about investigation related factors on Eco-fashion clothes (Maichum et al., 2016) concluded that the intention for purchasing organic products are influenced by environmental activities.

Lang et al. (2013) stated that there is a strong relationship between purchasing and dispose of clothing. Likewise, Young Lee et al. (2013) and Dahlbo et al. (2017) showed that clothes disposal toward sustainability can lead to purchasing intention of Eco-fashion products. Moreover, a survey conducted by Kloth Cares Malaysia (2018) reported that 81% of Malaysian showed sustainable behaviour toward clothing disposal, however, no study has been executed about the purchase of Eco-fashion clothes, particularly made of recycled materials.

- **Purchase Intention and Purchase Behaviour**

Behaviour can be determined from the intention with considerable accuracy. Indeed, the behavioural intention powerfully affects actual behaviour, but it is not always true. Moreover, Sheppard et al. (1988) mentioned a high degree of connection between intention and behaviour. Research on purchase behaviour for Eco-fashion clothes made of cotton contents is indicated a significantly positive relationship between purchase intention and purchase behaviour (Kumar et al., 2017). Although very well established in the literature, this study aims to ascertain this relationship in the context of Eco-fashion clothes made of recycled materials.

## 2.4 Research Conceptual Model

According to Guba and Lincoln (1994), a conceptual model is a visual description that maps out hypothesised relationships among variables, it can illustrate concepts underlying an issue.

Firstly, according to the literature review in the clothing life cycle part, the centre of proposed research conceptual model is developed based on the CTGC model (Koo et al., 2014) and three pillars of sustainability; the society, environment and economy in the model

of Rodriguez et al. (2002). Based on the discussed literature, all three pillars are related to the phases of the clothing life cycle. Indeed, the clothing has effects on the environment during phases used by society (consumers and designers) and process to make a profit (economic). Therefore, the conceptual model supports phases involved in the clothing life cycle in the border of three pillars of sustainability. Hence, each phase is investigated with clear research objectives and questions which can be achieved through questionnaires and in-depth interview sessions.

First, as seen in Figure 2.15, the conceptual model starts by consumer phase, so, based on the discussed literature, related factors on consumer's behaviour regarding Eco-fashion clothes will be investigated through questionnaire and interview session (Research question one - part one).

According to this conceptual model attitude, subjective norms, perceived behavioural control and perceived behaviour to dispose of clothing have a positive effect on purchase intention of Eco-fashion design, directly. Moreover, purchase intention has a significant effect on the real purchase behaviour toward Eco-fashion clothing, directly (Figure 2.16).

Second, the discovery of the designer's behaviour toward Eco-fashion design with related factors to intention will be studied through questionnaire and interview session (Research question one - part two). Therefore, this part of the model will be completed in Chapter 4.

Third, after investigation of two main parts; consumer and designer, the next phases involved in the clothing life cycle are Eco-fashion materials, Eco-fashion process and

sustainable techniques will be studied through in-depth interview, questionnaire and observation (Research question two) to develop an Eco-fashion design model.

Finally, it returns to the first phase (consumer) and investigates of consumer's willingness and acceptance toward Eco-fashion clothes made of developed (Research question three).

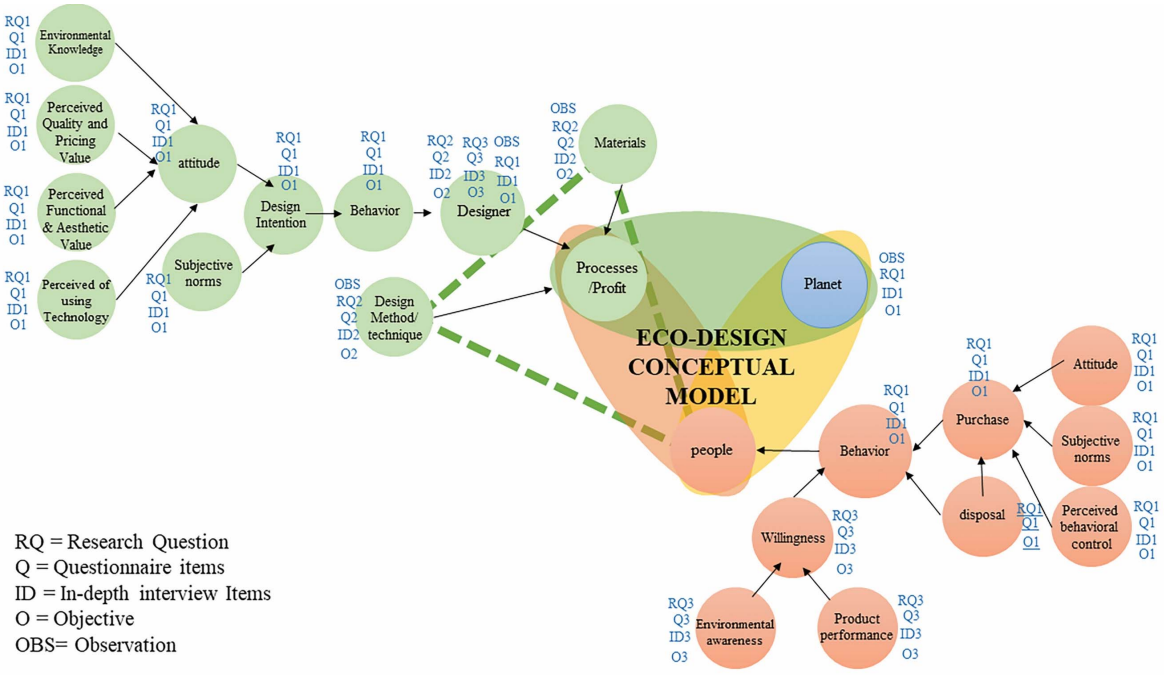



**Figure 2.15:** Structural Model of Eco-Fashion Design

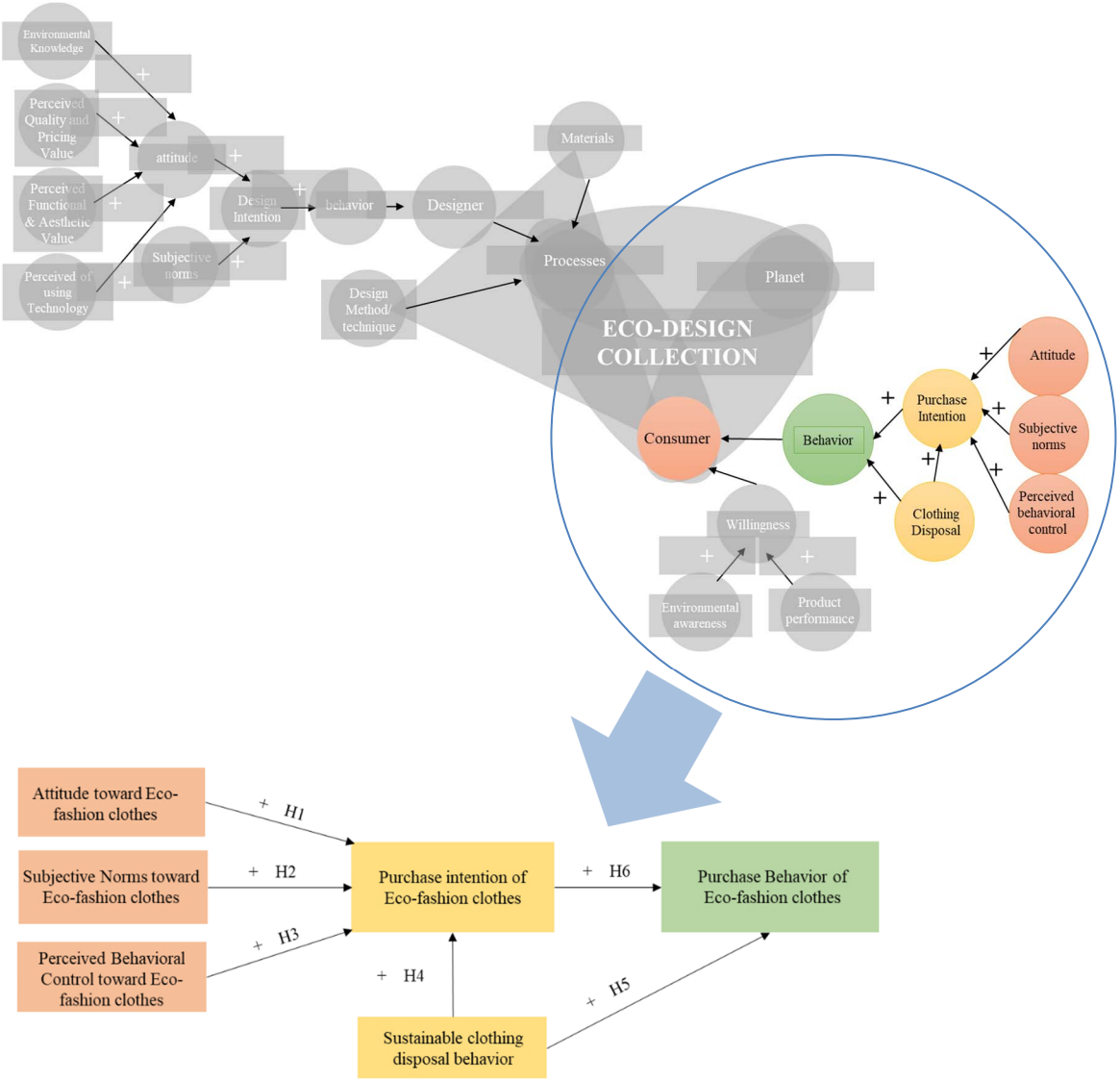



**Figure 2.16:** Conceptual Model of Consumer's Behaviour towards Eco-Fashion Clothes

## 2.5 Chapter Summary

As seen in the previous studies (LaBat & Sokolowski, 1999; Lamb & Kallal, 1992; Orlando, 1979; Regan et al., 1998; Watkins, 1988), the function of the Eco-fashion design model is similar to the traditional fashion and apparel design, but attention to the sustainability issues which offer to make profits, protecting the environment and social health is not considered. Hence, the concept of sustainability in the fashion and clothing

design needs to consider each three of these aspects; economic, society and environment. The previous study by Kälkäjä (2016) reported that there are different dimensions of the design concept which support sustainability such as design for disassembly, design toward waste minimisation/zero-waste, design for slower consumption, design concerning the end of the product's life and design for social well-being. Therefore, the structure of the Eco-fashion design which considers the environmental impact related to the product throughout its entire life from production to disposal can reach sustainability.

Jin Gam et al. (2009) developed the Cradle to Cradle Apparel Design Model (C2CAD) to guide sustainable clothing designers interested in the environmental issues and human health in the design process. This model includes cradle to cradle model in the latest clothing design production models in the fashion and clothing industry. By using this model, three sustainability pillars are addressed during the clothing design process. This process can be economic through prevent pollution and social development. Therefore, it will give a better environment such as good living quality. Regarding the use of C2CAD model, designers and manufacturers can select materials based on human and environmental health and safety.

On the other hand, some researchers like Lindahl (2006) and Gehin et al. (2008) stated that fashion and apparel designers need simple and effective methods that easy to adopt and can be applied to their skills. Also, it can set the design criteria, as one of the most barriers identified in implementing sustainability reported the lack of consideration of design criteria such as aesthetic styles, costs, and fashion trends. In addition, most sustainable fashion designers have a financial barrier and this model is developed by and for large corporate businesses. Besides, using cradle to cradle assessment tools in C2CAD model may

lead to require instruction or learning for use. Hence, it cannot connect and speak to designers directly and can be confusing and difficult to use (Kozlowski et al., 2019) as cited as being too technical and scientific. Therefore, focus on the design phase in the developed Eco-fashion design model is valuable rather than material assessment tools as a designer's perspective.

Therefore, based on the upon researches, the Eco-fashion design process is developed. The three of main steps is adopted from LaBat and Sokolowski (1999) and Jin Gam et al. (2009); problem definition & research; creative exploration and implementation. Indeed, the Eco-fashion model process model is developed based on the C2CAD model (Jin Gam et al., 2009). Nevertheless, from the designer's viewpoint, it means that the product interacts with the environment in material production, manufacture, transportation, packaging, use, and disposal of clothes. It indicates that one of the related factors and essential tools in the Eco-fashion design is related to the investigation of the clothing life cycle.

Moreover, designers are at the centre of the design process, therefore, designers need to consider all phases during the design process, from the material to the end of life. Hence, the clothing life cycle needs more consideration regarding sustainability. Indeed, according to Koo et al. (2014) and Locker (2008), the clothing life cycle can be found in the relationship between materials, designers, design process and the consumer concerning support three pillars of sustainability. The selection of materials is the paramount phase in the clothing life cycle toward sustainability. All materials in sustainable product design should meet the criteria to recycle. One of the ways to achieve sustainability is using Eco-fashion materials in fashion and apparel design which has become very popular in the fashion industry.

Furthermore, Jin Gam et al. (2009) showed that in mass production, designers have become the most powerful creator for Eco-friendly product. In addition, the role of the designer is not only creating clothes; most of the fashion and apparel designers often fulfil multiple roles. Hence, understanding of designer's behaviour toward sustainability issue and Eco-fashion design is a notable issue. As mentioned, the development in sustainable design allows designers to rethink about the design process and choose the best way regards to economical and beneficial to the environment. It can help designers to rethink about how they design, what they produce, how they use materials and resources, and what processes they choose. Regarding the promotion of the Eco-fashion design and reduce the waste, designers are thinking to new design concepts such as zero waste designs (McQuillan, 2011; Rissanen, 2008), design for disassembly (Jin Gam et al., 2011) and transformable design (Fletcher, 2008).

Finally, one of the most important pillars in the clothing life cycle is related to the consumer and how they interact with clothes. In regard to developing effective sustainable or Eco-friendly products, it is essential to understand how consumers perceive and evaluate new Eco-fashion products and what evaluative criteria they use to purchase such products. Therefore, a conceptual model is developed based on the clothing life cycle. This conceptual model has included the two dependent models to the conceptual model in this study about individual's behaviour, suggests the importance of the clothing life cycle in line with three pillars of sustainability. The conceptual models will be developed to map out the stages that clothing must go through before it reaches a tactile stage. Indeed, the conceptual model emphasises the relationship between the material, designer, design process and the consumer, where sustainable consumer's behaviour and designer's behaviour are studied and discussed separately and then add to the main conceptual model.

# CHAPTER 3

# MATERIALS AND METHODS

## 3.1 Introduction

This research is designed as an exploratory investigation to provide the development of a model for the Eco-fashion design process rooted in scholarly exploration. Various methods of data collection can be used in analysis which may rely on the intent of the project, the time-frame which possible financial constraints (Yin, 2015).

To fulfil the purpose of this study and answer the research questions, a mix-method (qualitative and quantitative) approach is employed for investigation and finding solutions toward the research problem. Henceforth, it is discussed why the mixed method is suitable for this study in the following. As shown in Figure 3.1, the research activities and workflow are created to find answers for three main questions of this study.

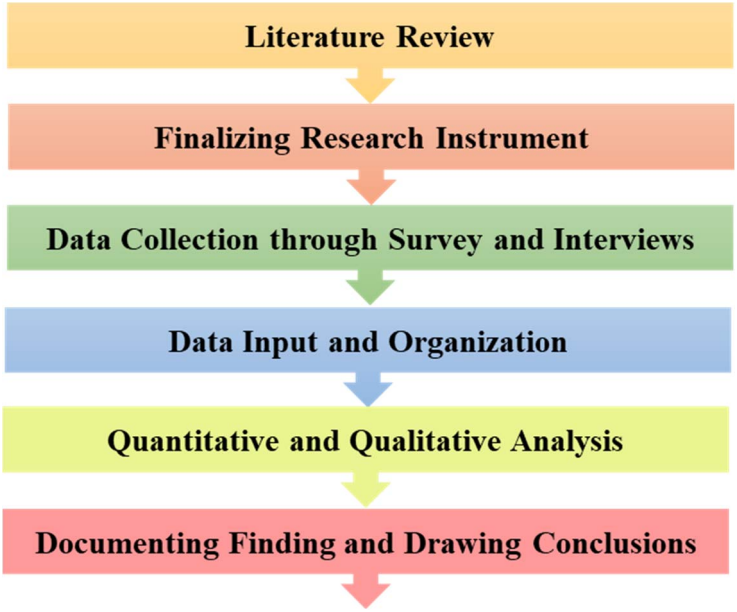



**Figure 3.1:** Research Activities and Workflow

Owing to the study about understanding consumer's behaviour and their attitude, a quantitative study is chosen, firstly. Besides, exploring the minds and behaviours of the consumer which includes words, feelings, and reactions are the most factor to choose the qualitative approach. Both approaches are effective in the proposed model in the fashion world (Bryman & Bell, 2015).

Furthermore, a qualitative research methodology is necessary where new programmes, events, knowledge and phenomena are developed, as well as there is no enough relevant research and no systematic methods for evaluating the emerging problems (Patton, 2005). The study is combined with in-depth interviews, observations, and document reviews to discover the factors which determine the process of design.

Hence, searching about the Eco-fashion clothing and apparel design and its products, fashion designers as well as consumer's responses in the fashion and apparel industry, there are gaps within the area that make the development of a new model more important. Since the lack of Eco-design and production models that recognise the designer's role in reducing the impact on the environment, the qualitative analysis is used to explore ways of implementing the sustainable development in the fashion and clothing design and production process.

Therefore, the main reason to choose the qualitative and quantitative approaches that involve terms, emotions and responses are to examine the minds and behaviour of individuals and groups, where statistical numbers are of interest (Bryman & Bell, 2015). The criteria issued for the chosen sampling of this study was goal-oriented to the research objectives and fitted to all survey and interview conditions. Moreover, samples were selected at random. This means that any item in the group had a full and equal chance of being

selected and included in the sample. According to Delice (2010), this method makes the selected sample truly representative. Delice (2010) stated that the criteria to select sample size for mixed studies are quite similar to quantitative and qualitative researches. Hence, the sizes of the sample for each stage of this study were different. Moreover, a sample size calculator online was used for this study to calculate the ideal sample size with a confidence level of 0.95%. According to Mertens (2003), mixed-method investigations is used due to the following reasons:

i. Better understanding the question of analysis by converging numeric patterns from quantitative data and specific details from the qualitative knowledge.
ii. Identify variables and constructions which can be calculated by current or new instruments or the development of new ones.
iii. Obtain statistical, the quantitative and survey data, and use them to identify people who can expand on the results through the qualitative data to improve outcomes.

Consequently, this chapter describes the mixed-method research design which involved three phases of data collection and data analysis. The methodology chapter consists of three parts based on the three objectives.

The first phase is related to the objective one about the investigation of consumer's and designer's behaviour toward their sustainable activities and deciding toward sustainability issues, where it is a significant issue to develop Eco-product designs.

Objective two is followed by the second phase to develop the Eco-fashion design to source Eco-fashion materials, create the Eco-fashion design process model and experimental design to create an "Eco capsule wardrobe". This prototype represents a clothing wardrobe kit to save on clothing consumption as well as increase the use of clothes.

Finally, the third phase is related to objective three to evaluate society's willingness and individual's behaviour about the Eco capsule wardrobe (as a prototype) designed based on the proposed Eco-fashion design process as shown in Figure 3.2.

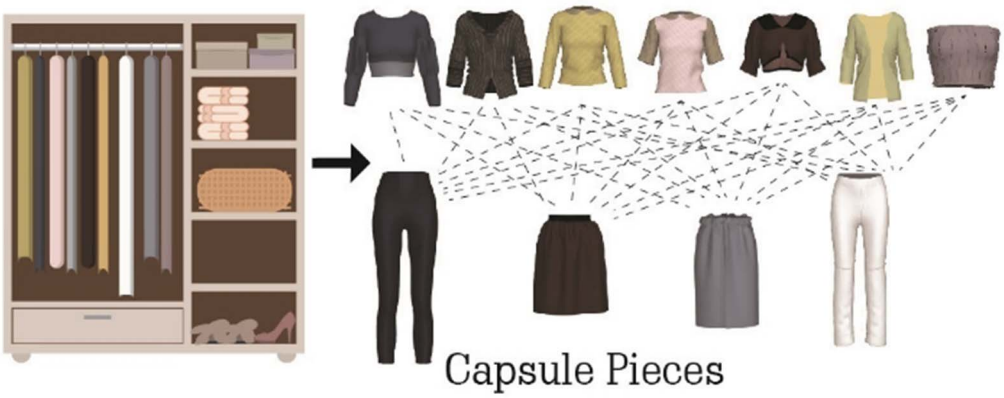



**Figure 3.2:** Proposed Eco Capsule Wardrobe Prototype

As seen in Figure 3.3, data collection strategy framework is divided into three phases to gain all the objectives. The strategy for the collection data is divided into three steps based on the objectives of this study.

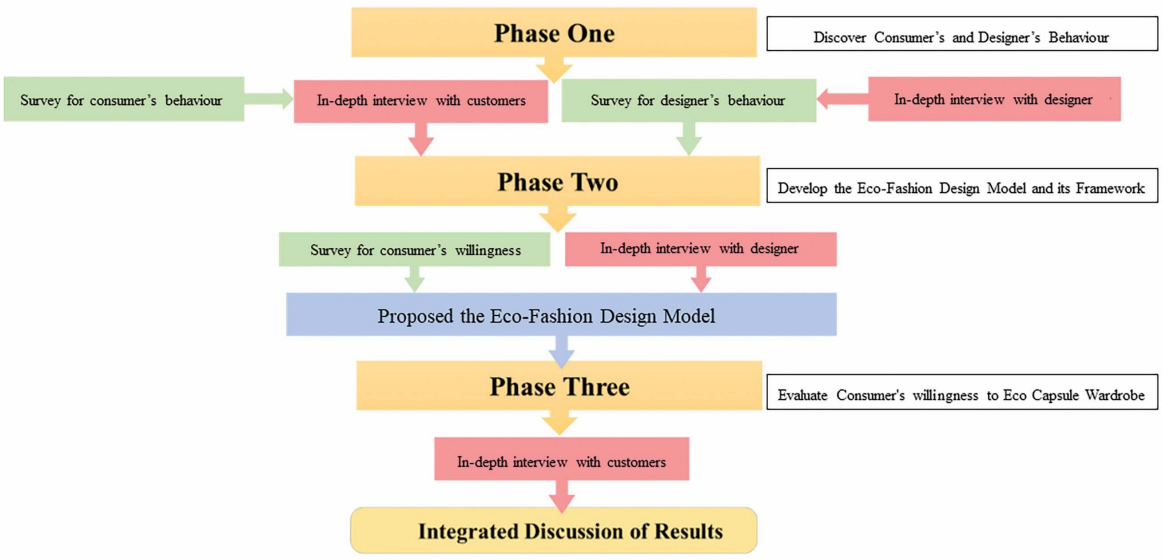



**Figure 3.3:** Data Collection Strategy

## 3.2 Discover Consumer's and Designer's Behaviour (Objective One)

According to the goals of this project and many research themes, different types of data are needed. The methodology of the first objective includes mixed-method strategy with to study of consumer's sustainable behaviour toward Eco-fashion clothes and to investigate of the fashion and apparel designer's behaviour towards Eco-fashion design.

In these objectives, the research investigates on the consumer's behaviour toward sustainable activities such as clothing disposal, especially recycling and purchase of Eco-fashion clothes and the designer's behaviour toward minimisation clothing waste, as well as the design of Eco-fashion clothes.

Therefore, the findings of these two investigations will help to construct a conceptual model. Since this research aims to propose a conceptual model with focusing on phases of the clothing life cycle which affect the pillars of sustainability; social, environmental and economic, therefore findings of this objective focuses on a social part and will be used to develop a conceptual model.

### 3.2.1 Questionnaire Construction for Discovery of Consumer's Behaviour

**Instrument Development.** The instrument used in this study has been investigated by previous researchers. The questionnaire instrument is considered the discovery of the consumer's behaviour. Figure 3.4 illustrates the process of the conduct of a questionnaire. All surveys used in this study have followed this method step by step.

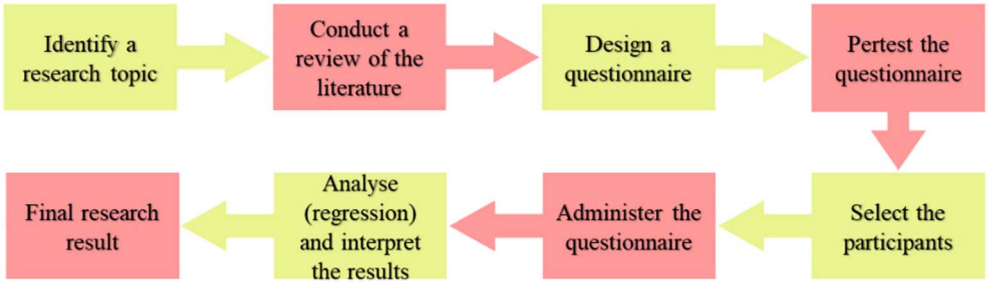



**Figure 3.4:** Conduct the Questionnaire (George & Mallery, 2003)

Based on two classifications of consumer behaviour, sets of the close-ended questionnaire were designed (Refer to Appendix 2). According to the hypotheses formed in the literature review, the questionnaire consists of three main sections with 34 questions: demographics, perceived behaviour to dispose of clothing and sustainable purchase behaviour which this one is included attitude, social pressure/norms, and perceived behavioural control.

Each category is included multi-choice questions with Likert-scale questions from one means 'strongly disagree' and five means 'strongly agree'. Respondents indicate their agreement level based on the five scales starting from 'strongly agree' to 'strongly disagree'. The scales from number 1 signify 'strongly disagree', 2 'disagree', 3 'neutral', 4 'agree' and 5 'strongly agree'.

(1) Demographic information of respondents is collected in terms of gender, age, income, and the occupation. The first six questions collect personal data of respondents.

(2) Perceived behaviour to dispose of clothing and purchasing behaviour questions are adopted from Bianchi and Birtwistle (2012) in 6 multi-choice questions where respondents indicate their answers by choosing one or more choices. It collects in terms of how often purchase new clothes, how much spend on purchasing clothes, the main reasons

for disposing clothes and how to dispose of unwanted clothes. Questions 7 to 12 are multiple-choice questions.

(3) Measurement items for sustainable purchase behaviour are adopted from Gam and Banning (2011); McCann (2015) and Zhang et al. (2018) in 4 questions for attitude; 4 questions for perceived behavioural control; 4 questions for subjective norms; 4 questions for perceived behaviour to dispose of clothing; 4 questions for purchase intention and finally 2 questions for purchase behaviour with a set of close-ended 1-5 Likert-scale questionnaire. Indeed, the factors being measured are attitude, perceived behavioural control, subjective norm, perceived behaviour to dispose of clothing and purchase intention toward purchase behaviour of Eco-fashion clothing. Moreover, independent, and dependent variables are illustrated in Figure 3.5, there is no moderating or mediating variables involved in this study.

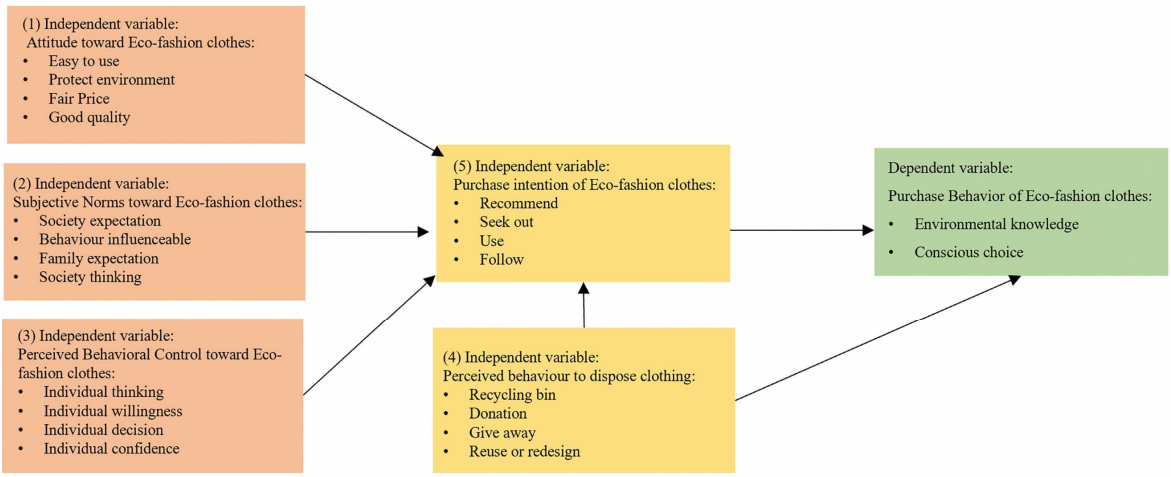



**Figure 3.5:** Independent and Dependent Variables in Consumer's Purchasing Behaviour

After the initial pool of questionnaire items was written, two experts in this area reviewed the items. Items were reviewed to make sure they are accurate, free of item construction problems, and grammatically correct. Before finalizing the final draft of the

questionnaire, it was tested among a small sample (30) of respondents to check and improve the items. As mentioned previously, the concept of Fishbein and Ajzen's theory of planned behaviour is used for this study. Before the survey questions about Eco-fashion clothes made of recycled materials, a definition was provided to inform participants about the term's meaning to allow them to respond more precisely.

**Data Collection.** The inquiry was carried out as a hard-copy survey in November 2018 in Malaysia. The questionnaire was programmed with Google Forms and the link to the questionnaire was disseminated throughout east and west of Malaysia. It was based on a "snowball sampling" method. Snowball sampling is applied when samples with the target characteristics are not easily accessible. Naderifar et al. (2017) suggested considering snowball sampling strategies while working with the attendees of educational programs or samples of research studies.

Since the respondents decided to engage in this study, they completed the written questionnaire. Subsequently, the completed responses were numbered 583. The respondents were classified as a student (had a diverse major, including arts, design, materials science, linguistics, museum curation, engineering, and finance), non-professional (employee or whoever with lower academic qualification) and professional (educator, accountants, lawyers, doctors, professors, engineers). Empirical research using survey was carried out to investigate the consumer's behaviour.

**Data Analysis.** Descriptive statistics, reliabilities, and correlations are computed through Statistical Package for Social Science (SPSS) to obtain the results and identify the relationships between each variable. A significance level of 95% is set. Partial Least Squares Structural equation modelling (PLS-SEM) using the analysis of structures software

SmartPLS version 3.0 is employed to analyse the collected data. For the model assessment, this study accepts the evaluation of outer measurement and inner structural model (George, 2011; Ringle et al., 2005).

**Reliability and Validity.** The outer measurement model aims to calculate reliability, internal consistency, and validity of the observed variables with confirmatory factor analysis (CFA). The reliability is tested by composite reliability (CR) and Cronbach alpha (α) with both more than 0.70. According to George and Mallery (2003), it is supported to combine the items under each measurement into the intended multi-item scale, with high reliability ($\alpha \geq 0.7$) for all variables. The validity of the scale items is assessed by factor loadings and Average Variance Extracted (AVE) which both greater than 0.5. Also, Heterotrait-Monotrait (HTMT) ratio test is applied that constructed variables should be below than 0.85 (George & Mallery, 2003).

**Regression Analysis.** In addition, owing to the analysis developed in the literature review and construct hypotheses, this study accepts to compute a multiple regression model. According to Henseler et al. (2015), an $R^2$ value of 0.75 is considered valuable. The assumption of independence in errors should be met with Durbin Watson statistic which is between the two critical values of $1.5 < d < 2.5$. If the value is inside this range, so there is a positive autocorrelation between variables and no correlations between model errors (George & Mallery, 2003).

**Structural Model and Hypothesis Testing.** The next step is to measure the inner structural model that includes path coefficient ($\beta$-value), t-statistic value and effect size ($f^2$). According to Ringle et al. (2005), the higher β-value shows the stronger impact of a predictor independent variable on the dependent variable. The coefficient of determination measures

the overall effect size explained in the endogenous variable for the structural model and thus is a measure of the model's predictive accuracy. The criteria suggested by Cohen (2013) for interpreting the effect size is given as follows: small effect < 0.02, 0.02 < medium effect < 0.15 and the large effect >0.35 ($p<0.05$). In addition, according to Hair Jr et al. (2016), evaluation of the correlations and regressions is the significance with t-value ≥ 1.96.

A single source (Eco-fashion clothes survey) research is carried out as variables in this study. Therefore, According to Podsakoff et al. (2003), the Common Method Bias (CMB) does not affect data if the total variance for a single factor is less than 50%. In this study, total variance obtained from SPSS is 38%, therefore, CMB does not affect data.

### 3.2.2 In-Depth Interview for Discovery of Consumer's Behaviour

**Data Collection.** Kennedy and Vargus (2001) suggested that an in-depth interview study improves the information obtained from the questionnaire. In order to strengthen the findings of this research, the study has conducted a follow-up semi-structured interview study as a focus group with 16 consumers (14 women and 2 men) have experience of buying Eco-fashion clothes, especially made of recycled materials (Refer to Appendix 2). Indeed, the invitation letter sent to all 144 people those claimed to have had the experience of buying such clothes, but only 16 accepted to be part of this research.

The researcher believes that the in-depth interview provides better knowledge of Eco-fashion clothes and consumer's opinions may yield valuable insights into this study. Prior to the interview, the researcher designed an interview protocol, outlining all the major questions developed using the literature reviews on factors which influence on purchase behaviour of sustainable clothes (Gam & Banning, 2011; Maloney et al., 2014; McCann, 2015).

The interview schedule for the focus group session was organised into two main sections with four questions: demographics and real purchase behaviour, especially related factors on the participant's attitude. It is pointed out that the results obtained from the questionnaire in the last part showed that attitude is a significant factor in purchasing behaviour. Hence, purchasing behaviour questions are considered to achieve factors which affect attitude's participants when they are facing to purchase and making-decision on Eco-fashion clothes, as well as their suggestions to improvement feature for next purchasing.

(1) The first segment gathers demographic data: age, major or occupation, and yearly family income.

(2) The second part consists of three questions about the real purchase behaviour and the related factors on the attitude toward Eco-fashion clothes made of recycled materials adopted from previous literature (Cao et al., 2014; Forsman & Madsen, 2017; Janigo & Wu, 2015) (Refer to Appendix 3). There are numerous resources to assist with the development of interview guides, for this study the recommendations' Patton (2015) are used to develop interview questions. Patton (2015) lays out different kinds of questions that might be asked of interviewees. He also suggests that questions might be formulated to generate accounts related to an interviewee's past, current, and future.

The interview is audio recorded with the interviewees' permission. This interview is transcribed. For consistency, interview transcriptions are reviewed by the researcher periodically during analysis to ensure validity. The informants include direct quotes to increase the confidentiality of the findings (Elo & Kyngäs, 2008).

**Data Analysis.** As mentioned, the interview is audio recorded. The findings of the interview are transcribed and analysed by creating nodes in Nvivo 10. This approach helps

to decrease the risk and increase the validity of the correct selection in the scientific articles (Reim et al., 2015). To maintain authenticity, the following protocol adopts: (1) an audio-taped interview with the permission of the participant is transcribed, (2) NVivo 10 programme is used for transcriptions of interviews, (3) transcriptions are coded by using "nodes" to represent content created in the software, (4) nodes are ordered based on the main questions, (5) relationships and patterns are considered as well as memos.

**Reliability and Validity.** Deciding to identify study participants through snowball sampling could have influenced the reliability of the analysis. In fact, snowball experiments contributed not only to the researcher's vicinity but also to each other and the exchange of interactions. So, common elements in the study are drawn from the participants' experiences. Differences in age, culture, and nationality between participants could have had a positive impact on the data collected (Heger, 2016). According to Saunders et al. (2009), standardization in the in-depth interview may lead to a reduction in reliability issues.

This research applies Coding Comparison Test regarding achievement inter-relater reliability through Kappa Coefficient. Cohen's Kappa coefficient is a statistical measure of the similarity between inter-rater or inter-annotator coding selections and commonly used for categorical variables. Also, the Kappa Coefficient is compared across coding nodes and individual sources. So, interrater reliability is calculated in NVivo 10 for each assigned code and averaged to attain the overall code agreement between coders.

Cohen's kappa coefficient ($\kappa$) is a statistic value used to measure inter-rater reliability for the qualitative data. Kappa is often equal to or below 1. A 1 value implies absolute consistency and values under 1 mean less than complete consistency (Creswell & Clark,

2017). Different sources point to $\kappa = 0.75$ to 1 as agreement, and 0.4 to 0.6 as moderate agreement

### 3.2.3 In-Depth Interview for Discovery of Designer's Behaviour

For the investigation of the designer's behaviour toward Eco-fashion design, this study applies a mixed-method strategy executed by Cruz Cardenas et al. (2018). The qualitative method is disused in this part and the next session will be focused on the quantitative study. This research utilises the analysation of written documents to describe the sustainable fashion and apparel design model and recognise issues by qualitative research. In line with the quantitative research, Marshall and Rossman (1995) proposed that standard qualitative research should be driven by systemic considerations from the literature review in the generating research questions.

**Data Collection.** Researchers may recognise the gaps between previous literature and which this study will contribute. The qualitative method investigates factors and issues which can influence on the fashion designer to the behavioural intention of Eco-fashion design. In October and November 2018, this study approached eight fashion and apparel designer (six women and two men) with ages ranged from 31 to 55 years old and more than seven years' experience in sustainable fashion design in Malaysia and Iran. All eight sessions were done through personal or one-on-one interview.

The invitation letter was sent by e-mail to the participants (Refer to Appendix 4- part one). The interviews discussed specific issues of design using Eco-fashion materials and not just abstract concepts due to insufficient research on the vast quantity of Eco-fashion design, open-ended questions were used.

The interviewer addressed the physical and social scenario of the interviewee following the introduction and an approximation stage. Then, the interviewer pursued more data about the actions and perceptions of interviewees related to the design intention toward Eco-fashion with Eco materials as the main mechanism for generating knowledge.

The interview schedule is organised into two main parts with five questions: demographics, design intention and design behaviour toward Eco-fashion design and attitude concerning the Eco-fashion design process.

Firstly, the demographic information of respondents is collected in terms of gender, expertise, and occupation.

The second part consists four main questions about design intention, design behaviour and attitude questions adopted from previous literature (Jin Gam et al., 2009; McKelvey & Munslow, 2011; Sinclair, 2014) and modified to fit this study (Refer to Appendix 4).

Such types of questions are organised to obtain the participants' attitude to the Eco-fashion design intention and define design standards (for example, performing work on environmental issues in the context of apparel design). For this study, the recommendations' Patton (2015) are used to develop interview questions. All interviews are audio recorded.

**Data Analysis.** As mentioned, all sixty minutes interview are audio recorded. These interviews are transcribed and analysed by creating trees and nodes in Nvivo 10. This method reduces the risk and increased the validity of the correct selection in the scientific articles (Reim et al., 2015).

With the assistance of the Computer-Aided CAQDAS, a significant amount of interview data is used in coding and categorising. In addition, the quality data analysis programme NVivo 10 is used for the sorting, coding, and checking of the interview questions for the designer. The references are uniquely marked and then stored under corresponding nodes.

To maintain authenticity, the following protocol is adopted: (1) an audio-taped interview with the permission of the participant is transcribed, (2) NVivo 10 programme is used for transcriptions of interviews, (3) transcriptions are coded by using "nodes" to represent content created in the software, (4) nodes are ordered based on the main questions, (5) relationships and patterns are taken into consideration as well as memos.

**Validity and Reliability.** As stated, data are coded to find themes related to the research questions via the software NVivo 10. Validity and reliability of the research findings are supported through the different practises as suggested by standard case study methods (Yin, 2015). Interrater reliability is calculated Cohen's kappa by NVivo 10 for each assigned code and averaged to attain the overall code agreement between coders. Cohen's kappa coefficient ($\kappa$) is a statistic value used to measure inter-rater reliability for the qualitative data. Kappa is often equal to or below 1. Different sources point to $\kappa = 0.75$ to 1 as agreement, and 0.4 to 0.6 as moderate agreement (Creswell & Clark, 2017).

The systemic validity of data is verified by the integration from patterns in the various data streams, the on-going chain of evidence from questions to conclusions, the original research validation of the initial report, and finally the study results of the participant's review. This research is faithfully observed by the protocol for the analysis and all data are recorded in the test archive to help the precision of the methodological tests. This analysis is

provided with a framework for this study. In addition to strengthening the trust of the results, the informants include direct quotations (Elo & Kyngäs, 2008).

### 3.2.4 Questionnaire Construction for Discovery of Designer's Behaviour

Regarding the aims of this study, a survey is accepted to investigate and evaluate the designer's behaviour based on the findings of interviews with fashion and apparel designers.

**Instrument Development.** This study adopts closed-ended questions with responses on a Likert-scale from one meaning 'strongly disagree' and five meaning 'strongly agree' (Refer to Appendix 5). According to the hypotheses formed in the literature review, the questionnaire with 32 written questions is organised into three main sections: demographics, factors affecting the designer's attitude to issue design criteria and designer's behaviour toward Eco-fashion design which it is included attitude and social pressure/norms.

Questions regarding the designer's attitude are structured to determine the degree of environmental concern, interest in environmental issues, and action regarding the environmental problems for each participant. Each category includes multi-choice questions with Likert-scale questions from one means 'strongly disagree' and five means 'strongly agree'. Respondents specify their agreement level based on the five scales starting from 'strongly agree' to 'strongly disagree'. The scales from number 1 signify 'strongly disagree', 2 'disagree', 3 'neutral', 4 'agree' and 5 'strongly agree'.

(1) Firstly, the demographic information of respondents has consisted of questions regarding demographic characteristics, gender, education, and experience. The first five questions collect personal data of respondents.

(2) Sets of the close-ended questionnaire of designer's attitude toward Eco-fashion design are adopted from previous literature (Fishbein & Ajzen, 1975; Jimenez, 2016; Jin Gam et al., 2009; Kumar et al., 2017; Parsons & Campbell, 2004; Sinclair, 2014) in 4 questions for environmental knowledge; 4 questions for perceived quality and price value; 4 questions for perceived functional and aesthetic attributes and finally 4 questions for the perceived use of technology with a set of close-ended 1-5 Likert-scale questionnaire. Indeed, the factors being measured are environmental knowledge, perceived quality, and price value, perceived functional and aesthetic attributes and perceived use of technology toward the attitude of Eco-fashion clothing design.

(3) In the third section, designer's behaviour is designed based on the previous researches (Fishbein & Ajzen, 1975; Jimenez, 2016; Jin Gam et al., 2009; Kumar et al., 2017; Parsons & Campbell, 2004; Sinclair, 2014) in 4 questions for subjective norms; 4 questions for attitude and finally 4 questions for behavioural intention toward minimisation of waste and Eco-fashion design with a set of close-ended 1-5 Likert-scale questionnaire. In fact, the factors being measured are subjective norms, perceived quality and attitude and behavioural intention toward actual behaviour of Eco-fashion clothing design. Moreover, independent, and dependent variables are illustrated in Figure 3.6.

**Data Collection.** The inquiry was carried out as a hard-copy and soft-copy survey in March 2019. It was based on a "snowball sampling" method, i.e. a type of convenience sampling method where the respondents recommend new respondents to the researcher. The respondents completed the questionnaires after they agreed to participate in this research and the completed responses numbered 133.

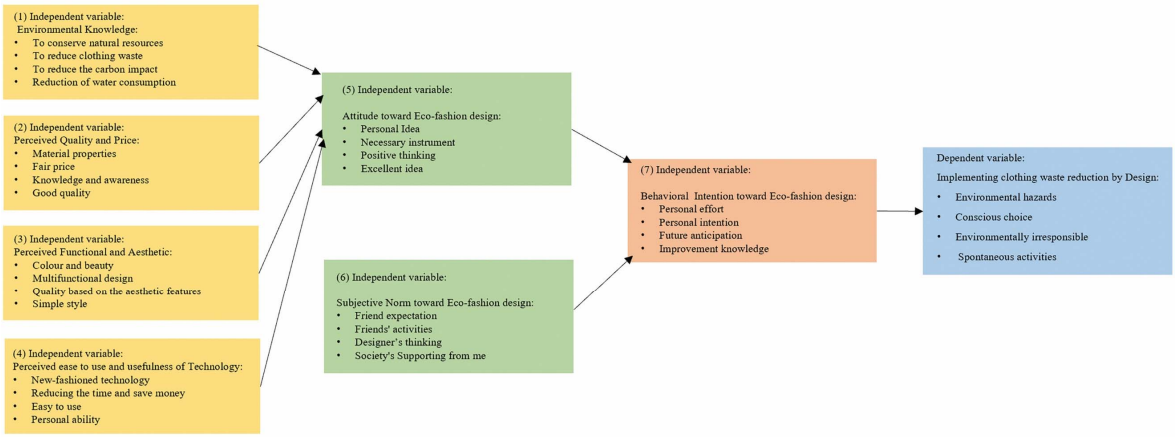



**Figure 3.6:** Independent and Dependent Variables in Designer's Behaviour

**Data Analysis.** For analysing quantitative research, Statistical Package for Social Science (SPSS) version 23 is employed for each variable to obtain the results and identify the relationships. A significance level of 95% is set. Besides, Partial Least Squares Structural equation modelling (PLS-SEM) using the analysis of structure software SmartPLS version 3.0 is utilised to analyse the collected data (For more detail, refer to Figure 3.4). For the model assessment, this study accepts the evaluation of outer measurement and inner structural model (George, 2011; Ringle et al., 2005). This study is conducted by a single source of data as variables. According to Podsakoff et al. (2003), in this study total variance obtained is 36%, thus, CMB does not affect data.

**Reliability and Validity.** The outer measurement model is aimed to calculate the reliability, internal consistency, and validity of the observed variables with confirmatory factor analysis (CFA). Through confirmatory factor analysis, the study aims to identify whether the proposed model meets the standards of reliability and validity. The reliability is tested by Composite Reliability (CR) and Cronbach alpha (α) with both more than 0.70. According to George and Mallery (2003), it is supported to combine the items under each

measure into the intended multi-item scale, with high reliability ($\alpha \geq 0.7$) for all variables. The validity of the scale items is assessed with factor loadings and Average Variance Extracted (AVE) which both greater than 0.5. Moreover, Heterotrait-Monotrait (HTMT) ratio test is applied that construct variables should be below than 0.85 (George & Mallery, 2003).

**Regression Analysis.** In addition, owing to the analysis developed in the literature review and construct hypotheses, this study applies to compute a multiple regression model. According to Henseler et al. (2015), an $R^2$ value of 0.75 is considered valuable. The assumption of independence in errors should be met with Durbin Watson statistic which is between the two critical values of $1.5 < d < 2.5$. If the value is inside this range, so there is a positive autocorrelation between variables and no correlations between model errors (George & Mallery, 2003).

**Structural Model and Hypothesis Testing.** The next step is to measure the inner structural model that includes path coefficient ($\beta$-value), t-statistic value and effect size ($f^2$). According to Ringle et al. (2005), the higher β-value shows the stronger impact of a predictor independent variable on the dependent variable. The coefficient of determination measures the overall effect size explained in the endogenous variable for the structural model and is thus a measure of the model's predictive accuracy. The criteria suggested by Cohen (2013) for interpreting the effect size is given as follows: small effect < 0.02, 0.02 < medium effect < 0.15 and the large effect >0.35 ($p<0.05$). In addition, according to Hair Jr et al. (2016), evaluation of the correlations and regressions is the significance with t-value ≥ 1.96.

## 3.3 Develop Eco-Fashion Design (Phase Two)

The methodology of the second objective includes; a quantitative survey is conducted to investigate the design of Eco-fashion capsule wardrobe among consumers, a qualitative interview with fashion experts in Eco-fashion design is used that may lead to developing an Eco-fashion design process model and finally, a workshop is conducted for exploration of Eco-fashion collection design as named “Eco capsule wardrobe” based on the proposed model.

Regarding this objective, the research develops an Eco model with supporting Eco-fashion material and Eco-fashion techniques toward creation an Eco-fashion collection. Since this research aims to propose an Eco-fashion design model with focuses on phases of the clothing life cycle which affect the pillars of sustainability; social, environmental and economic, therefore findings of this objective helps to focus on the environmental and economic parts and will be used to develop a conceptual model. Moreover, all findings of this objective will be applied to create an Eco-fashion design model with the theoretical structure which focuses on Eco-fashion material and Eco-fashion techniques.

### 3.3.1 Questionnaire Construction for Design Concept and Consumer’s Need

Regarding the aim of this study to develop an Eco-fashion design model, a design concept, as well as consumer’s need in the first phase of the design model, is required. So, an investigation of young consumer’s need (in the range 20 to 30 years old) toward Eco-fashion clothes is developed. Henceforth, finding of this questionnaire helps to support the Eco-fashion collection toward exploration of Eco-fashion collection design as named “Eco capsule wardrobe”.

**Instrument Development.** The instrument used in this study was first investigated by previous researchers. Based on consumer's opinions, sets of the close-ended questionnaire are designed (Refer to Appendix 6). The questionnaire is created to test the willingness of the consumer to obtain a capsule wardrobe by focusing on making profits and helping them to save time and money.

The questionnaire on the research instrument is comprised of three sections with 67 questions: demographics, involvement with a capsule wardrobe and construct a favourite casual wardrobe. The multi-choice questions for each group are scaled from one to five in Likert-scale questions, where number one means 'strongly disagree' and number five means 'strongly agree'. Indeed, respondents specify their agreement level based on the five scales starting from 'strongly agree' to 'strongly disagree'. The scales from number 1 signify 'strongly disagree', 2 'disagree', 3 'neutral', 4 'agree' and 5 'strongly agree'.

(1) The first section is to identify samples of the respondents, socio-demographic information. Age, level of education and employment status of respondents are achieved. The first five questions gather personal data from respondents.

(2) The second section of the questionnaire contributes to the involvement of participants in their clothing wardrobe. It is included as items measuring product involvement. In addition, product involvement with their essential casual clothing wardrobe is measured by Zaichkowsky (1994) which is focused on the personal involvement inventory (Table 3.1).

**Table 3.1:** Product Involvement Measurement

| To me [object to be judged] is | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Important | 1 | 2 | 3 | 4 | 5 | Unimportant* |
| 2 | Boring | 1 | 2 | 3 | 4 | 5 | Interesting |
| 3 | Relevant | 1 | 2 | 3 | 4 | 5 | Irrelevant* |
| 4 | Exciting | 1 | 2 | 3 | 4 | 5 | Unexciting* |
| 5 | Means nothing | 1 | 2 | 3 | 4 | 5 | Means a lot to me |
| 6 | Appealing | 1 | 2 | 3 | 4 | 5 | Unappealing* |
| 7 | Fantastic | 1 | 2 | 3 | 4 | 5 | Mundane* |
| 8 | Worthless | 1 | 2 | 3 | 4 | 5 | Valuable |
| 9 | Not needed | 1 | 2 | 3 | 4 | 5 | Needed |

* Indicates the item is reverse scored

Indeed, Zaichkowsky measurement has used the Semantic Differential Scale (SDS) measurement. SDS is a survey or questionnaire rating scale that asks people to rate a product, company, brand, or any "entity" within the frames of multi-point rating options. These survey answering options are grammatically on opposite adjectives at each end. Questions for the involvement with capsule wardrobe are adopted in three close-ended dichotomous from previous literature (Heger, 2016; Hsiao & Grauman, 2018; Jin Gam et al., 2009), where respondents indicate by ticking either Yes, No or Maybe and 9 close-ended questions of product involvement measurement using 1-5 Likert-scale questionnaire.

(3) The third part of the questionnaire is constructed based on the favourite casual wardrobe including 50 close-ended questions. Respondents specify their agreement level based on the five scales starting from ‘strongly disagree’ to ‘strongly agree’. The scales from

number 1 signify ‘strongly disagree’, 2 ‘disagree’, 3 ‘neutral’, 4 ‘agree’ and 5 ‘strongly agree’. Among the questions, there are different types of clothing which respondents can give points to them based on the level of interest. Hence, the researcher designed 51 items in flat sketches in Adobe Illustrator 2019. So, there are eight different types of Top, six different types of Shirt, eight different types of Jacket, ten different types of Dress, ten different types of trouser and seven different types of Skirt. The measurement items for favourite casual wardrobe are referred from previous literature (Collings, 2015; Heger, 2016; Vazquez, 2015). Prior to the survey questions, a description of the capsule wardrobe meaning is given to inform participants to respond answer more appropriately.

**Data Collection.** The inquiry was carried out as a hard-copy survey in March 2019 in Malaysia and Iran. A surveyor visited the site to administer surveys and gave questionnaires directly to young women who were willing to participate. Likewise, the questionnaire was programmed with Google Forms and the link to the questionnaire was disseminated. This study was based on a “snowball sampling” method, i.e. a type of convenience sampling method where the respondents recommend new respondents to the researcher. The snowball experiments contributed to the sharing of encounters not only in the vicinity of the researcher but also with each other. Differences in age, culture and education level among the participants may have a positive effect on the data collected (Heger, 2016).

The respondents completed the questionnaires after they agreed to participate in this research and the completed responses numbered 386. However, based on the research theme, only 214 of respondents were women in range 20 to 30 years old. Therefore, 214 respondents

are accepted for this investigation. Before collecting data, a pre-test was performed with five graduate student age between 20 to 30 years old.

Participants were prompted to choose different types of clothes to make their capsule wardrobe. Therefore, respondents indicated their level of agreement in the specific clothes for their favourite wardrobe based on the five-point Likert-scale from 'strongly agree' to 'strongly disagree'. Among the questions, there are different types of one garment which respondents can give points to them based on the level of interest. Henceforth, there are eight different types of Top, six different types of Shirt, eight different types of Jacket, ten different types of Dress, ten different types of trouser and seven different types of Skirt.

**Data Analysis.** Statistical Package for Social Science (SPSS) version 23 is employed, and simple descriptive analysis is used to study the online data. Empirical research using a survey is carried out to investigate the consumer's willingness. A significance level of 95% is set. The reliability is tested by Composite Reliability (CR) and Cronbach alpha (α) with both more than 0.70.

### 3.3.2 In-Depth Interview of Development Eco-Fashion Design

Regarding the aim of this study to develop an Eco-fashion design model, a qualitative interview with fashion and apparel experts in Eco-fashion design subject requires to develop the model. So, an investigation among eight sustainable fashion designers is accepted.

**Data Collection.** The qualitative analysis will be driven by formal criteria in the generation of research questions, according to Marshall and Rossman (1995). This study involves in-depth interviews with eight fashion eight sustainable fashion designers (three

only designers, two designers and fashion consultants, and three fashion lecturers) in Malaysia and Iran.

The selection criteria for this study are these respondents have a long experience in the clothing and apparel industry with the knowledge in sustainable design more than 10 years, and they showed a willingness to take part in this study. The interviews were conducted with an interview guideline. For this study, the recommendations' Patton (2015) are used to develop interview questions. The invitation letter was sent by e-mail to the participants (Refer to Appendix 4 - part two). The interviewees discussed specific issues of fashion design, Eco-fashion materials and design concepts due to insufficient research on the vast quantity of Eco-fashion design, open-ended questions are used.

The interviewer addresses the physical and social scenario of interviewees following the presentation and introduction of the main subject. Subsequently, the interviewer tries to know more about the interviewee's interaction as the core mechanism for gathering knowledge related to design intention toward using Eco-fashion materials. The interview schedule is organised into two main parts with seven questions: participant's Eco-fashion design process, and existing factors in three main steps in the general Eco-fashion design process.

(1) Firstly, the information about the design process of each participant shows their ability and how they are involved in the sustainable issue.

(2) In the second section, sets of the six open-ended questions are designed based on each step in the existing Eco-fashion design process. As stated, these steps are adopted from the previous researches (Cross, 2003; French et al., 1985; Jin Gam et al., 2009; LaBat & Sokolowski, 1999; Lamb & Kallal, 1992; Orlando, 1979; Pahl & Beitz, 1984; Watkins,

1988). All questions are modified to fit with the subject of the clothing life cycle in this study (Refer to Appendix 4 – part two).

This interview is designed to discover the important factors to each step in the general Eco-fashion design process, as well as to know the process of designer's artwork and how they think about developments in the Eco-fashion design process with regarding phases in the clothing life cycle. The precision of data processing and interpretation is improved with utilising a voice recorder. The instrument used in this study was first investigated by previous researchers.

**Data Analysis.** In phenomenology, the focus is on the phenomena rather than the individual, so it is not of great importance for the data analysis which participants or which data gathering method is used. The following seven steps of the Hycner (1985)'s Guidelines are used to analyse data obtained from interviews. Figure 3.7 illustrates the process of the conduct the in-depth interview and the procedure of the outputs. All in-depth interview sessions in this study have followed this step by step guideline. Therefore, all transcribed are analysed by creating trees and nodes in Nvivo 10.

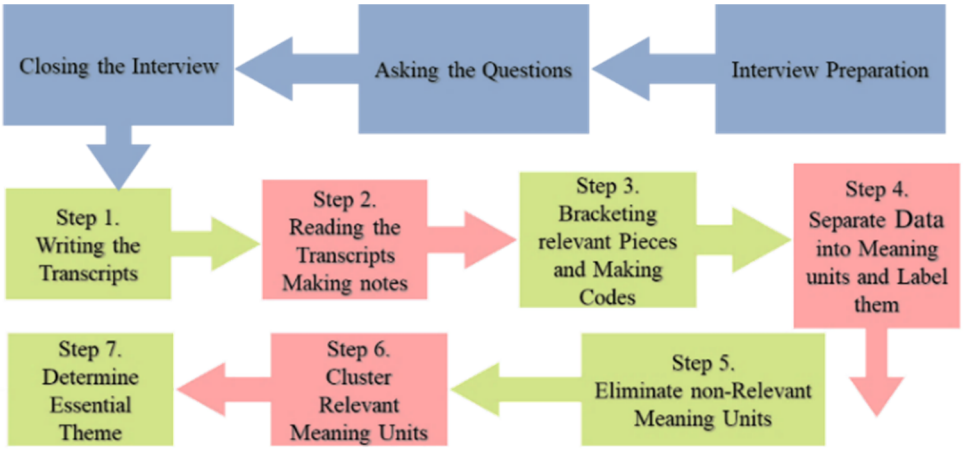



**Figure 3.7:** Conduct the In-Depth Interview Results (Hycner, 1985)

**1. Transcription.** Vocal data of each participant must be transcribed in detail with included the participant's actual comments.

**2. Reading transcripts for a sense of the whole and making notes**. After the transcriptions, the details are read and interpreted many times by the researcher.

**3. Bracketing relevant pieces and making codes**. Reading the transcripts, bracketing tips help to separate the personal experience of researchers from the participant's phenomenon (Connell, 2010). Indeed, by bracketing step, the researcher attempted to put herself with live participants through their experience.

**4. Separating data into meaning units and label them**. After analysing transcripts, according to Giorgi (1999), the words and phrases are divided by names to produce the same units as labels. Therefore, each unit of meaning is labelled with descriptive comments which describe the nature of the unit of meaning.

**5. Elimination non-relevant meaning units.** Therefore, the researcher explains the study questions to each meaning unit and removes the remaining issues.

**6. Cluster unit of relevant meaning.** Subsequently, specific meaning units are organised into groups with a common theme and put into categories.

**7. Determine essential themes.** Finally, all the groups (clusters) are analysed to find out whether the nature of these clusters' essence in a core theme. Afterwards, these themes will be accompanied by the study participant's descriptive comments.

**Validity and Reliability.** Reliability can be observed when one can use this essential description continuously (Giorgi, 1999). Moreover, the validity of the research is improved

with several methods of data collection regarding the interpretation and analysis of interviews. Giorgi (1999) noted that interviewers may make an error regarding the test hypothesis with previous experience and therefore may undermine the legitimacy of the research. Hence, the researcher follows Patton (2005)'s recommendation to "explore one's predispositions and making biases explicit to the extent possible and engaging in mental cleansing processes" to decrease researcher bias.

A rich explanation of context, procedures and participants used in this analysis are presented to further improve the creditworthiness of the study so that researchers can extend the findings to other settings or similar contexts (Creswell & Clark, 2017). Moreover, according to Saunders et al. (2009), a structured in-depth interview, in other words, standardization in the interviews, may lead to reduce the reliability concerns. Interrater reliability is calculated Cohen's kappa by NVivo 10 for each assigned code and averaged to attain the overall code agreement between coders. Kappa is often equal to or below 1. According to Creswell and Clark (2017), different sources point to $\kappa = 0.75$ to 1 as agreement, and 0.4 to 0.6 as moderate agreement.

**Ethical Consideration.** Ethical issues are described in research interpretation, research system creation, data collection, data analyses and the production of research findings (Saunders et al., 2009). Hence, this research accepts principles of MRS code to consider ethical manner (Heger, 2016).

The MRS code's principles are the following: Researchers must ensure that participants are voluntarily chosen; be transparent as to the topic and purpose of data collection; respect to the information confidentiality in their work; esteem the rights and well-being of all individuals; ensure that respondents are safe in the planning, execution and

recording of their professional activities; make sure that the professional activities are done by people with appropriate skills, qualifications and experience; protect the reputation and integrity of the profession.

### 3.3.3 Design Experiments on Eco Capsule Wardrobe

Regarding the aim of this research, this study develops an Eco capsule wardrobe based on the proposed Eco-fashion design model. Hence, guided by the proposed Eco-fashion design model and design concept achievement from the capsule wardrobe survey distributed between young women consumers (Refer to page 119), an Eco capsule wardrobe is designed and developed through a workshop in May 2019 in Iran. This workshop was composed of three young fashion and clothing designers with more than 4 years of experience in the casual clothing design and interested in the Eco-fashion design. Indeed, this study evaluates the proposed model of Eco-fashion design process model develops and designs an Eco capsule wardrobe. In addition to following the model step by step, the designer's team in the workshop applied two noteworthy points in the model that should be emphasised more during design experiment:

i. Using the concept of C2CAD model (Jin Gam et al., 2009) for choosing the Eco-fashion material and evaluation of the quality and design.
ii. Using the Eco design techniques used in previous researches such as multifunctional design and zero-waste design (Cao et al., 2014; Jin Gam et al., 2009; Koo et al., 2014; Rahman et al., 2014).

This study has applied the steps of the proposed Eco-fashion design model (Refer to the next chapter, Table 4.19) to design an Eco-fashion collection (casual Eco capsule

wardrobe) young women consumer between range 20 to 30 years old. Hence, workshop activities are discussed in the following in three steps.

#### 3.3.3.1 Step One: Problem Definition & Research

This step is consisted of "Define Consumer's Need" and "Define Idea".

- **Define Consumer's Need**

**1- Problem Identification.** Among in designer's team discussion, the problem is identified as excessive clothing consumption, as well as increasing clothing and fabric waste based on the statistical data published in Statista.com. Almost 3.753.63 million pieces of dress from women garment's type were produced and purchased which it is expected to reach 3.940.31 million until 2023. The average price per unit in the segment for Dresses amounts to US$ 28.70 in 2019 (Statista, 2020).

**2- Analyse and Problem Definition.** As mentioned before, the consumers of young women's wear (age between 20 to 30 years old) are identified as a target market. Also, this group of women is seen as the most clothing consumers and more conscious about socially and environmentally issues (Ekström & Salomonson, 2014). The thinking about the increase in clothes purchasing with short lifespan can have harmful environmental impacts lead to both production and disposal (Rhee & Johnson, 2019). Therefore, the critical problem of clothing waste may result in a lack of awareness and thinking about consumption (Cowan & Kinley, 2014; Rhee & Johnson, 2019).

**3- Search for the Alternative.** The outfit is not the only decision that people have to focus on during the day (Heger, 2016). Therefore, people try to apply the capsule wardrobe concept for decreasing the number of decisions that should be made. Hence, the designer's

team decided to focus on the capsule wardrobe as a new strategy to control clothing consumption. Regarding using this concept, it can help people to manage their clothing wardrobe, reduce to buy unnecessary clothes, decrease stress, and save money and time. In addition, according to the findings of the fashion market, it is needed to see such clothes placed together and be in the various types, in other words in the mass-production.

- **Define Idea**

**1- Generation a Concept.** A capsule wardrobe is a limited set of garments by many visually compatible outfits (Hsiao & Grauman, 2018). Hence, the main issue is making a series of essential Eco clothing in women's capsule wardrobe (age between 20 to 30 years old) that prevents from clothing consumption problem and reduces the clothing waste. Therefore, the concept of a capsule wardrobe can help consumers in trying to decrease the number of decisions, as well as save money and time.

It is mostly known in western societies and recently eastern countries. Generally, it is done by women especially young age group and a small collection of pieces everyone loves (DeLong et al., 2019). Hsiao and Grauman (2018) stated that a capsule wardrobe is included a set of a few essential clothing items and accessories like a puzzle that can be mix and match well into many visual outfits. The consideration of the capsule wardrobe can lead to encouraging consumers to change their habits toward removing excessive consumption habits (Heuer & Becker-Leifhold, 2018).

Hence, the designer's team surveyed the possession and perception of capsule wardrobe among young women (age between 20 to 30 years old). So, this study accepts a survey to investigate the consumers' belief and their needs for possessing an essential clothing wardrobe (Refer to page 119). Investigation among young women is shown that

they agree with the idea of possessing a capsule wardrobe, and the answers indicate that the capsule wardrobe which includes only essential clothing is an interesting, understandable, and acceptable phenomenon for them. Hence, focus on the creation capsule wardrobe as a catalyst to reduce the consumption based on the market needs is reasonable.

**2- Select Definitive Idea.** On the other hand, a capsule wardrobe is part of fast fashion products such as other products which affect the environment. Additionally, Joy et al. (2012) stated that with increasing fashion styles toward sustainability and sustainable issues, young consumers are becoming aware of sustainable values as well as struggling to balance their fashion needs. In addition, based on the findings of this study concerning consumer's behaviour, they claim that want to meet the fair price, good quality and stylish sustainable and Eco-fashion clothing, where Eco-fashion clothes can balance their fashion needs, in the fashion market.

Owing to improving the sustainable disposal clothing behaviour, they are become more conscious and follow clothes with long lifespan to save money and time. They state that the two most problems which they faced in the purchasing Eco-fashion clothing are not much available in the fashion market and if they can find, they are in the limited colour, design, and expensive. So, the designer's team decided to design a capsule wardrobe with consideration of sustainable characteristics during production and using Eco-fashion materials which can be a definitive idea of this study, where it is named "Eco capsule wardrobe".

The idea of a capsule wardrobe needs a specific style based on the Eco-fashion design approach. This approach is used to support the consumer's daily clothes wearing and get still looking fashionable with at least setting price and good quality. Since most parts of this

project are done in Malaysia where it is a tropical country, therefore, the design theme is chosen “casual summer style” for young women ages between 20 to 30 years old. The West is the trendsetter of the present fashion world. Their clothing includes jeans wear, t-shirts, skirts, pants, shorts etc. On the contrary Eastern clothing though it is fast changing depicts tradition and culture. Religious beliefs, cultural obligations, traditions determine the code of dressing in the east. On the other hand, according to reported statistical data in Statista.com (2019), the new generation has already changed their way to be modern stylish by following the latest trends around the world.

Additionally, neutral colours are chosen as a colour palette. They are not too bright or eye-catching and sometimes called “earth tones”. The most basic neutral colours include white, black, grey, brown, and the various shades of these four colours (Kobayashi, 1987). The main issue is to design a capsule wardrobe which can show off the outfits concerning nature. Therefore, based on the finding of Radeloff (1991), the researcher chose this colour palette with consists of white, nude, beige, taupe, marine, grey, khaki, olive, navy blue and brown colours.

#### 3.3.3.2 Step Two: Creative Exploration

This step is consisted of “Design Criteria”, “Collaboration and Consultation” and “Product Design”.

- **Design Criteria**

**1- Environment Protection.** During the design of Eco-fashion products, each material must be chosen responsibly to protect the concept of the C2C model (McDonough & Braungart, 2002). Therefore, consumers can purchase Eco-fashion clothes in the capsule

wardrobe and manufacturers can easily recycle or reuse these clothes after usage. Hence, the designer's team considered recyclable parameter in selecting the materials process.

**2- Quality and Pricing Value Requirements.** Based on the achievement in the first objective that most of the young women consumers are influenced by price and good quality of Eco clothing during purchase such clothes (Valaei & Nikhashemi, 2017). Also, designing for Eco clothes is a risky task for designers, then designers are very sensitive to choose Eco-fashion materials. Therefore, choosing Eco-fashion materials with acceptable price, as well quality is a reasonable point in the capsule wardrobe design which was considered by the designer's team.

**3- Functional and Aesthetic Value Requirements.** Kjaerheim (2013) declares that not only quality of materials is an essential key in designer's attitude to the success of making sustainable clothes, but also the functional and aesthetic features of Eco-fashion materials are considered for any successful design in the Eco-fashion clothing. Therefore, materials should be chosen based on the discussed design criteria. The fabrics and other materials should be selected based on environmental protection property, good quality, acceptable price, high performance, and good appearance. Therefore, for this research, the outer and inner layers of clothes are from the non-hazardous biodegradable materials, technical or biological nutrient. The initial goal in sourcing the inner layers' fabrics is to use cotton since it is suitable for body health (Jin Gam et al., 2009). Moreover, all materials are also able to be recycled. One of the goals of this project is to display and use of Eco-fashion material as sustainable contents.

By consulting with Eco-fashion companies and NGO partners, the designer's team decided to choose the five types of fabrics based on the cotton and polyester materials to

ensure they are categorised under the concept of sustainable C2C model (McDonough & Braungart, 2002) and can meet designer's demands for designing the sustainable collection. A benefit of choosing polyester fabrics is its ability to be recycled or burnt for energy, as well as acceptable price and good quality. Indeed, recycled polyester is almost the same price and quality of the virgin polyester in the textile market.

Cotton fabrics are commonly used in casual clothes due to their comfort, recyclable, good quality, nice appearance, and high-performance power in versatility with any design and style (Table 3.2). Moreover, according to the finding achieved in the textile market, the quality of the recycled cotton is the same as the virgin cotton and with the acceptable price. According to McDonough and Braungart (2002), the recycling process is suggested as the most suitable solution for recovering technical nutrients. Hence, to achieve acceptable quality after recycling, a combination of two different materials in fibre's structure is not recommended (McDonough & Braungart, 2002). The designer believes second-hand or other Eco-fashion materials such as leftover or upcycled are not suitable for mentalist issues and mass-production. Moreover, details such as the type of thread used to sew the clothes can take otherwise Eco-related clothing and spoil their ability to recycle.

- **Collaboration and Consultation**

Regarding Jin Gam et al. (2009), Eco-fashion design process does not have effects on the environment. Designers and manufacturers may have connections with other companies to solve their environmental problems, for instance, chemical contents used in the design process. It is difficult to find information about the textile dyeing process of cotton fabrics in the textile market. Hence, four natural dyes are used for dyeing cotton fabrics based on the neutral palette. Global Organic Textile Standard (GOTS) is the leading set of

factors regarding organic fabric processing such as dyeing and finishing. The researcher investigated GOTS certified dyes for cotton fabric; Henna, Camellia sinensis-tea leaf, Turmeric and Myrobalan from the textile market in Tehran Big Bazaar and used the light olive, nude, beige, and ivory dyes to dye cotton fabrics, respectively. The only mordant used to help fixing natural dyes in the dyeing process is salt (NaCl).

**Table 3.2:** Profile of Fabrics and Materials used for Making Eco Capsule Wardrobe

| **Fabrics and Materials** | **Type of Materials and Benefits** | **Name** | **Description** |
|---|---|---|---|
| Outer Layers | Cotton<br><br>Biological Nutrient (ability to be composted returning nutrients to the earth) | Batist | -un-dyed cotton (Co) fabrics<br>-in size 35 " in 95 " from Organic Cotton Sapphire Textile Pvt. It'd.<br>-Commonly used in casual clothes<br>-Breathable and easy-to-wash. |
| | | Jean | -recycled organic fabric (*r-Co*)<br>form Guess Sustainability Campaign of FJBenjamin Sdn Malaysia |
| | Polyester<br><br>Technical Nutrient (ability to be recycled or burnt for energy) | Crepe | -recycled fabrics made of a plastic bottle (*r-PES*)<br>-taupe 80 in 12, olive 35" in 35" and marine 80" in 12" from Kloth Care Malaysia Sdn Bhd and Waste2Wear<br>- suitable for more durable results |

**Table 3.2** continued

| | | | |
|---|---|---|---|
| Outer Layers | Polyester<br><br>Technical Nutrient (ability to be recycled or burnt for energy | Chiffon | -recycled fabrics made of a plastic bottle (*r-PES*)<br>-white 80" in 12", navy in 50" in 12" and brown 35" in 40" form Kloth Care Malaysia Sdn Bhd and Waste2Wear<br>-light and translucent<br>-very well draping for casual style. |
| Outer Layers | Polyester<br><br>Technical Nutrient (ability to be recycled or burnt for energy | Polyester Gabardine | -unsold polyester (PES) trouser from Kloth Care Malaysia Sdn Bhd and Waste2Wear |
| | | Satin | -unsold polyester (PES) dress from Kloth Care Malaysia Sdn Bhd and Waste2Wear |
| Inner Layers | Polyester<br>Technical Nutrient | Satin | -navy 30" in 20" from Kloth Care Malaysia Sdn Bhd and Waste2Wearsoft<br>-can be worn comfortable ability<br>-to be recycled or burnt for energy |
| Thread | Cotton<br>Biological Nutrient | Cotton Thread | -ability to be composted returning nutrients to the earth |
| | Polyester<br>Technical Nutrient | Polyester Thread | -ability to be recycled or burnt for energy |

**Table 3.2** continued

| | | | |
|---|---|---|---|
| Zipper | Polyester<br>Technical Nutrient | Double-Sided Zipper | -affordable and easy to connect two different pieces.<br>-easy to disassemble during the recycling<br>- ability to be recycled or burnt |
| Buttons | Polyester<br>Technical Nutrient | Railroad buttons | -no confusing instructions<br>-ability to be recycled or burnt for energy |

- **Product Design**

**1- Conceptual Design.** The idea of Eco-fashion clothes is seen to be unstylish and unfashionable based on the consumer's needs (Moon et al., 2015; Sisco & Morris, 2012). Also, young women need more aesthetically good designs (Joergens, 2006; Niinimäki, 2010). However, diverse and versatile products are needed (Van Nes & Cramer, 2005). Valaei and Nikhashemi (2017) showed that most of young women consumers are considered design features and interested to buy functional sustainable products. Besides, multifunctional and modular fashion designs are one of the new styles in the latest Eco-fashion clothes (Cunha & Broega, 2009). By using the multifunctional design platform, the clothes have removable or exchangeable parts which allow for adaptation as well as upgradeability (Cao et al., 2014).

Based on the finding of consumer's behaviour concerning Eco-fashion clothes, they are not interested in purchasing Eco-clothes with one purpose, not practical and out of style. Besides, the prototype was designed and developed by using a 3D simulation software

CLO3D and draping them to find the best use of the fabrics, as well as grading patternmaking for mass-production (Refer to Appendix 10). The number of pieces in capsule wardrobe recommend as few as ten to as many as fifty.

As shown in Figure 3.8, the designer's team in the workshop chose 10 common clothes according to the evaluation of young women's interest in having casual clothes in their wardrobe. Respondents (young women between the ages of 20 and 30) expressed their interest in having types of casual clothes in their wardrobe. Top no. 3, 4 and 5; Blouse no. 2, 3 and 6; Jacket no. 1, 2, 3 and 6, Dress no. 3, 4, 5, and 7; Trouser no. 2, 5, 6, 8 and 9; Skirt no. 2, 5 and 6 were more popular items with a good mean more than 4 (For more detail, refer to Table 4.15). So, the activities in the workshop were followed based on selected items.




**Figure 3.8:** Workshop Activities of Prototypes Development

Therefore, these twenty-two popular ones (mentioned above) selected by respondents but based on the objectives of this study, these selected clothes were slightly modified in the design process of the workshop and moved towards sustainability and multi-functionality in ten clothes. In fact, ten types of clothing were selected, but most are considered multifunctional because of their multiplicity. The environmental perspective of clothing design led to choosing multi-functional features to improve utilising clothes and extend their lifespan.

Besides, Computer-Aided Design (CAD) was applied to the pattern making and grading process of all the pieces in the Eco capsule wardrobe. Designers used Gemini Pattern Maker and Marvellous Designer software to illustrate and simulation of clothing designs. For this study, medium size (38) of the global standards was used for clothing measurement. Moreover, using the CAD system can reach more sustainability in Eco-fashion design process with reduction paper waste, time waste and money-saving.

**2- Embodiment Design.** Hence, according to the concept of multifunctional convertible clothes, this study creates the design of ten clothing items with using a zero-waste technique as named “jigsaw puzzle technique”. As a side note to focus on the environmental concerns, it is needed sustainable techniques to improve the utilisation of clothes and reduce fabric waste and help to the recycling programme with the design for disassembly in the embodiment design.

The total study involved the design of ten pieces using jigsaw puzzle technique. As a side note to focus on the environmental concerns, it is needed using sustainable techniques to improve the utilisation of clothes and reduce fabric waste, as well as help to the recycling programme with the design for disassembly during the embodiment design phase. In this

technique, a geometric area was fixed to create clothes with minimum or zero fabric waste (Refer to Appendix 10).

The Eco capsule includes one trouser, two t-shirts with curved neckline and long/short sleeve, one blouse, a mid-length skirt, one jacket with shawl-collar, a mini coat with baby collar, a mini skirt, one jumpsuit and cardigan. To minimise the material, use and effort for easy recycling, the researcher decided that the jacket, blouse, and cardigan prototypes without these additions still retained an attractive appearance. Table 3.3 shows all clothes designed and produced in the workshop activity.

The pattern making was strictly critical due to the limited size and type of fabrics. Convertible clothes were the main point of design in this capsule wardrobe. Hence, all the clothes were made with some detachable parts using *railroad* buttons and zipper as attaching or detaching joints that increased interchangeability (Refer to Appendix 11).

The initial design was developed using a combination of flat patternmaking by applying jigsaw puzzle methodology via CLO3D (Refer to Appendix 10). As mentioned, cotton and polyester threads were used to sew. The stitches in this type of design must not only be durable during the consumer use phase but also it must be easy to separate at the end of usage. The researchers decided to concentrate their attention on the usual straight stitch, after visually examining and hand-pulling other hand stitching forms. Moreover, as an example in Appendix 9, the researcher used casual fashion trends of summer to select the best outfits (Neutral colour schemes, 2011), (Carver, 2015), (Joy, 2017) and (Trending On Chictopia, 2019) (Refer to Appendix 11).

**Table 3.3:** Profile of Ten Pieces of Eco Capsule Wardrobe

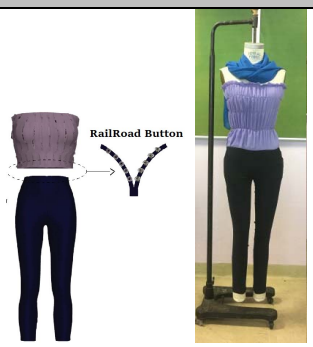
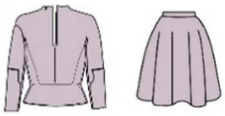
| **Type of Clothing** | **Bolero & A-line Skirt** | **Jumpsuit** |
|---|---|---|
| **Illustration** |  |  |
| Fabric | Brown *r-PES* Crepe | Taupe *r-PES* Chiffon & *r-Co* Jean |
| Dye | Disperse dye | Disperse dye & Indigo |
| Thread | Polyester | Cotton & polyester |
| Accessories | *Railroad* button | *Railroad* button |
| Lining Fabric | Brown *r-PES* Satin | - |
| Dye for Lining Fabric | Disperse dye | - |
| Selected Clothes by Respondents |  |  |

**Table 3.3** continued

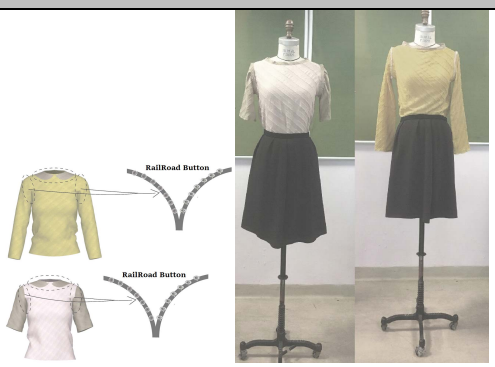
| Type of Clothing | Cardigan | Shirts |
|---|---|---|
| **Illustration** |  |   |
| Fabric | Olive *r-PES* Chiffon | Light olive, Nude & Beige cotton *Batiste* |
| Dye | Disperse dye | Henna, Camellia sinensis-tea leaf & Turmeric |
| Thread | Cotton & polyester | Cotton |
| Accessories | - | *Railroad* button |
| Lining Fabric | Ivory cotton *Batiste* | - |
| Dye for Lining Fabric | Myrobalan | - |
| Selected Clothes by Respondents |  |  |

**Table 3.3** continued

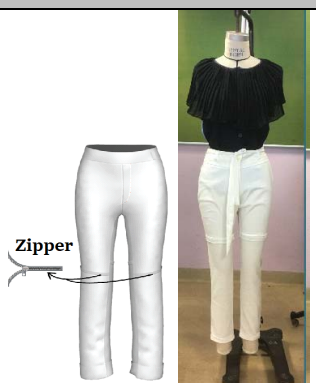
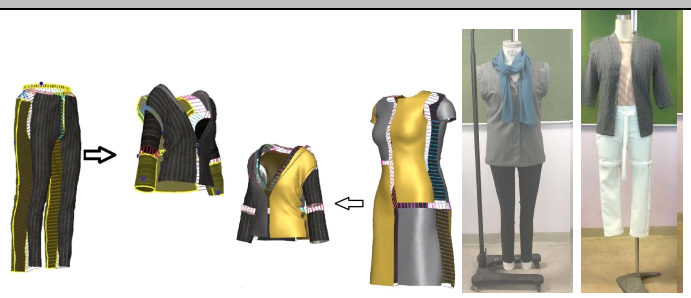
| Type of Clothing | Straight Trouser | Mantua/Mid-Length Dress |
|---|---|---|
| **Illustration** |  |  |
| Fabric | White *r-PES* Crepe | Marine *r-PES* Chiffon & Navy *r-PES* Crepe |
| Dye | Disperse dye | Disperse dye |
| Thread | Polyester | Polyester |
| Accessories | Zipper | - |
| Lining Fabric | - | Navy PES Satin |
| Dye for Lining Fabric | - | Disperse dye |
| Selected Clothes by Respondents |  |  |

**Table 3.3** continued

| **Type of Clothing** | **Shawl-Collar Jacket** |
|---|---|
| **Illustration** |  |
| Fabric | Grey striped PES Trouser |
| Dye | Disperse dye |
| Thread | Polyester |
| Accessories | *Railroad* button |
| Lining Fabric | Grey PES Satin Knee-length Dress |
| Dye for Lining Fabric | Disperse dye |
| Selected Clothes by Respondents |  |

During the sewing process, the stitches must be durable which can be separated easily at the end of its usage. After hand and machine stitching process were done, a simple straight stitch is been centred. Since the sewn power between the two standard straight stitches was not substantially different. The use of a standard straight stitch of six stitches per inch to sew is therefore decided.

#### 3.3.3.3 Step Three: Implementation

Cost estimation, design and quality will be considered and evaluated in this step. After all, after evaluation design outputs based on the design, quality and price features, the final design will be developed and delivered.

- **Evaluation**

**1- Cost Estimation.** As the fashion and textile industries become globalized, the cost of production for textile is difficult to evaluate. Depending on manufactures and raw materials used, the cost for clothing can be substantially different. In the clothing industry, the cost analysis involves raw materials, production design, assembly, finishing, products and duty (Jin Gam et al., 2009).

Based on the goals and small-scale of this study, as well as it was under the research project of the university with no industrial production ability, therefore estimating the accurate cost and evaluation was difficult. Therefore, the cost evaluation of design outputs is not one of the significant scopes of this project. Indeed, focusing on making a profit with Eco-fashion materials and reduce clothing and fabric waste with related factors were the significant issue of this study.

**2- Design and Quality.** All clothes in the Eco capsule wardrobe met the requirements outlined for the research. They are designed based on the multifunctional convertible features that *railroad* buttons help to this property. Furthermore, the buttons were covered with a layer of the fabric to have a good appearance. In addition, the pattern was planned to be detached trouser in the leg thigh area and become shorts with detachable hidden zipper.

Overall, the wardrobe has a casual look designed to functional purpose to allow for a sustainable lifespan. After usage and finishing the useful life of Eco clothes, they can be disassembled and recycled easily. Cotton fabrics can either become compost or use into a new purpose. The polyester fabrics can be melted down and then remade into new fabric or burnt for energy. The polyester *railroad* buttons and zippers can reuse or recycled for another purpose. The evaluation of design features such as aesthetic and functionality and quality of the materials in Eco-fashion clothes are discussed in the next part (Refer to step three for objective three).

- **Development and Deliver**

Development to improve the design and quality of the materials are deliberated in the discussion part of this study. As mentioned, this study is under the research project of the university with no industrial production ability due to the production phase was not the main aim of this research.

**Summary.** Regarding the propose of Eco-fashion design model and following its steps, ten multifunctional items were designed by designer's team. Overall, each of the ten items has different looks and support different ways to wear. Therefore, wearing different styles with ten pieces can support more than fifty different outfits, as well as all twenty-two pieces which young consumers had chosen them for their favourite clothing wardrobe. Moreover, fabric-zero waste and multifunctional design techniques are used to reduce the fabric and clothing waste, as well as increasing the utilisation of clothes.

## 3.4 Evaluate Society's Willingness and Perception to Eco Capsule Wardrobe (Objective Three)

The methodology of the third objective includes a qualitative interview with young women (age between 20 to 30 years old) to evaluate the Eco-fashion collection, where is designed based on the Eco-fashion collection design model of this study. Regarding this objective, the research investigates on the consumer's willingness of the Eco-fashion collection design made of the proposed Eco-fashion design model. Hence, this research aims to propose a conceptual model with focuses on phases of the clothing life cycle which affect the pillars of sustainability; social, environmental and economic, therefore findings of this objective help to focus on social and environmental parts and will be used to develop a conceptual model. As stated, this research desire to create an Eco-fashion design model with the theoretical structure with focuses on Eco-fashion material and sustainable techniques, therefore, findings of this objective will be used to evaluate output designs made of following this Eco-fashion design model.

### 3.4.1 In-Depth Interview with Young Women Consumer

Guided by the Eco-fashion design model, an Eco summer capsule wardrobe for young women is designed and developed. Hence, two focus groups discussion is conducted with women consumers to evaluate consumer's acceptance and perception of the design and quality of the Eco capsule wardrobe (Koo et al., 2014).

This is supported by Caelli (2001) who stated that qualitative research can be superior rather than the quantitative research when you are pursuing to understand human perception and feelings. In particular, the quality and design evaluation consist of the clothing quality of the style, functionality, appearance, detail design and quality of the material in Eco capsule wardrobe.

**Data Collection.** Prior to the focus group sessions, the participants were informed that the data collection is for research purposes only. Details on the research are limited to avoid influencing the responses of the focus groups. A semi-structured interview guide is created before starting the sessions to keep the two-focus group underway concurrently. The interview guide is structured based on the conceptual model of this study. All focus groups can openly react, talk, and venture out if needed during the session. The main aim of the focus groups is to get a clear understanding of the participant's view of the topics discussed. The invitation letter was sent by e-mail to participants who have attended the survey of the capsule wardrobe (Refer to Appendix 7).

The focus groups are chosen based on a different group of consumers. A group of twelve young women consumer is considered for the first focus group who had never seen each other before. This focus group is considered as a group of young women consumer who did not all know one another. Hence data collection from a community where participants know each other, the debate and conversation will become less intense, not as in detail due to unconscious understanding of the other individual's behaviour and expressions.

Besides, the data gathering from the focus group of consumers those met each other before may boost the insightful data to obtain because of the safety and belongings one can feel with people they know (Eriksson & Kovalainen, 2008). Hence, the second focus group is considered as an academic selection of young women consumers from the same college. This group has consisted of eight young women consumers those all knew each other since they are classmates at fashion and clothing design in Tehran.

Eriksson and Kovalainen (2008) stated that two groups are a minimum level to conduct proper research. Additionally, Eriksson and Kovalainen (2008) have also indicated

that there is a focus group of 2 to 12 participants in the debate to provide a wider sample and further views. According to Patton (2005), semi-interview structured can help people to understand and describe a phenomenon as well as a judge it, so they can sense and talk about it. This is supported by Caelli (2001) who stated that qualitative research is superior rather than a quantitative study when you are pursuing to understand human's perception. Moreover, the audio recordings are transcribed. The duration of the focus group discussion is estimated at sixty minutes.

**Research Framework.** A new comprehensive framework for willingness to accept the Eco capsule wardrobe is applied from Jin Gam et al. (2009). Jin Gam et al. (2009) established a framework for the investigation of the mother's willingness to purchase Organic Cotton Clothing (OCC) for their children. This research showed that five independent variables, including the demographic profile, product involvement, price premium, product performance and environmental awareness influence the mother's acceptation to purchase organic cotton clothes.

Hence, this research has adopted the OCC framework to understand how young women consumers evaluate the Eco capsule wardrobe to make willingness and decisions in the next purchase. However, only two factors of the OCC framework; product performance, environmental knowledge, and aspects are accepted to evaluate the willingness for possessing of the Eco capsule wardrobe among young women consumers. According to Eckman et al. (1990), values, experiences, social, economic and psychological influences are principle subjects that consumers applied to evaluate clothing products. Constant evaluation of the quality and design is an essential part of the design process. In particular, the quality and design evaluation consist of the clothing quality of the style, functionality,

appearance, detail design and quality of the material in the Eco capsule wardrobe. Besides, environmental knowledge and concerns are one of the important factors during the evaluation. So, it is noteworthy that identifying and addressing gaps between consumer's need and product attributes can be important for researchers and business centres. Therefore, the semi-structured interview schedule is organised into three main parts: demographics, the evaluation of design features and quality of the materials in the Eco capsule wardrobe, and the suggestions to improve clothes in the capsule wardrobe.

(1) Firstly, the demographic information of respondents is collected in terms of age, education level, occupation, and work expertise.

(2) The second section, respondents are asked three questions about the evaluation of the prototype design.

(3) Henceforth, in the third section, respondents are questioned on the suggestion to develop the Eco capsule wardrobe, consumers are interviewed to give opinion and viewpoints to improve the Eco capsule wardrobe. All questions in section two and three are developed based on the literature reviews (Cao et al., 2014; Jin Gam et al., 2009; Koo et al., 2014) based on the product functionality and appearance, and environmental knowledge contents and modified to fit this study (Refer to Appendix 7). Such kinds of questions are designed to assess the environmental concerns of the participants, interest in acceptance of Eco-fashion clothing, evaluate of design features and quality of the materials in the Eco capsule wardrobe. Prior to the discussion, a video about Eco capsule wardrobe presented to the audience.

**Data Analysis.** The audio files are transcribed after the focus group session. Transcription refers to the analysis process of writing a word by word in the audio recording

(Bryman & Bell, 2015). Subsequently, it is accepted to evaluate the details of transcribing and interpreting empirical data several times regarding the chronological order of the theoretical framework.

**Reliability and Validity.** Reliability and validity are the most common measurement tools when evaluating study results and standards. Reliability describes how research can be replicated using the same measurement. On the other hand, the validity shows how the research is founded and how well the intended responses are answered (Creswell & Clark, 2017), which is not always the easiest way to evaluate qualitative research (Eriksson & Kovalainen, 2008). Interrater reliability is calculated Cohen's kappa (κ) by NVivo 10 for each assigned code and averaged to attain the overall code agreement between coders, where $\kappa = 0.75$ to 1 as agreement, and 0.4 to 0.6 as a moderate agreement (Creswell & Clark, 2017). The process must be open for the reader of the study to satisfy the research dependability (Bryman & Bell, 2015).

The reader should be able to trace the data presented and identify the relevant documents required to logically fulfil the research purposes (Eriksson & Kovalainen, 2008). All related details should be provided to the reader by providing citations, as well as a reference list and the appendix documents. Using the most aware group regarding sustainability issues helps to set the high general point of awareness. The researcher decides that if the most conscious generation is chosen and interviewed, the remaining generations could be assumed to be less trained and conscious in this specific subject. Therefore, work is more time-efficient and relevant.

## 3.5 Chapter Summary

As a conclusion, a mixed-method is utilised in the studies to obtain data collections and analysis. The research methodology includes three phases:

**Phase One.** The methodology of the first objective includes a mixed-method strategy with to study of consumer's sustainable behaviour toward Eco-fashion clothes and to investigate of the fashion and apparel designer's behaviour regarding Eco-fashion design. Regarding this objective, the research investigates on consumer's behaviour toward sustainable activities such as clothing disposal, especially recycling and purchase of Eco-fashion clothes and the designer's behaviour toward minimisation clothing waste, as well as the design of Eco-fashion clothes.

(1) Hence for the first part, a questionnaire instrument is considered to the discovery of the consumer's behaviour. The inquiry was carried out as a hard-copy survey in November 2018 in Malaysia. The respondents completed the written questionnaires after they agreed to participate in this research. Subsequently, completed responses numbered 583. Descriptive statistics, reliabilities, and correlations using Statistical Package for Social Science (SPSS) version 23 is computed for each variable to obtain the results and to identify the relationships.

Also, Partial Least Squares Structural equation modelling (PLS-SEM) using the analysis of structures software SmartPLS version 3.0 is employed to analyse the collected data. In addition, to strengthen the findings of this research, the study has accepted a semi-structured interview with 16 consumers who have the experience of buying Eco-fashion clothes, especially made of recycled materials. The interview session is audio recorded. The interview is transcribed and analysed by creating nodes in Nvivo 10.

(2) In the second part, for the investigation of the designer's behaviour toward Eco-fashion design, this study applies a mixed-method strategy design. The qualitative method investigated factors and issues which can influence on the fashion designer to the behavioural intention of the Eco-fashion design. In October and November 2018, this study approached the eight sustainable fashion designers (six women and two men) those ages ranged from 31 to 55 years old with more than seven years' experience in sustainable fashion design in Malaysia and Iran. All interviews are audio recorded. These interviews are transcribed and analysed by creating trees and nodes in Nvivo 10. Henceforth, a questionnaire is accepted based on the findings of the interview and literature review. It was carried out as a hard-copy and soft-copy survey in March 2019. The respondents those be interested in sustainable fashion completed the questionnaires after they agreed to participate in this research and the completed responses numbered 133. For analysing quantitative research, Statistical Package for Social Science (SPSS) version 23 is employed for each variable to obtain the results and to identify the relationships and PLS-SEM using the analysis of structure software SmartPLS version 3.0 is utilised to analyse the collected data.

**Phase Two.** The methodology of the second objective includes; a quantitative survey is conducted to investigate the design of Eco-fashion capsule wardrobe among consumers, a qualitative interview with fashion experts in Eco-fashion design; thus this will help to develop an Eco-fashion design process model and exploration of the Eco-fashion design as named "Eco capsule wardrobe" with following the proposed model. Regarding this objective, this research develops an Eco model with supporting Eco-fashion material and sustainable techniques toward the creation of the Eco-fashion collection.

(1) Regarding the aim of this study to develop an Eco-fashion design model, a design concept, as well as consumer's need in the first phase of the design model, is required. So, an investigation of young consumer's needs (age between 20 to 30 years old) toward Eco-fashion clothes is developed. The inquiry was carried out as a hard-copy survey in March 2019 in Malaysia and Iran. Based on the research theme, only 214 of respondents were in range 20 to 30 years old. Therefore, 214 respondents are accepted for this investigation**.** Statistical Package for Social Science (SPSS) version 23 is employed, and a simple descriptive analysis was used to study the online data.

(2) This study involved in-depth interviews with eight sustainable fashion designers (three only designers, two designer and fashion consultants, and three fashion lecturers) in Malaysia and Iran. The selection criteria for this study are these respondents have a long experience in the clothing/apparel industry with the knowledge in sustainable design more than 10 years, and they showed a willingness to participate in this study. This interview is designed to discover the important factors in each step in the existing Eco-fashion design. Also, it is developed to understand the process of designer's artwork and how they think about developments in the Eco-fashion design process regarding phases in the clothing life cycle. The following seven steps of Hycner (1985) are used for evaluating the data collected through interviews. All in-depth interview sessions in this study have followed this step by step guideline. So, all transcribed are analysed by creating trees and nodes in Nvivo 10.

(3) Regarding the aim of this research, this study develops an Eco capsule wardrobe based on the proposed Eco-fashion design model. Hence, guided by the proposed Eco-fashion design model and design concept achievement from the capsule wardrobe survey distributed between young women consumers, an Eco capsule wardrobe is designed and

developed through a workshop in May 2019 in Iran. This workshop includes three young fashion and clothing designers with more than 4 years of experience in casual clothing design and interested in an Eco-fashion design.

**Phase Three.** The methodology of the third objective includes a qualitative interview with young women (age between 20 to 30 years old) to evaluate the Eco-fashion collection designed based on the proposed Eco-fashion design model. Regarding this objective, the research investigates on the consumer's willingness of the Eco-fashion collection design made of the proposed Eco-fashion design model of this research. Guided by Eco-fashion design model, an Eco summer capsule wardrobe for young women is designed and developed. Hence, two focus groups discussion are conducted with women consumers to evaluate the consumer's acceptance and perception of the design and quality of the Eco capsule wardrobe. The focus groups are chosen based on a different group of consumers. A group of twelve young women consumer conducts for the first focus group session those had never seen each other before. The second group has consisted of eight young women consumers those all knew each other since they are classmates at fashion and clothing design in Tehran. All participants are women with age between 20 to 30 years old. Moreover, the audio recordings are transcribed. The duration of the focus group discussion is estimated for sixty minutes. The audio files have also been transcribed. Transcription refers to researchers writing a word for word audio file. All in all, the research design method comprises of consumer's behaviour, designer's behaviour, Eco-fashion design process and requirements and Eco-fashion design concept. The experimental design and development of the Eco capsule wardrobe are simplistic and easy to use, a version of more friendly features to match with designer's behaviour and experiences.

# CHAPTER 4

# RESULTS

## 4.1 Introduction

This chapter presents the result finding of data collections from the three objectives:

i. Investigation of consumer's and designer's behaviour toward their sustainable activities and planning toward sustainability issues.
ii. Development of the Eco-fashion design model and creation an Eco-fashion design process model as well as experimental design on the Eco capsule wardrobe.
iii. Evaluation of the consumer's perception and their behaviour about the Eco capsule wardrobe (prototype) based on the proposed Eco-fashion design process.

This study investigates three pillars of sustainability: society (especially consumers), environment and economy in the cycle loop regarding the Eco-fashion clothing. Hence, the investigation is started by consumers and their sustainable behaviour. It is continued toward the designer's behaviour and the design process, where designers are the core of the design process and choose the material and make decisions in the right way. Finally, the investigation is finished through the study of society's willingness (especially young women consumers).

The results are based on analysis of the survey and interview contents. Therefore, three phases of this chapter based on the three objectives are designed. Moreover, this study consists of two categories data: ordinal data for quantitative and nominal data for qualitative findings. Ordinal data is a kind of categorical data with a set order or scale to it and in ordinal data, there is no standard scale on which the difference in each score is measured.

## 4.2 Discover Consumer's and Designer's Behaviour (Objective One)

The first objective of this study is to explore consumer's behaviour and designer's behaviour about making decisions on Eco-fashion design subjects.

### 4.2.1 Quantitative Results from Discovery of Consumer's Behaviour

**Descriptive Statistics and Analysis.** A total of 583 respondents participated in the survey. A convenience sample of 294 people from east of Malaysia and 289 people from the west of Malaysia attended this study. Table 4.1 provides a demographic profile of respondents. 66.7% of respondents were female and 33.3% were male. The largest percentage (63%) was young between range 21 to 30 years old. The most employment status of the respondents was student (62.8%) and salaried employee (17%), respectively. The highest (64.7%) monthly family income of the respondents was reported between RM 500 and RM 2,000.

64.5% of respondents were not familiar with Eco-fashion clothes that most of them were students and less than 30 years old. Moreover, when it was asked about the purchase behaviour of clothing to protect the environment, many respondents did not have any experience to purchase them. The reasons which they did not purchase them were "not heard about this kind of clothes" and "not available in the fashion and apparel market" (48.4%, and 27.9%, respectively).

Whilst 35.5% of participants had purchase experience related to Eco-fashion clothes that 14.4% used second-hand clothes as a type of Eco-fashion clothes and only 3.3% of them purchased clothes made of recycled material. Besides, the measurement scales for the two different groups are shown in Table 4.2.

**Table 4.1:** Demographic Profile of Respondents (N=583)

| Construct | Items | Frequency | Valid Per cent |
|---|---|---|---|
| Q1. Gender | Female | 389 | 66.7 |
| | Male | 194 | 33.3 |
| Q2. Age | -20 | 59 | 10.1 |
| | 21 - 30 | 367 | 63 |
| | 31 - 40 | 111 | 19 |
| | +41 | 46 | 7.9 |
| Q3. Employment status | Currently unemployed | 6 | 1 |
| | Government servant | 92 | 15.8 |
| | Homemaker/Housewife | 3 | 0.5 |
| | Retired | 2 | 0.3 |
| | Salaried employee | 99 | 17 |
| | Self-employed | 15 | 2.6 |
| | Student | 366 | 62.8 |
| Q4. Monthly income | RM 500 - RM 2, 000 | 377 | 64.7 |
| | RM 2, 001 – RM5, 000 | 116 | 19.8 |
| | RM 5, 001 – RM10, 000 | 79 | 13.6 |
| | RM 10, 001 – RM20, 000 | 11 | 1.9 |
| Q5. How often did you purchase new clothing? | Once a week | 12 | 2.1 |
| | Once a month | 141 | 24.2 |
| | Once every 3-4 months | 220 | 37.7 |
| | Once every 6-7 months | 108 | 18.5 |
| | Once or twice a year | 102 | 17.5 |

**Table 4.1** continued

| | | | |
|---|---|---|---|
| Q6. How much do you spend on clothing each time you go shopping? | Less than RM50 | 88 | 15.1 |
| | RM51 - RM200 | 393 | 67.4 |
| | RM201 - RM500 | 90 | 15.4 |
| | RM501 – RM1, 000 | 8 | 1.4 |
| | More than RM 1001 | 4 | 0.7 |

As seen in Table 4.2, all three psychological factors on the purchase intention toward Eco-fashion clothes have significant value with alpha (α) greater than 0.7. Since the reliability coefficients indicated appropriate internal consistency for attitude (A, α = 0.781), perceived behavioural control (PBC, α = 0.741) and subjective norm (SN, α = 0.715). Also, perceived behaviour to dispose of clothing, purchase intention and purchase behaviour have significant mean with more than 4.34 out of 5, as well as alpha greater than 0.7; perceived behaviour to dispose of clothing (PBD, α = 0.805), purchase intention (PI, α = 0.752), and purchase behaviour (PB, α = 0.870) that significant at the level 0.001.

In addition, there were not much difference results between the two groups of "familiar" and "not familiar" with Eco-fashion clothes. The most common ways to dispose of unwanted clothing among Malaysian respondents are "give away to family or friends" and "donation to the charity" (M = 4.89, M = 4.87, respectively). They were able to give their unwanted clothing to non-government organisations (NGO) who provide awareness about the collection service and clothing recycling bin (M = 4.49) or reuse unwearable clothes for other purposes (M = 4.77).

**Table 4.2:** Informational Factors Rated Significantly Different by 'Not Familiar' and 'Familiar' with Eco-Fashion Clothes (N=583)

| Items | Not Familiar with Eco-Fashion Clothes (N=376) | | Familiar with Eco-Fashion Clothes (N=207) | | Factor Loading (≥0.7) |
|---|---|---|---|---|---|
| | M | S. D | M | S. D | |
| Attitude (α=0.781) | | | | | |
| Q1. I believe that Eco-fashion clothes have similar price with the other products. | 4.57 | 0.69 | 4.70 | 0.51 | 0.70 |
| Q2. I believe that Eco-fashion clothes are made of materials with good quality. | 4.61 | 0.71 | 4.64 | 0.75 | 0.73 |
| Q3. I believe that Eco-fashion clothes can help to protect the environment. | 4.74 | 0.38 | 4.84 | 0.37 | 0.74 |
| Q4. I believe that Eco-fashion clothes are easy to use, nice and chic. | 4.56 | 0.65 | 4.72 | 0.40 | 0.71 |
| Perceived Behavioural Control (α=0.741) | | | | | |
| Q5. I have the resources, time, and willingness to purchase Eco-fashion clothes. | 4.77 | 0.45 | 4.79 | 0.42 | 0.73 |
| Q6. Purchasing Eco-fashion clothes is a decision that is only up to me. | 4.84 | 0.38 | 4.80 | 0.37 | 0.76 |
| Q7. I am confident that I can purchase Eco-fashion clothes for other clothes when I want. | 4.50 | 0.70 | 4.60 | 0.60 | 0.72 |
| Q8. To me, purchasing Eco-fashion clothes is easy. | 4.51 | 0.76 | 4.55 | 0.58 | 0.72 |

**Table 4.2** continued

| | | | | | |
|---|---|---|---|---|---|
| Subjective Norm (α=0.715) | | | | | |
| Q9. My family expect me to engage in Eco-fashion clothes when buying clothes. | 4.52 | 0.81 | 4.34 | 0.75 | 0.73 |
| Q10. People who influence my behaviour might think that I should use Eco-fashion clothes. | 4.67 | 0.67 | 4.60 | 0.63 | 0.72 |
| Q11. My society expects me to engage in Eco-fashion clothes when buying clothes. | 4.34 | 0.59 | 4.41 | 0.44 | 0.70 |
| Q12. Most of the people who are important to me think that purchasing Eco-fashion clothes in my shopping is a good thing. | 4.40 | 0.69 | 4.48 | 0.38 | 0.71 |
| Perceived Behaviour to Dispose of Clothing (α=0.805) | | | | | |
| Q13. I donate unwanted clothes to the charity or people who need them. | 4.86 | 0.24 | 4.88 | 0.29 | 0.98 |
| Q14. I give away unwanted clothes to my family or friends. | 4.82 | 0.31 | 4.98 | 0.16 | 0.94 |
| Q15. I always make an effort to put unwearable clothes in recycling bins. | 4.50 | 0.70 | 4.48 | 0.60 | 0.78 |
| Q16. I always try to make a new design for a purpose with unwearable clothes. | 4.77 | 0.33 | 4.78 | 0.38 | 0.76 |
| Purchase Intention (α=0.752) | | | | | |
| Q17. I would patronize and recommend the use of Eco-fashion clothes. | 4.53 | 0.77 | 4.60 | 0.60 | 0.71 |
| Q18. I would actively seek out Eco-fashion clothes in a store to purchase it. | 4.51 | 0.76 | 4.58 | 0.63 | 0.73 |

**Table 4.2** continued

| | | | | | |
|---|---|---|---|---|---|
| Q19. I will buy Eco-fashion clothes if I happen to see them in a store. | 4.67 | 0.34 | 4.78 | 0.43 | 0.77 |
| Q20. I would like to use Eco-fashion clothes. | 4.34 | 0.88 | 4.52 | 0.54 | 0.70 |
| Purchase Behaviour (α=0.870) | | | | | |
| Q21. If I understand the potential damage to the environment that non-Eco-fashion clothes can cause, I do not purchase those products. | 4.53 | 0.77 | 4.70 | 0.60 | 0.94 |
| Q22. I choose the Eco-fashion clothes alternative in shopping if one with a similar price is available. | 4.51 | 0.76 | 4.58 | 0.63 | 0.93 |

Note. Mean = M, S.D = Std. Deviation.

**Reliability and Validity.** Through confirmatory factor analysis (CFA), the study aims to identify whether the proposed model meets the standards of reliability and validity. The reliability was tested by composite reliability (CR) and Cronbach alpha (α) with both more than 0.70. It is supported to combine the items under each measure into the intended multi-item scale, with high reliability ($\alpha \geq 0.7$) for all variables. As stated, the validity of the scale items was assessed with factor loadings and Average Variance Extracted (AVE) which both greater than 0.5 and Heterotrait-Monotrait (HTMT) with below than 0.85. It was found that the values of factor loading were high on their respective variables.

In general, factor loading over 0.5 is classified as a “strong” item loading (Ringle et al., 2005). Second, the AVE for the six measures is higher than 0.5, showing convergent validity at the variable level. As seen in Table 4.3, the AVE values are within 0.613 and 0.885.

Finally, discriminant validity can be accepted for this measurement model and supports the discriminant validity between all variables (Henseler et al., 2015). The constructs in the study satisfy the discriminant validity assessment based on HTMT. The output is summarised as in Table 4.3.

**Table 4.3:** Empirical Results of Outer Structural Model Outcomes (N=583)

| Variables | α (≥0.7) | CR (≥0.7) | AVE (≥0.5) | Latent Variables | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | A | PBC | SN | PBD | PI |
| A | 0.781 | 0.795 | 0.613 | | | | | |
| PBC | 0.741 | 0.817 | 0.743 | 0.67 | | | | |
| SN | 0.715 | 0.850 | 0.659 | 0.28 | 0.46 | | | |
| PBD | 0.805 | 0.881 | 0.669 | 0.63 | 0.27 | 0.63 | | |
| PI | 0.752 | 0.757 | 0.621 | 0.10 | 0.17 | 0.27 | 0.57 | |
| PB | 0.870 | 0.939 | 0.885 | 0.49 | 0.21 | 0.14 | 0.44 | 0.43 |

Note. α= Chronbach alpha, CR= Composite Reliability, AVE= Average Variance Extracted

**Regression Analysis.** As shown in Table 4.4, the assumption of independence in errors was met with Durbin Watson statistic of 1.954, which is between the two critical values of $1.5 < d < 2.5$. Therefore, there is a positive autocorrelation between the purchase behaviour and variables and no correlations between model errors (George & Mallery, 2003). The p-value for each component is $p<0.00$ which indicates that all the criteria have a significant relationship with consumer's purchase behaviour (Table 4.4). Multiple regression analysis resulted in $R = 0.932^a$, $R^2 = 0.915$, and an adjusted $R^2=0.916$. R-Squared ($R^2$) is a correlation between the observed and predicted values. According to Henseler et al. (2015),

an $R^2$ value of 0.75 is considered valuable. Hence, the $R^2$ values in this study were substantial. It means 91% of the variance in purchase behaviour is affected by the perceived behaviour to dispose of clothing and purchase intentions of Eco-fashion clothes.

**Table 4.4:** Regression Analysis of Variables on the Purchase Intention, p<0.001

| | | **Unstandardized Coefficients** | | **β** | **t-value** | **p-value** | **95.0% Confidence Interval of the Difference** | |
|---|---|---|---|---|---|---|---|---|
| | | **B** | **Std. Error** | | | | **Lower Bound** | **Upper Bound** |
| Factors affecting on PI | A | 1.140 | 0.048 | 1.090 | 23.82 | .000 | 1.050 | 1.240 |
| | PBC | 0.344 | 0.018 | 0.293 | 7.99 | .000 | 0.108 | 0.179 |
| | SN | -0.151 | 0.031 | -0.102 | -4.91 | .000 | -0.211 | -0.091 |
| | PBD | 0.567 | 0.041 | 0.422 | 12.11 | .000 | 0.246 | 0.787 |
| $R^2 = 0.964$ , F (4,36) = 828.355, P = 0.00, Durbin-Watson = 1.750 | | | | | | | | |
| Factors affecting on PB | PBD | 0.399 | 0.064 | 0.316 | 4.22 | .000 | 0.214 | 0.585 |
| | PI | 0.917 | 0.096 | 0.547 | 9.58 | .000 | 0.729 | 1.104 |
| $R^2 = 0.915$ , F (2,58) = 575.035, P = 0.00, Durbin-Watson = 1.954 | | | | | | | | |

The finding of the regression in SPSS was like the results of structural model outcomes in SmartPLS which will be discussed later (see Table 4.5). Since p-value ≤ 0.05, therefore, this study shall reject the null hypothesis. The model was significant, F (4,36) = 828.355, P = 0.00, meaning that the attitude, subjective norm, perceived control behaviour and perceived behaviour to dispose of clothing significantly predict the intentions of purchasing Eco-fashion clothes.

Additionally, disposal behaviour and purchase intentions can predict purchase behaviour due to the F (2.58) = 575.035, P = 0.00. Consequently, this study can assume that there is a linear relationship between the variables in the model. As seen in Table 4.4, attitude and perceived behaviour to dispose of clothing are strong predictors toward purchase intentions in comparison to other variables ($\beta$ = 0.718, $\beta$ = 0.547, respectively). Therefore, based on regression analysis, all variables are significantly different from each other in the purchase intention and can predict the intentions for Eco-fashion clothes.

**Structural Model and Hypothesis Testing.** The following subsections discuss the tests used to assess the validity of the structural model for this study. The study tested the proposed hypotheses through structural equation modelling (SEM) technique. The results of the structural model obtained from SmartPLS are presented in Table 4.5 and Figure 4.1, The validity of the structural model is assessed using effect size, path coefficients (β-value) and t-statistic value.

The coefficient of determination measures the overall effect size explained in the endogenous variable for the structural model and is thus a measure of the model's predictive accuracy. In this study, four factors had a large effect based on the criteria suggested by Cohen (2013) for interpreting the effect size. According to Ringle et al. (2005), the higher β-value shows the stronger impact of a predictor independent variable on the dependent variable. The results show that the β value of attitude has the highest co-efficient value of 0.459 on purchase intention. However, the subjective norm is having the smallest co-efficient value of -0.105 which indicates that subjective norm is giving the least impact to the purchase intention. With accordance to Hair Jr et al. (2016), β-value whether it is positive

or negative is not a concern because the impact of the path is related to the absolute value of the β.

All hypotheses were supported. Therefore, the following variables had a positive association with the consumer's purchase intention toward Eco-fashion clothes: attitude ($H_1$), subjective norm ($H_2$), perceived control behaviour ($H_3$) and perceived behaviour to dispose of clothing ($H_4$).

The SEM modelling indicated that attitude and perceived behaviour to dispose of clothing has a strong effect on the purchase intention toward Eco-fashion clothes more than other factors. Finally, behavioural purchase intention and perceived behaviour to dispose of clothing play important roles as predictors variable for purchase behaviour toward Eco-fashion clothes which supports $H_5$ and $H_6$, respectively. According to Hair Jr et al. (2016), evaluation of the correlations and regressions is the significance with t-value ≥ 1.96. Results of hypotheses testing are summarised in Table 4.5.

**Table 4.5:** Results of Hypotheses Testing p<0.05*, p<0.01**, p<0.000***

| Path Correlation | $f^2$ | Total Effect | β | SE | t-value | p-value | Decision |
|---|---|---|---|---|---|---|---|
| H1: A -> PI | 0.638 | large | 0.459 | 0.092 | 4.981 | 0.000*** | Supported |
| H2: SN -> PI | 0.073 | small | -0.105 | 0.046 | 2.293 | 0.022* | Supported |
| H3: PCB -> PI | 0.220 | medium | 0.272 | 0.090 | 3.021 | 0.003** | Supported |
| H4: PBD -> PI | 0.565 | large | 0.393 | 0.151 | 2.611 | 0.001** | Supported |
| H5: PBD -> PB | 0.353 | large | 0.381 | 0.048 | 7.933 | 0.000*** | Supported |
| H6: PI -> PB | 0.808 | large | 0.595 | 0.155 | 3.854 | 0.000*** | Supported |

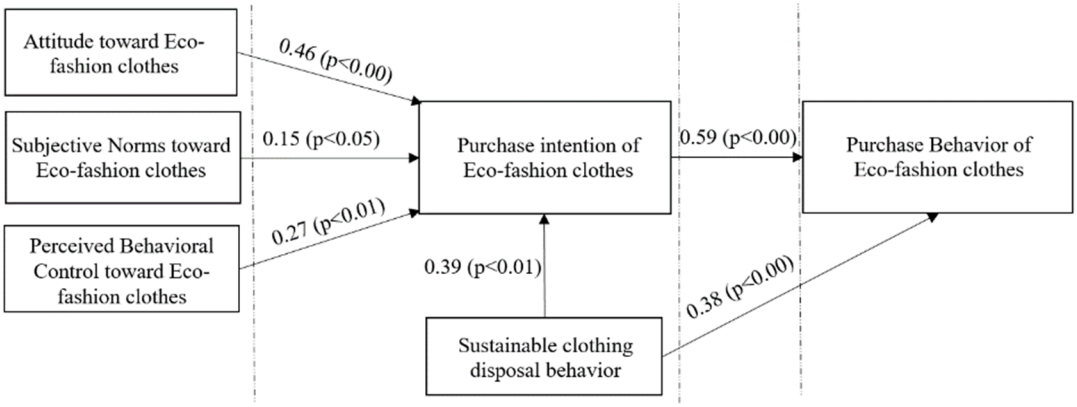



**Figure 4.1:** The Measurement Conceptual Model of Consumer's Behaviour toward Purchasing Eco-Fashion Clothes

**Summary.** The outcome of the structure model and reliability statistics analysis demonstrated a significantly high level of perceived behaviour to dispose of clothing and purchasing behaviour toward Eco-fashion clothes with an alpha of variables features greater than 0.7. Also, all hypotheses were supported significant level.

### 4.2.2 Qualitative Results from Discovery of Consumer's Behaviour

The results of the in-depth interview show to promote sustainable issues, both society and industry must have sufficient knowledge in this area (Moon et al., 2015). Additionally, the quality features were valued by many of the women interviewed. Best quality, in general, was often commented based on better material strength and quality sewing in Eco-fashion clothes. Most of the volunteer respondents (75%) were in 25 to 35 years old. Participants were asked to indicate monthly family income. No participant fell into the more than RM 10,000 (Ringgit Malaysian), while only three participants were in the RM 5,001 - 10,000 range. The largest percentage of participants (56.25%, n = 9) had monthly family income between RM 500 - 2000. It indicates high monthly income did not significantly affect the purchasing Eco-fashion clothes. Table 4.6 shows the demographic of 16 people invited for

an in-depth interview as a focus group. Regarding occupation, participants' work covered a broad variety of fields, including law, health care, social work, design, and creative arts. Only 18.75% (n = 3) were students, 37.5% were some type of artist or freelancer (n = 6), and 43.75% (n = 7) held a variety of other occupations.

**Table 4.6:** Demographics of Respondents

| No. | Name | Age | Employment Status | Gender | Monthly Family Income |
|---|---|---|---|---|---|
| 1 | Orked | 28 | Student | Female | RM 500 - RM 2, 000 |
| 2 | Aisyah | 34 | Secretary | Female | RM 500 - RM 2, 000 |
| 3 | Suzila | 38 | Buyer | Female | RM 5, 001 – RM10,000 |
| 4 | Maria | 31 | Student | Female | RM 2, 001 – RM5, 000 |
| 5 | Hisyam | 38 | Fashion Designer | Male | RM 2, 001 – RM5, 000 |
| 6 | Mawar | 26 | Homemaker | Female | RM 500 - RM 2, 000 |
| 7 | Fatima | 24 | Secretary | Female | RM 500 - RM 2, 000 |
| 8 | Denise | 41 | Contractors | Female | RM 2, 001 – RM5, 000 |
| 9 | Noria | 36 | Nurse | Female | RM 2, 001 – RM5, 000 |
| 10 | Soraya | 33 | Lawyer | Female | RM 5, 001 – RM10,000 |
| 11 | Amin | 29 | Student | Male | RM 500 - RM 2, 000 |
| 12 | Linda | 28 | Graphic designer | Female | RM 500 - RM 2, 000 |
| 13 | Asliza | 25 | Homemaker | Female | RM 500 - RM 2, 000 |
| 14 | Grace | 25 | Teacher | Female | RM 500 - RM 2, 000 |
| 15 | Lina | 32 | Teacher | Female | RM 5, 001 – RM10,000 |
| 16 | Sharifa | 27 | Student | Female | RM 500 - RM 2, 000 |

Information and a rich overview of the Eco-fashion clothing were conceived for detailed interviews. Firstly, through the interview, it was asked where they buy clothes made of recycled materials due to this type of clothes is not trendy in society (Refer to Appendix 3 - Question two). Seven interviewees (43.75%) claimed H&M is the biggest producer of Eco-fashion clothes and they are loyal customers to this brand. They always put unwanted clothes in recycling bin exist at H&M shopping and purchase Eco-fashion clothes made of recycled materials. Besides, one of the interviewees purchased jeans made of regenerated post-consumer cotton waste by Levi Straus. Shirts made of recycled materials were purchased by two interviewees from The North Face and UNIQLO. Participants claimed that they were very comfortable, soft, nice with good quality. Four interviewees had a purchasing experience with recycled shawls and clothes of Waste-to-Wear Brand. The rest of them purchased re-designed clothes from the local fashion labels.

Afterwards, questions were asked about the customer's experience of buying Eco-fashion clothes, especially factors affect the attitude (Refer to Appendix 3 - Question three and Question four). Indeed, which factors influenced consumers to buy Eco-fashion clothes? Due to the results achieved from the questionnaire, it was concluded that attitude is the most factor in purchasing Eco-fashion clothes rather than other psychological factors. So, consumer's feedback is valuable to develop features which should be added or changed in these clothes. The interview comments and reviews from open-ended questions about influencing factors on attitude in actual behaviour toward purchasing Eco-fashion clothes as shown on the next page. Interrater reliability (overall Kappa) was 0.852, above the recommended threshold identified by Creswell and Clark (2017); Quality and Price Value ( $\kappa = 0.805$), Design Features ($\kappa = 0.860$) and Environmental Knowledge and Concern ($\kappa = 0.890$) (More details in Appendix 12).

#### 4.2.2.1 Common Related Factors on Attitude in Purchasing Eco-Fashion Clothing

**Quality and Price Value.** Almost (87.5%) all participants had a feeling of excitement, enthusiasm, and determination, with some more and less than others, while buying the Eco-fashion clothing, especially made of recycled content. Asiyah was very adamant when it decides to throw out or give away clothing. She had a good experience to face with Eco-fashion clothes, she stated:

> The quality of my polyester skirt made of recycled materials was good, so, why I do not collaborate to preserve the environment?! all should be invited to this movement. I got rid of so many clothes, I was very determined which liked because finally, I threw out and be sure they are recyclable to convert new fabrics and I can purchase them again in a new design.

Some participants (43.75%) also were not satisfied with the limited choices of Eco-fashion clothes in the fashion market. Probably, most of the reason is that clothes are more expensive because of the limited choice.

Moreover, economic concerns predicted both the disposal and purchasing clothes behaviours (Bianchi & Birtwistle, 2012). All the interviewees believed that the fair price along good quality affects to have a positive attitude toward purchasing such clothes. Most of them (88.58%) emphasised that if the cost of clothes made of Eco-fashion recycled contents is more than other clothes, they refuse to purchase. Unless the quality and design are stunning and worth for higher value. Suzila was one of the persons that encouraged her family and friends to buy Eco-fashion clothes. She said*:*

> I would like to purchase recycled clothing; they are very limited but makes me feel like I achieve some benefits when I spend money on something which wants to help

> economic society. I bought a dress that was made of recycled materials for my daughter, the price was the same as the other, but the design was colourful, it attracted me to purchase.

Another very satisfying moment has occurred when half of the participants (50%) first feel their purchasing is valuable for many times. Denise, even though she admitted that she was struggling with the price of Eco-fashion clothing at the first time, could not hide her satisfaction when she purchased it because the over the long term it shows the benefits. Denise said:

> I would prefer to spend a much higher price for recycled clothes rather than other clothes if I can wear them for a long time. Then the moment I put all the Eco-fashion clothes in my closet and feel this is enough for a long time. It can make a profit because they are longevity and recyclable after usage. The two positive viewpoints of the economic issue.

Orked had purchased a redesigned dress from a local fashion label. She explained:

> I was interested to buy re-designed because of two points; quality and design. This dress was made of three plus-sized women's tops in organic cotton as when you touch it, you could not understand it is a fabric, it was amazing quality. I bought the dress from a consignment shop that had a redesign contest involving local fashion design college students and industry professionals. The contestants redesigned unsold clothing from the shop and displayed the new looks in a runway show.

**Design Features.** The most interviewees (91.05%) believed that Eco-fashion clothes should be easy to use (functional), simple design, fashionable and attractive colours which

consideration these factors have a positive effect on consumer's attitude. Maria provided insights into how she feels when she has the intention to buy Eco-fashion clothes compared other times. She emphasised:

> Most of the sustainable fashion designers still focus on the use of environmentally friendly materials, such as cotton, hemp or other natural fibers; not much attention is put on the styles or aesthetic value of the product, designers should improve creativity in Eco-fashion clothes. Because usually I am going to purchase sustainable clothing and I know it only can find in two fashion shops and five minutes is enough to evaluate them because they are in the simple design and very limited choice.

Similar to Maria, Sharifa also noted that Eco-fashion clothing is made limitation to her choices. She was satisfied with the multifunctional Eco-fashion design which she could not find in other clothes. She said, "I like clothing designed for multipurpose, that is this coat, I could wear this for a waistcoat one day and then a dress the next day." Some participants also experienced good design in Eco-fashion clothes. Since the participants were not able to find such functional clothes somewhere. Linda stated:

> Fashionable clothes which I know they are not trending the next year. I am not going to waste my money on. I bought plain shawls made of recycled materials in a six-colour package. They help me to set with my wardrobe, the price and quality did not much difference with the other shawls in the fashion market.

Also, Soraya admitted that she had some "stuck moments" where she felt, "I didn't feel like wearing any of my clothes after delivering my baby". Then when she found the multipurpose design of Eco-fashion clothes, she was interested in them. She explained, "I like boutiques that have random and unique things and exceptional. I purchased an Eco-

fashion dress made of recycled materials. It can wear both sizes; short and long. It was interesting. I was fascinated by the multipurpose feature." Similarly, Amin mentioned size adjustable clothing in the last longer and functionality purposes were main points which he and his wife to purchase sustainable clothing. He said:

> We bought this jacket for our son and has a pocket sewn in the lining to let it out so it can grow with him, so it can last more than one year. Purchasing clothes for kids do not have economic point because they are growing rapidly. To me, it was worthwhile to invest more money in a coat that I know he will wear for two years.

**Environmental Knowledge and Concerns.** Based on the finding of the in-depth interview, the most important factors that had influence consumer's attitude in buying Eco-fashion clothes are good quality, fair price, design features and multipurpose styles. However, the findings show that to promote sustainable issues, both society and industry must have sufficient knowledge in this area which fifteen (90.36%) emphasised that their knowledge and worries about the environment influenced their attitude to purchase Eco clothes. When Hisyam was asked specifically how he explained his first experience when he was informed about such clothes. He answered:

> In 2014, I saw an advertisement that was about putting in unwanted clothes to the recycling bin and receive a coupon to purchase new clothes. I went there, they gave me a new viewpoint of fabric recycling after we put our clothes in the recycling box. I never heard about it before.

Similarly, Asliza felt like she is not informed about the Eco-fashion clothing in society. So, she suggested:

> We are as a consumer need to learn about sustainability and be notified by clear information about Eco-fashion clothes, as well as materials. I was interested in seeing the label of Eco-clothes in the fashion store, it fascinated me to buy, a cycle of clothing production from waste to a renew fabric.

When asked how participants viewed the purchasing of Eco-Fashion clothing, all participants said they perceived it as a learning experience that has taught them something more about themselves. Orked said that what changed is:

> The way, I understand how I care about wardrobes by Eco-fashion clothes made from recycled materials, I must admit it made me conscious of those issues certainly, I always buy items a little more carefully, observe their name, the word "recycled" can’t keep me from buying it and I am proud of that.

**Summary.** Overall, it can be said that participants experienced the purchase of Eco-fashion clothes made of recycled contents. The findings of the interview are shown that participants were excited by the different designs, worried through quality and price value, proud of preserving the environment or learned something. Ultimately, all those ups and downs that were felt when wearing Eco-fashion clothing. Therefore, Eco-fashion clothes are the same clothes in the market with different raw materials which support sustainability issues. If this means the participants enjoyed or disliked Eco-fashion clothes or they would or would not buy them again. No all-positive or all-negative experience existed, and the experience was unique. In fact, the quality, price, and design features, as well as awareness of environmental pollution and concerns are most related factors during design and purchase Eco-fashion clothing design.

### 4.2.3 Qualitative Results from Discovery of Designer's Behaviour

**Data Finding.** As previously stated, this paper extends the mixed-method approach design, performed by Cruz Cardenas et al. (2018). They investigated sustainable practices such as recycling and upcycling between people and found victories. Eight fashion and apparel designer described their design and production processes regarding sustainability. All designers were aware of environmental problems in fashion and apparel design and production. The designer's responsibilities are summarised in Table 4.7.

**Table 4.7:** Backgrounds of the Interviewees

| No. | Name | Gender | Position | Expertise | Organisation | Nationality |
|---|---|---|---|---|---|---|
| 1 | Janet | Female | Sustainable fashion designer | Ethics and design | Freelance designer | Iranian |
| 2 | Jane | Female | Programme director | Sustainable design | University | Malaysian |
| 3 | Suzy | Female | Sustainable fashion designer | Marketing in design | Research Consultancy | Malaysian |
| 4 | Julie | Female | lecturer, designer | Sustainable design | Research Consultancy | Iranian |
| 5 | Sina | Male | Sustainable fashion designer | Ethics design | University | Iranian |
| 6 | Nur | Female | Lecturer, fashion designer | sustainable design | University | Malaysian |
| 7 | Nazla | Male | Sustainable fashion designer | Sustainable design | Freelance designer | Malaysian |
| 8 | Dana | Female | Fashion manager | Sustainable design | Freelance designer | Iranian |

Interrater reliability (Overall Cohen's kappa ) was 0.873, above the recommended threshold identified by Creswell and Clark (2017); Environmental Knowledge (EK) (κ = 0.880) , Perceived Quality and Price (PQP) (κ = 0.90), Perceived Functional and Aesthetic (PFA) (κ = 0.902), Perceived ease to use and usefulness of Technology (PT) (κ = 0.820), Attitude (A) (κ = 0.883), Subjective Norm (SN) (κ = 0.830) and Behavioural Intention (BI) (κ = 0.898) (More details in Appendix 12). The qualitative analysis of the data allows for the establishment of factors which influence on designer's attitude and their respective hypotheses. These findings were achieved by the response of question two to question five in Appendix 3. Additionally, according to the TRA model, psychological factors toward Eco-fashion design are discussed following. These data presented below are supported by quotes from the interviewees' narratives and the additional literature review to support them.

- **Environmental Knowledge and Attitude**

One of the first topics that emerged in the interviews was theme came up in the respondents' stories, the relationship between interviewees' environmental knowledge and their attitude toward Eco-fashion design. In the process of clothing design, participants were asked to discuss their issues and environmental concerns in interviews. The first major concern was destroyed the environment by them during beautiful designing clothes, but it may threaten the health of the environment. Several participants (88.31%) expressed the reasons why they were worried about the environment in the future. Jane stated that her environmental information is relatively important in her job since it involves environmental impacts from the design to use phase. She said, "I am also concerned about what we are doing to the environment, and about fashion." Nazla stated his concerns to follow the expensive design "Haute Couture", he stated:

> My concern is to spend time, energy, and resources in the design of couture and to not make them fit or look fine. So just think, you waste money and time, and the other side you destroy the environment by wasting materials and fabrics. So, If I am going to put this much sustainable work into it, it is going to be good, at least I know it can be fit for anybody.

Moreover, environmental concern seems are related to the involvement in half of the participants (50%) in increasing their awareness of environmental issues. Janet emphasised knowledge of environmental issues which encouraged her to have a positive attitude. She stated, "the remarkable point is after usage; clothing will be recycled. Since materials become usable at the end of life instead of buried."

All designers want to protect the world and use natural resources in fashion. Ohtomo and Hirose (2007) observed that if designers have a lack of knowledge about the environmental issues, a gap is created between attitude-behaviour and it may have a strong influence on the sustainable design intention. Moreover, Hill and Lynchehaun (2002) concluded that possessing environmental knowledge can make a good sense to preserve the environment. Therefore, if individuals (especially designers) be conscious, the attitude toward Eco-fashion products can achieve as a way to reduce clothing waste in the environment (Mostafa, 2007).

- **Perceived Quality and Price, and Attitude**

This theme came up in the respondent's subjective perceptions. Most of the participants (91.25%) believed that it would be necessary to reduce barriers and possibility for thinking about Eco-fashion subject through presenting the good quality in Eco clothing styles as much as affordable prices and improving awareness through advertising.

Sina proposed that designers should promote the high quality and price characteristics in Eco-fashion clothes, as well as consumers. He said:

> Designers could purchase for clothing and fabrics at the thrift store or left-over parts in factories, knowing if they wanted to change the garment. Somehow, they could take it because of the good price and materials and change to be a beautiful garment.

Julie explained that the good perception of quality in Eco-fashion materials led her to buy larger volumes of materials. Her story presented the recycled or reuse fabrics in acceptable quality is dealing with the high price of natural fabrics (Jin Gam et al., 2009), "the material's quality encourages me to change my misconception, also, finding organic fabrics is difficult and most costly."

Nazla expressed that he judges the value of an Eco-material using quality indicators and then combine this judgement to evaluate their design intention (Wagner, Curteza, et al., 2018), "my collection always shows a good visual appearance and quality, but it seems quite expensive because this is a special style, so the understanding of quality and price of materials is my design borderline."

Dana seemed to have the greatest potential to earn money from her Eco-fashion design from all the enthusiasts of Eco-fashion design. However, it was also necessary for the (87.5%) participants to inexpensive prices, regardless of whether the materials are involved and whether clothes are made, but the cost to design for an Eco-fashion product is difficult to estimate.

Approximately half of the participants (50%) did not want to pay extra for the purchase of Eco-fashion products since they believed its effect on the final design output

directly, and consumers slightly more wished to pay less or the same than other clothes. In addition, in most of the designer's opinion (75%), the extent of Eco-fashion design as customization could also influence the price. The price differences by participants' perception seem to make logical sense. Hence, the perceived price in second-hand garments is an important factor which leads to the designer thinking about using them as an Eco-fashion material (Xu et al., 2014).

- **Perceived Functional and Aesthetic, and Attitude**

There was primary interest for the psychologic or behavioural characteristics of individuals who designed Eco-fashion clothes. The most of interviewees (91.23%) noted an ability to alter their attitudes by the perception of functional and aesthetic attributes toward Eco-fashion design. Of all the Eco-fashion design enthusiasts, Dana seemed to be the most capable of making money and create something unique from her work. Dana indicated that she thinks to buy second-hand clothing and recycled fabrics because she believes they are still beautiful. She stated, "in some cases, the apparent charm of the recycled fabrics makes me convinced to use them in design instead of burying. I am able to create clothes which are still beautiful but only needs alterations."

Kjaerheim (2013) declares that not only quality of materials is an essential key in designer's attitude to the success of a created product, but also the perception of functional and aesthetic features is required for any successful Eco-fashion products. Jane commented that Eco-fashion clothes can have a simple style regarding an environmental friendly appearance (Niinimäki, 2010), "the sustainable fabrics give me a good feeling; I feel a sense of nature. Ability to adapt in any style and design is interesting."

Style and fashion-oriented are considered as the main factor in the design of Eco-fashion (Gwozdz et al., 2015). It was reported that the elements of fashionability in second-hand garments make important factors toward using them (Wagner, Curteza, et al., 2018). Suzy expressed that she could make a good connection with Eco-fashion materials in terms of appearance and performance, “they have no executive restrictions and flexible for any seasonal collection design.”

Although most of the designers (87.5%) had a wide variety of skills and were typically trained in a category of sustainable products since they are professional. For example, Nazla is sportsman, so many of the items he made were purchased and designed based on the functionality and performance. Nazla said, “I mainly buy and design on organic cotton sportswear. I have chosen fabrics and designed based on the functionality, so Eco-fashion materials especially organic cotton has been convinced me for wearing in the cold weather.” Sina highlighted that he is satisfied with the visual value of the Eco-fashion materials. He stated, “sense aesthetic understanding is an element of synaesthesia. These features changed my attitude toward Eco-fashion materials.”

- **Perceived Ease to Use and Usefulness of Technology, and Attitude**

The issue of using technology was significant in several interviews where most respondents (88.04%) agreed that their experience of using technology has changed their attitudes. Empirical studies have reported that designers have struggled with understanding information of technology in making a responsive design in Eco-fashion products (Kjaerheim, 2013). Four of the participants (Janet, Julie, Sina and Nazla) considered themselves as textile artists along designing Eco-fashion items. They were trained in the design and craftsmanship techniques for the creation of wearable works of art. They believed

that nowadays technology has affected their work. Hence, designers discussed how they are still learning, improving, and expanding their skills based on modern technology.

Designers desire to use technology in the Eco-fashion design if they understand that it will help them to deliver the value of sustainability to perform their job better (Kozlowski et al., 2018). Dana stated that she does not pay attention to the technology system unless she sees the benefit of using it, "I am always trying to save material as well as reduce the time in Eco-fashion design. Working with zero-waste technology has brought me closer to my goal." These qualitative results align with previous studies. The perceived usefulness of technology significantly reduces the costs, saves time and increases the aesthetic value of products in the fashion industry with regards to sustainability (Kjaerheim, 2013). Nazla pointed out that he believes the use of technology leads to reducing human error as well as decrease of fabric waste (Vanderploeg et al., 2017), "it is very easy to learn and apply. I can save time and money to make a prototype using Eco-fashion materials, that is my main goal in Eco-fashion design; enjoy, reduce, save."

Parsons and Campbell (2004) showed that technology encourages the designer's attitude to develop their knowledge as a contribution to sustainability in the design process and change their common techniques. Lee et al. (2019) noted that fashion design with the employment of modern technology software can lead to an acceptable outcome as well as save time and money.

- **Attitude of Eco-Fashion Design and Behavioural Intention**

Intention indicates how much effort an individual will put forth or invests to produce a behaviour that is appropriate for a sustainable environment. Jin Gam et al. (2009) showed that there is a positive relationship between attitude and design behavioural intention. Julie

stated that her positive attitude to the Eco-fashion collections stimulated her intention to design, “in 2012, the good memory of Eco-fashion clothes with a unique design at the REDRESSED fashion show, persuaded me to design with Eco-fashion materials.”

This finding has consisted of the previous literature that the recycled material was especially common among young designers, who set up their own small fashion companies, instead of virgin material (Kjaerheim, 2013). Mostafa (2007) found an interesting result that in most of the cultures positive attitude can make a good impression to perform a behaviour. The present study shows that almost all interviewees (86.44%) reacted positively towards further help with more sustainable designs.

- **Subjective Norm of Eco-Fashion Design and Behavioural Intention**

Subjective norm is defined as a psychological factor which is under social pressure to perform or not to perform the behaviour (Fishbein & Ajzen, 1975). Most designers (86.85%) agreed with that close friends and family modified their actions in several main ways to reduce the effect on the community. Indeed, all except two participants have confirmed that their family is concerned with the world and its future.

Six participants (75%) indicated they speak with their close friends about everything that is affecting the environment and preserving the planet for the next generations. Sina stated that social norms have a major influence on his intention (Chan & Bishop, 2013), “I rely on customers who have become more conscious and are looking for clothes with ethical labels. So, they expect me to observe environmental issues in design.” Jane shared the same comment:

I would like to use Eco-fashion material because of my children. I want they will be proud of me and my designs that this will save their future lives. My husband is interested in forestry and he worked is related to timber products. My daughter is also an engineer of an international development firm, farming. She is always worried that developed nations will be abused.

While half of the participants (50%) indicated that often, a specific family member or close friend was influential on their beliefs in designing clothes toward preserving the environment. When they were asked about the family's level of education, they stated that this specific family member is qualified in the environmental fields or is working.

Nearly all participants said household items are recycled by their close friends and family members, and some suggested that their waste is also composted by different members. Also, four participants (50%) said that his family member made choices to reduce their environmental effect on earning and saving money, such as water, fuel, and energy conservation. Besides, researcher across studies have evaluated that subjective norm can describe environmentally responsible behaviour (Biel & Thøgersen, 2007). Hence, designers often perceive more risk in Eco-fashion design than when they do other design. They may be more susceptible to the influence of subjective norm in design with Eco-fashion materials.

- **Behavioural Intention and Actual Behaviour toward Eco-Fashion Design**

The tendency to make a specific action is known as a behavioural intention, and it is measured by a person's enthusiasm to make an effort to reach it (Tu & Hu, 2018). Intention determines actual behaviour. Basically, the strong predictor of behaviour is assumed "intention", though in some cases, it may not act consistently. All participants were highly likely to design the clothing based on the Eco-fashion services and process in the future.

Most Participants (90.32%) addressed different clothing plans which they intended in the Eco-fashion design focus on using only Eco-fashion materials soon.

Reasons for interest in using Eco-fashion design included consideration human health, preservation the environment as we live in the earth, getting more use out of clothing and fabrics in their fashion home or studio, to achieve a special look, and not to like the design and price of ready to wear clothes. However, several participants (50%) said they enjoy the creative process of the redesign service in Eco-fashion design. Nur emphasised:

> I enjoy the redesign process with leftover fabrics or unsold clothing, and I often do not know what I am going to design with them. So, I prefer to choose the draping technique to compare with making a pattern. It is a part of the ideation process.

In addition, most of the participants (91.25%) agreed with when they have the intention to buy fabrics from retail stores, they sometimes paid attention to fibre types rather than texture and appearance. Bamboo, recycled polyester, recycled yarn, angora yarn, silk, cotton, and organic cotton called sustainable fibres.

As with organic and fair-trade clothing, some but not the majority of participants (62.5%) had bought fabrics or non-sold items of clothing brands. Such brands have shown policies of social responsibility and fabrics manufactured in the country and textiles/clothes manufactured by local textile designers. However, two designers were not being sure that they had bought fabrics, especially traditional handmade made by socially responsible brands. Nazla stated:

> I always try to keep all my handmade as well as natural fabrics such as silk and cotton. Even though I keep such pieces and fabrics for saving money, I think might

> come back into style. Much vintage stuff in silk when I was a student in Paris, now I am using in the fashion show this year.

Similarly, Dana indicated a similar intention, she said:

> I started keeping clothing, fabrics and anything related to fashion and clothes which now they are not useful, because after being a long time in the fashion, I have gotten better about choosing more long-lasting styles. So, I am sure one day they will help me. It was a deliberate decision on my part.

A study worked on the behaviour related to the environmentally sustainable product (Kumar et al., 2017) reported a large effect size of behavioural intention toward sustainability on the actual behaviour. The research on design behaviour for minimising waste has shown a significant relationship between intention and design behaviour (Li et al., 2015). In addition, three of the participants (37.5%) hired tailors and cobblers to fix individual clothes and shoes, occasionally. Although many kinds of literature established the relationship between intention and behaviour, the study would like to develop this relationship in the sense of Eco-fashion clothing.

According to the available literature and analytical-qualitative researches, researchers developed a conceptual model based on the TRA theory to investigate the relationship between the factors in Eco-fashion design. As seen in Figure 4.2, in this conceptual model, environmental knowledge; perceived quality and pricing value; perceived functional and aesthetic value and perceived of using technology positively affect attitude toward Eco-fashion design, directly. According to Figure 4.2, the designer's part of the structural model of Eco-fashion design is completed after findings about the discovery of the designer's behaviour and then the conceptual model will be developed. Moreover, attitude

and subjective norms have a significant effect on the design intention toward Eco-fashion clothing, directly. Finally, design intention toward designing of Eco-fashion clothes has a positive effect on the designer's real behaviour toward minimisation clothing waste and Eco-fashion design. In the next stage, the conceptual model will be evaluated.

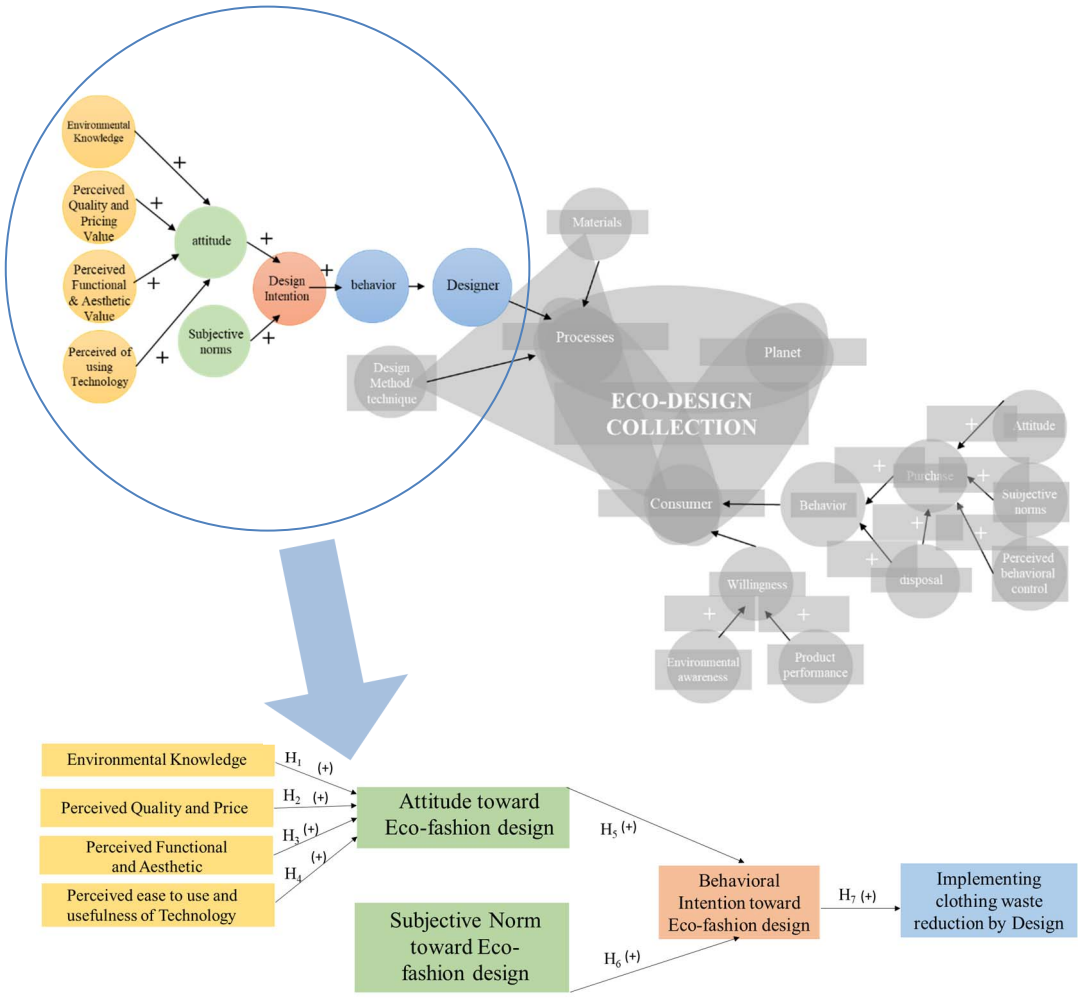



**Figure 4.2:** Conceptual Model of Designer's Behaviour towards Eco-Fashion Design

### 4.2.4 Quantitative Results from Discovery of Designer's Behaviour

**Descriptive Statistics and Analysis.** A total number of 133 respondents completed questionnaires distributed between sustainable fashion designers. But only 98 respondents

were chosen to analyse because the experience in the field of Eco-fashion design must be more than 2 years. Regarding the designer's general experience, 74% (n = 98) has been designing for more than two years; So, according to Warde (1990), a response rate above 30% is excellent for social science. Table 4.8 includes the results of the characteristics of the sample. The sample of sustainable fashion designers consisted of 92 females and 6 males with 56% over the age of 35 years. The most (54.1%) of respondents possessed a bachelor's degree (n = 53). For the country of the business location, most of the participants (40.8%, n = 40) were in Southeast Asia and the rests are the Middle East and Europe (32.7% and 26.5%, respectively).

**Table 4.8:** Demographic Profile of Respondents (N=98)

| **Categories** | | **Frequency** | **Valid Per cent** |
|---|---|---|---|
| Gender | Female | 92 | 93.9 |
| | Male | 6 | 6.1 |
| Age | -20 | 7 | 7.1 |
| | 21 – 25 | 19 | 19.4 |
| | 25 – 35 | 17 | 17.3 |
| | +35 | 55 | 56.1 |
| Level of Education | Technical school graduate | 20 | 20.4 |
| | Bachelor's degree | 53 | 54.1 |
| Level of Education | Postgraduate or professional degree | 25 | 25.5 |
| Location | Europe | 26 | 26.5 |
| | Southeast Asia | 40 | 40.8 |
| | Middle East | 32 | 32.7 |

In addition, the measurement scales are shown in Table 4.9. All findings demonstrated significant high level of the related variable on the designer's attitude with the alpha of variable features greater than 0.8; environmental knowledge (α = 0.806), perceived quality and price (α = 0.822), perceived functional and aesthetic (α = 0.835) and perceived ease to use and usefulness of technology (α = 0.855), however, perceived ease to use of technology has higher reliability rather than other variables. Moreover, attitude, subjective norm and intention behaviour have a significant value of alpha; attitude (α = 0.876), subjective norm (α = 0.771) and behavioural intention (α = 0.726).

**Table 4.9:** Informational Factors Rated Significantly Different (N=98)

| **Variables (α ≥0.7)**<br>**Items** | **M** | **SD** | **Factor loading (≥0.7)** |
|---|---|---|---|
| Environmental Knowledge (EK) (α=0.806) | | | |
| Using Eco-fashion materials in design is a primary way to; | | | |
| Q1. conserve natural resources. | 4.39 | 0.79 | 0.73 |
| Q2. reduce clothing waste. | 4.45 | 0.64 | 0.83 |
| Q3. reduce the carbon impact. | 4.30 | 0.86 | 0.80 |
| Q4. reduce water consumption. | 4.42 | 0.75 | 0.85 |
| Perceived Quality and Price (PQP) (α=0.822) | | | |
| In design with Eco-fashion material; | | | |
| Q5. I perceive the price of Eco-fashion as a positive thing. | 4.42 | 0.65 | 0.88 |
| Q6. I am interested in using materials, seem inexpensive. | 4.38 | 0.66 | 0.89 |
| Q7. It is important to know the material's quality I buy. | 4.28 | 0.80 | 0.73 |
| Q8. It is important to buy a high quality of materials. | 4.31 | 0.76 | 0.75 |

**Table 4.9** continued

| | | | |
|---|---|---|---|
| Perceived Functional and Aesthetic (PFA) (α=0.835) | | | |
| In design with Eco-fashion material; | | | |
| Q9. I am interested in using them with nice colours and high attractiveness. | 4.05 | 0.87 | 0.80 |
| Q10. I perceive the simple style is a positive thing. | 4.11 | 0.86 | 0.78 |
| Q11. It is important to assess the quality and price base on aesthetic features. | 3.92 | 0.87 | 0.75 |
| Q12. I search for as much functional feature information before I design. | 3.89 | 0.89 | 0.79 |
| Perceived Ease to Use and Usefulness of Technology (PT) (α=0.855) | | | |
| In design with Eco-fashion material: | | | |
| Q13. I would find it easy to use technology to make a design decision. | 3.88 | 1.04 | 0.71 |
| Q14. It would be easy for me to become an expert in utilising technology. | 3.83 | 0.92 | 0.83 |
| Q15. New-Fashioned technology makes me a smarter designer. | 3.89 | 0.89 | 0.75 |
| Q16. Utilising technology reduces my time and saves my money. | 3.93 | 0.97 | 0.72 |
| Behavioural Intention (BI) (α=0.726) | | | |
| Q17. After that, I will make an effort to use Eco-fashion materials in my profession. | 4.24 | 0.80 | 0.81 |
| Q18. As regards to my profession, I intend to use Eco-fashion products. | 4.08 | 0.92 | 0.78 |

**Table 4.9** continued

| | | | |
|---|---|---|---|
| Q19. I believe that Eco-fashion materials usage will become widespread in the future. | 3.88 | 1.04 | 0.88 |
| Q20. I think I will use the information of Eco-fashion products regularly in the near future. | 3.68 | 0.85 | 0.92 |
| Behavioural Design (BD) (α=0.812) | | | |
| Q21. I choose the Eco-fashion materials for my products if they have a similar price as other types available in the market. | 4.45 | 0.66 | 0.80 |
| Q22. I redesign my unsold clothes in the wardrobe to reduce the use of materials and fabrics. | 4.45 | 0.64 | 0.78 |
| Q23. If I understand the potential damage to the environment that some clothes can cause, I do not design those clothes. | 4.30 | 0.86 | 0.82 |
| Q24. I do not buy material if the company which sells it, is environmentally irresponsible. | 4.38 | 0.68 | 0.76 |
| Subjective Norm (SN) (α=0.771) | | | |
| Q25. Most of my friends are using Eco-fashion materials in their process design. | 3.89 | 0.89 | 0.71 |
| Q26. My friends and social environment emphasise to use of Eco-fashion materials. | 4.42 | 0.65 | 0.85 |
| Q27. I think most people who are important to me supporting my Eco-clothes collections. | 4.39 | 0.66 | 0.77 |
| Q28. Most designers who are important to me think that using Eco-fashion products is a good idea. | 4.30 | 0.86 | 0.81 |

**Table 4.9** continued

| Attitude (A) (α=0.876) | | | |
|---|---|---|---|
| Q29. According to me, the idea of using Eco-fashion materials in my profession is wisely. | 4.11 | 0.86 | 0.78 |
| Q30. Using Eco-fashion material in fashion design is an excellent idea. | 4.38 | 0.66 | 0.93 |
| Q31. Using Eco-fashion materials into apparel design would be very pleasant. | 4.39 | 0.66 | 0.88 |
| Q32. I feel that Eco-fashion materials are a necessary instrument in fashion design. | 4.42 | 0.65 | 0.92 |

Note. $\alpha$ = Cronbach alpha, Mean = M, SD = Standard Deviation.

**Reliability and Validity.** The reliability was tested by Composite Reliability (CR) and Cronbach alpha (α) with both more than 0.70. According to George and Mallery (2003), the researcher found support to combine the items under each measure into the intended multi-item scale, with high reliability ($\alpha \geq 0.7$) for all variables.

The validity of the scale items was assessed with factor loadings and Average Variance Extracted (AVE) which both greater than 0.50 and Heterotrait-Monotrait (HTMT) ratio test with variables below than 0.85 (Fornell & Larcker, 1981). As shown in Table 4.10, reliability and discriminant validity can be accepted.

**Table 4.10:** Empirical Results of Outer Structural Model Outcomes (N=98)

| Items | α (≥0.7) | CR (≥0.7) | AVE (≥0.5) | Variables | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A | BI | BD | EK | PFA | PQP | SN |
| A | 0.87 | 0.92 | 0.79 | | | | | | | |
| BI | 0.72 | 0.83 | 0.70 | 0.83 | | | | | | |
| BD | 0.81 | 0.87 | 0.68 | 0.73 | 0.79 | | | | | |
| EK | 0.80 | 0.87 | 0.63 | 0.69 | 0.77 | 0.82 | | | | |
| PFA | 0.83 | 0.89 | 0.66 | 0.72 | 0.48 | 0.70 | 0.73 | | | |
| PQP | 0.82 | 0.86 | 0.63 | 0.35 | 0.64 | 0.65 | 0.70 | 0.66 | | |
| SN | 0.77 | 0.85 | 0.68 | 0.59 | 0.27 | 0.64 | 0.68 | 0.73 | 0.74 | |
| PT | 0.85 | 0.89 | 0.65 | 0.73 | 0.35 | 0.74 | 0.54 | 0.49 | 0.47 | 0.39 |

Note. CR= Composite Reliability, AVE= Average Variance Extracted

**Regression Analysis.** As shown in Table 4.11, the assumption of independence in errors was met with Durbin Watson statistic with validity value between 1.5 to 2.5 (George & Mallery, 2003). Multiple regression analysis resulted in the model.

According to George and Mallery (2003), R-Squared is the correlation between the observed and predicted values and it is significant whilst is more than 0.6. Hence, the model coefficients imply that the "environmental knowledge", "perceived quality and price", "perceived functional and aesthetic", and "perceived ease to use and usefulness of technology" account for 87.4% ($R^2$ = 0.874) of the variation in the designer's attitude significantly. However, the linear regression analysis shows environmental knowledge is an important predictor toward strengthening the designer's attitude ($\beta = 0.52$, $p = 0.00$).

**Table 4.11:** Regression Analysis of Variables *p<0.05, **p<0.000 (N=98)

| | | B | Std. Error | β | t-value | p-value | Lower | Upper |
|---|---|---|---|---|---|---|---|---|
| Factors affecting on A | EK | 0.509 | 0.047 | 0.528 | 10.94 | 0.000** | 0.417 | 0.601 |
| | PQP | 0.211 | 0.047 | 0.210 | 4.48 | 0.000** | 0.118 | 0.305 |
| | PFA | 0.214 | 0.048 | 0.261 | 4.43 | 0.000** | 0.118 | 0.310 |
| | PT | 0.092 | 0.038 | 0.125 | 2.42 | 0.017* | 0.017 | 0.167 |
| $R^2 = 0.874$ , F (4,93) = 161.516, P = 0.00 , Durbin-Watson = 1.994 | | | | | | | | |
| Factors affecting on BI | AD | 1.047 | 0.169 | 0.914 | 6.20 | 0.000** | 0.712 | 1.382 |
| | SND | 0.331 | 0.165 | 0.295 | 2.05 | 0.048* | 0.030 | 0.659 |
| $R^2 = 0.640$ , F (2,95) = 40.396, P = 0.00 , Durbin-Watson = 2.002 | | | | | | | | |
| Factors affecting on BD | BI | 0.728 | 0.045 | 0.856 | 16.25 | 0.000** | 0.639 | 0.817 |
| $R^2 = 0.733$ , F (1,96) = 264.08, P = 0.00 , Durbin-Watson = 1.810 | | | | | | | | |

Additionally, the attitude and subjective norm describe significantly 64% of the variability ($R^2 = 0.640$) of the design intention. As can be seen in Table 4.11, the attitude is a strong predictor toward design intention more than subjective norms ($\beta = 0.914$, p=0.00; $\beta = 0.295$, p = 0.01, respectively). Finally, 73.3% ($R^2 = 0.733$) of the variance in intention predicts design behaviour to implement waste reduction by using Eco-fashion materials. Since p-value ≤ 0.05, therefore, this research shall reject the null hypothesis.

Consequently, the study can assume that there is a linear relationship between the variables in the model of this study. Since the MANOVA can detect patterns between

multiple dependent variables, the research applied this analysis shows the significant differences across design behaviour on the multivariate tests.

According to the results, different level of all factors made an effect on the designer's attitudes and subjective norm made an effect on the design intention confirmed by all two tests; Pillai's trace = 1.084, F (54.427) = 2.924, Wilks' Lambda = 0.202, p = 0.00.

In addition, the designer's intention made an effect on implementing waste reduction by design confirmed by Pillai's trace = 1.511, F (56.452) = 9.328 and Wilks' Lambda = 0.016, p = 0.00.

**Structural Model and Hypothesis Testing.** The study tested the proposed hypotheses through structural equation modelling (SEM) technique (See Figure 4.3). Results are summarised in Table 4.12; all hypotheses were supported. Thus, the following variables had a positive association with the designer's attitude: environmental knowledge ($H_1$), perceived quality and price ($H_2$), perceived functional and aesthetic ($H_3$) and perceived ease to use and usefulness of technology ($H_4$).

The results indicated that environmental knowledge and perceived quality and price have a strong effect on the attitude. Besides, Eco-fashion design can lead to the designer's intention by using Eco-fashion materials ($H_5$ and $H_6$). Finally, behavioural intention played an important role as a predictor variable for implementing clothing waste reduction by design in the quantitative results ($H_7$).

**Table 4.12:** Results of Hypotheses Testing *p<0.05, **p<0.000

| Path-Correlation | | $f^2$ | Effect | β | SE | t-value | p-value | Decision |
|---|---|---|---|---|---|---|---|---|
| $H_1$ | EK -> A | 1.65 | large | 0.52 | 0.04 | 13.34 | 0.00** | Supported |
| $H_2$ | PQP -> A | 0.59 | large | 0.30 | 0.04 | 7.60 | 0.00** | Supported |
| $H_3$ | PFA -> A | 0.15 | medium | 0.18 | 0.06 | 3.87 | 0.00** | Supported |
| $H_4$ | PT -> A | 0.10 | medium | 0.13 | 0.05 | 2.72 | 0.01* | Supported |
| $H_5$ | A -> BI | 0.42 | large | 1.01 | 0.19 | 5.37 | 0.00** | Supported |
| $H_6$ | SN -> BI | 0.06 | medium | 0.08 | 0.20 | 2.20 | 0.04* | Supported |
| $H_7$ | BI -> BD | 2.13 | large | 0.82 | 0.02 | 23.97 | 0.00** | Supported |

**Summary.** The outcome of the structure model and reliability statistics analysis demonstrated a significantly high level of behavioural intention in Eco-fashion design toward minimisation clothing waste with an alpha of variables features greater than 0.7. Also, all hypotheses were supported significant level.

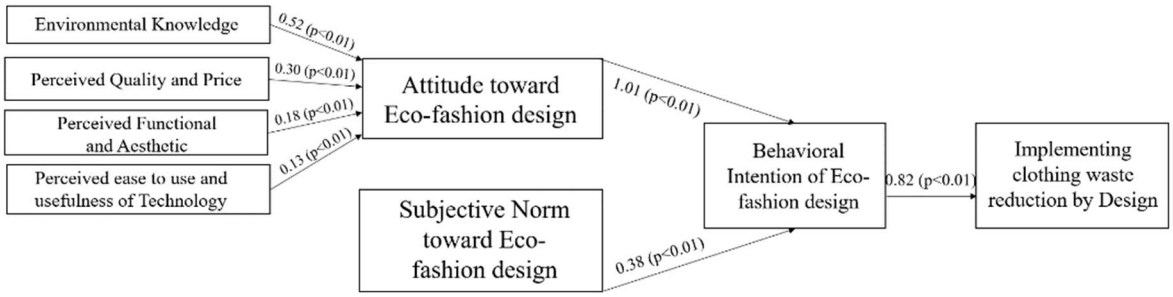



**Figure 4.3:** The Measurement Conceptual Model of Designer's Behaviour toward Eco-Fashion Clothes Design

## 4.3 Develop Eco-Fashion Design Model (Objective Two)

The second objective of this study is to develop an Eco-fashion design model with related factors to source Eco-fashion materials and create an Eco-fashion collection.

### 4.3.1 Quantitative Results from Design Concept and Discovery Consumer's Need

A total number of 214 respondents completed questionnaires distributed. But only 128 respondents were women in age between 20 to 30 years old. Regarding the women's age, 60% (n = 128) have a specific age in regards of the purpose this project; So, according to Warde (1990), a response rate above 30% is excellent for social science.

Table 4.13 includes the results of the characteristics of the sample. 43.8% of respondents possessed a bachelor's degree (n = 56) with most purchasing every 3 - 4 months (n = 87). Regardless of religion or culture, consumers desire to have a wardrobe of essential clothes (87.5%). Most of the respondents (66.4%, n = 85) were not familiar with "capsule wardrobe". Although 67.5% (n = 86) claimed that they might find the necessary clothes in their wardrobe, 87.5% (n = 112) were interested in possessing a package of essential clothes.

**Table 4.13:** Demographic Profile of Respondents (N=128)

| Categories | | Frequency | Valid Per cent |
|---|---|---|---|
| Q1. Country | Iran | 72 | 56 |
| | Malaysia | 56 | 44 |
| Q2. Level of Education | Bachelor's degree | 56 | 43.8 |
| | Postgraduate degree | 54 | 42.2 |
| | High school graduate | 18 | 14 |

**Table 4.13** continued

| | | | |
|---|---|---|---|
| Q3. How often did you purchase new clothing? | Once or twice a year | 15 | 11.7 |
| | Once every 6-7 months | 14 | 10.9 |
| | Once every 3-4 months | 87 | 68 |
| | Once a month | 12 | 9.4 |
| Q4. Do you know what is "Capsule Wardrobe"? | Yes | 43 | 33.6 |
| | No | 85 | 66.4 |
| Q5. Can find essential clothes in your wardrobe? | Yes | 20 | 15.6 |
| | No | 22 | 17.2 |
| | Maybe | 86 | 67.2 |
| Q6. Interested in possessing a package of essential clothes? | Yes | 112 | 87.5 |
| | No | 16 | 12.5 |

According to the quantitative findings, the capsule wardrobe means interesting (M = 4.87), exciting (M = 4.84) and important (M = 4.72) to them, respectively. Table 4.14 shows descriptive statistics of their favourite casual capsule wardrobe. All in all, the majority of respondents prefer to have s classic casual wardrobe.

**Table 4.14:** Descriptive Statistics of Product Involvement Measurement

| **To me "having a capsule wardrobe" is** | | |
|---|---|---|
| | **Mean** | **Std. Deviation** |
| Important | 4.72 | 0.560 |
| Interesting | 4.87 | 0.441 |
| Relevant | 4.17 | 0.504 |
| Exciting | 4.84 | 0.384 |
| Means a lot to me | 4.59 | 0.747 |
| Appealing | 4.64 | 0.740 |
| Fantastic | 4.63 | 0.697 |
| Valuable | 4.17 | 0.519 |
| Needed | 4.66 | 0.768 |

Table 4.15 provides a descriptive statistic of each piece in the wardrobe. The survey displays the majority of the ranking;

In **Top items** are Strapless top (M = 4.24, Top no.3), Princess top (M = 4.48, Top no.4) and Tanktop (M = 4.65, Top no.5);

In **Shirt/Blouse items** are T-shirt (M = 4.43, Shirt no.2), V-shirt (M = 4.66, Shirt no.3) and Western blouse (M = 4.55, Shirt no.6);

In **Jacket/Coat items** are Vest (M = 4.58, Jacket no.1), Blazer jacket (M = 4.73, Jacket no.2), Bolero (M = 4.26, Jacket no.3) and Cardigan (M = 4.22, Jacket no.6);

In **Dress items** are Highdress (M = 4.13, Dress no.3), Sundress/millitary dress (M = 4.35, Dress no.4), Shirtdress (M = 4.69, Dress no.5) and Mantua (M = 4.11, Dress no.7);

In **Trouser/Short** items are Straight trouser (M = 4.47, Trouser no.2), Short (M = 3.94, Trouser no.5), Jumpsuit (M = 4.64, Trouser no.6), Jean (M = 4.57, Trouser no.8) and Overall (M = 4.62, Trouser no.9);

In **Skirt items** are A-line round skirt (M = 4.63, Skirt no.2), Sport mid-lenght skirt (M = 3.94, Skirt no.5) and Pleat skirt (M = 3.80, Skirt no.6).

**Table 4.15:** Descriptive Statistics of the Casual Clothing in Wardrobe

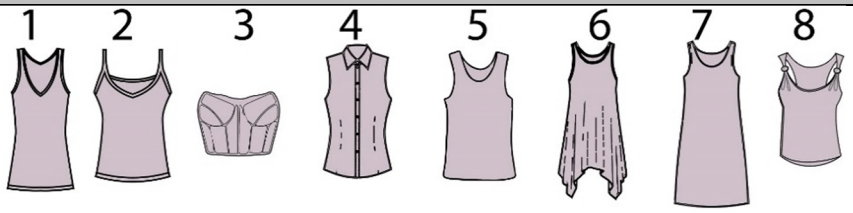
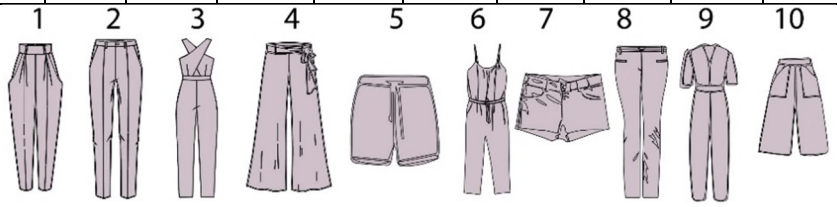
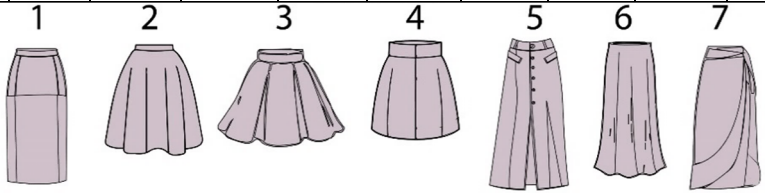
| **Type** | **Illustration of Casual Clothing by Designer's Team** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Top** | No |  | | | | | | | |
| | mean | 3.65 | 3.10 | 4.24 | 4.48 | 4.65 | 3.27 | 3.80 | 3.12 |
| | Std. Deviation | 0.972 | 0.957 | 0.473 | 0.627 | 0.714 | 0.752 | 0.651 | 0.705 |
| **Shirt/ Blouse** | No |  | | | | | | | |
| | mean | 2.77 | 4.43 | 4.66 | 3.80 | 3.69 | 4.55 | | |
| | Std. Deviation | 0.969 | 0.820 | 0.613 | 0.673 | 0.641 | 0.868 | | |

**Table 4.15** continued

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Jacket/ Coat** | No |  | | | | | | | |
| | mean | 4.58 | 4.73 | 4.26 | 3.05 | 3.58 | 4.22 | 3.28 | 3.12 |
| | Std. Deviation | 0.629 | 0.430 | 0.703 | 0.650 | 0.874 | 0.713 | 0.793 | 0.842 |
| **Dress** | No |  | | | | | | | |
| | mean | 2.98 | 3.20 | 4.13 | 4.35 | 4.69 | 3.23 | 4.11 | 2.73 | 3.67 | 2.68 |
| | Std. Deviation | 0.955 | 1.071 | 0.684 | 0.752 | 0.670 | 0.512 | 0.538 | 0.992 | 0.82 | 0.887 |
| **Trouser / Short** | No |  | | | | | | | |
| | mean | 3.82 | 4.47 | 3.97 | 3.09 | 3.94 | 4.64 | 3.35 | 4.57 | 4.62 | 3.28 |
| | Std. Deviation | 0.747 | 0.803 | 0.501 | 0.664 | 0.543 | 0.708 | 0.677 | 0.782 | 0.789 | 0.747 |
| **Skirt** | No |  | | | | | | | |
| | mean | 2.60 | 4.63 | 3.15 | 3.17 | 4.72 | 3.80 | 2.88 |
| | Std. Deviation | 0.981 | 0.607 | 0.632 | 0.688 | 0.626 | 0.784 | 1.012 |

**Summary.** The results reflected that using of a capsule wardrobe as a concept design was considered significantly "interesting", "exciting" and "important" for young women with age between 20 to 30 years old that mostly live in Iran. Hence, focus on creating a capsule wardrobe based on the consumer's needs can be a related and efficient subject in the fashion market. Also, twenty-two fashion items were chosen as favourite clothes in young women's clothing wardrobe based on the illustrated clothes shown in the questionnaire.

### 4.3.2 Qualitative Results from Designer to Develop Eco-Fashion Design Model

Eight fashion and apparel designer described their design and production processes regarding sustainability. All designers were aware of environmental problems in fashion and apparel design and production. The designer's responsibilities are summarised in Table 4.16. As a side note, Brown (2010) and Brown (2013) wrote two books as named "Eco-fashion" and " Refashioned" that introduces Eco-fashion designers and brands, where this study was applied the main subjects of them to develop the Eco-fashion process model (Refer to Appendix 8).

**Table 4.16:** Demographic of Interviewees

| No. | Interviewee | Position | Work Experience | Responsibility Description |
|---|---|---|---|---|
| 1 | Janet | Sustainable fashion designer/artisan maker | 15 year | Creating designs, selecting materials, deciding styles, colour, and fabrics |
| 2 | Jane | Programme director for fashion design | 30 years | Creating designs, selecting materials, research projects |

**Table 4.16** continued

| | | | | |
|---|---|---|---|---|
| 3 | Suzy | Sustainable fashion designer | 10 years | Performing market research, creating designs, managing production |
| 4 | Julie | Part-time lecturer, sustainable fashion designer | 20 years | Selecting designs; selecting materials, deciding styles, colour, and fabrics |
| 5 | Sina | Sustainable fashion designer | 12 years | Creating designs, selecting materials, managing production, research projects |
| 6 | Nur | Senior lecturer, sustainable fashion designer | 21 years | Creating designs, selecting materials, deciding styles, colour, and fabrics, research projects |
| 7 | Nazla | Sustainable fashion designer | 11 years | Creating designs, selecting materials, deciding styles, colour, and fabrics |
| 8 | Dana | Clothing department manager | 10 years | Managing production, creating designs, selecting materials, deciding styles, colour, and fabrics, |

**Descriptive Analysis of Results**. The semi-structured of open-ended interview questions (Refer to Appendix 4) used for this part of the research were intended to collect data regarding criteria in Eco-fashion and apparel design process. Participants were asked to describe their sustainable or Eco-fashion design process, based on their professional point of view (Refer to Appendix 4 - Question one). Interrater reliability (Cohen's kappa ) was

0.919, above the recommended threshold identified by Creswell and Clark (2017); Problem Identification and Define Idea ($\kappa = 0.923$) , Product Design ($\kappa = 0.937$), Evaluation and Implementation ($\kappa = 0.901$) (More details in Table 4.18 and Appendix 12).

Hence, often the question of Eco-fashion is rooted in asking questions about the design process, sourcing, resources, and other aspects of design. It is an introspective look, reminiscent of other sustainable or green movements, that seeks a connection with intent. The creation of the Eco-fashion movement is derived from the original green clothing movement. In the early 90s, the green movement became a trend. It came unexpectedly and, much like other fashion trends, vanished the next season. It cannot be focused on short-term movements but must be related to specific long-term benefits to sustain. Knowledge of the Eco-fashion design process is often derived from an understanding of the sustainable movements and the various aspects related to movements such as ethical and Eco-friendly design.

The research shows that the Eco-Fashion design process is not specified, but that all designers start the process with a plan on the look of the product. Their motivation is artistic, commercial, and environmental which means that all three must be considered in the process creation. The majority (87.5%) of designers sourced materials from the Eco-fashion sources which make for sustainable design, natural fabrics, recycled fabrics, unwanted or second-hand clothes, unused natural fabric and materials, fabrics leftover. Janet stated:

> I know many ways are to design a sustainable product which we borrow some of the parts from the sustainable movement to focus on Eco-fashion design. So, the process of Eco-fashion design, for me, is to keep leftover fabric or textiles out of the landfill. Also, using the undamaged parts, un-used natural fabrics, or clothes for upcycling,

use many post-consumer clothes: denim and stretch jersey, printed women's and knitwear are part of my design process. People throw around how you should buy well-made clothes that are going to last you forever. I used them to teach sustainable techniques design courses at the university. I usually design without patterns, add contrasting colours parts of cloths on mannequins, overlock most seams on the outside of the garment. But what I focus on when I am designing clothes is really on the aspect of making clothes that are going to hold up to repeated wearing and repeated washing. I consider complaints from the consumer's feedback because most of the people are not satisfied with quality and clothing lifespan. Long story short, being fair trade and using sustainable fabrics and agriculture or renewable resources aspects of Eco-fashion is important but my focus is more on the downstream aspect of when you are making it and how long you are going to keep it.

Responses emphasise the life-cycle system in Eco-fashion design. Julie sated:

> I think to follow a mini version of engineering design processes in fashion design. My studio is near a very good charity shop that sells unwanted donated clothes (some used, some new). I ask for clothes that charity shop cannot sell to buy at a low price and try to use these in some of my designs. I have made two-channel to discuss new trends and demands of Eco garments and follow consumer's needs and their wants. Therefore, new designs will be created such as bags, clothes and costumes based on demands. I am concerned about limited sustainable fabric sources, so researching methods for second-hand fabrics to improve the sustainability of fabrics, as well as removing polyester velour and replacing it with cotton velour or viscose/silk velvets is my future ideas. "Product-service system" in silk jewellery, I am trying to offer a "lifetime service" where things can be sent back for remaking, upcycling, or

repairing. Silk jewellery can only partially be washed, and some elements are not disposed of into landfill but reused. I think the main difference between Eco-fashion design with other design is started from ideation, plan, and produce.

Dana also mentioned:

> In Eco-Fashion design, I think many processes and intentionality of where the materials are being sourced, sustainable design techniques, and ideas around "where are the materials coming from?" and "who is making it?" intentionality about this issue. Having a purpose of connecting the designer with the user is important to think rather than making something just to design it or making something with the hope that somebody desires to buy or not, therefore more of connectedness are occur between the designer and the user. I need to understand the consumer's need and concerns of Eco-fashion clothes in the field of design, quality, and price value before starting my design. The end-user has created unique designs or designs with a particular customer in mind as a source of inspiration.

**Problem Identification and Define Idea.** Second, when researches are focusing on the design process, the basic questions are started to ask about discovering the problems and generating new ideas in the sustainable movements in clothing, especially Eco-fashion design (Question two and Question three). Jane stated:

> Nowadays, the Eco-fashion design process is less consumer-driven and focus on more design-driven. I believe that it is more of a conscious decision in material sourcing and what issues in design structure features. Also, concerns about the price and quality are the main problems which can affect to discover market' demands of Eco-fashion clothing, therefore in the initial thinking, I consider the people's needs

in these factors. I combine contradictory pieces of information, divide contrast information by opposing two items to display differences and connect different data to build the most important definition of sustainability issues. So, to put it in a nutshell, the user's needs demand in the fashion market and sustainable goals.

Moreover, Suzy believed:

> The most problem in sustainable clothing is identified needs and problems between the people and the market. In the traditional design process where it is started with these questions "what does the consumer want" and "who are you designing this for? and what do they want?", Versus Eco-fashion design, which is more "what do we want as designers in sustainability?" and until now, the consumer's needs do not much be considered. Economic issues have always been deterrent factors in sustainable product buying. I am worried about the fact that I want to keep the world as safe as possible and think about the future life of my children. Therefore, thinking of the market needs of the clothing subject always have guided me to select Eco-friendly ideas.

Julie stated:

> For me, it starts with the end-user so meeting with him or her and really if I can talk or meet them, but it is not common. searching in market needs and the people's concerns is getting a sense of who they are. Because in the sustainable design process we want to design clothing that someone is going to wear for a long time. Then let us look at how can we make it appear trend-forward but also have longevity in terms of its aesthetics. I think consumers are hesitant because they think that sustainable products or Eco-fashion items are uncomfortable with low-quality material and

> design. Then let us look at how can we make it appear trend-forward but also have longevity in terms of its aesthetics. Understanding the consumer's needs of clothes made of Eco-fashion material may help us and industry to focus on the sustainable product, personal cost, and emotional benefits rather than a strategy.

In addition to Eco-fashion product, concerns relative to sustainability dealt with the quality, price, design and how those concerns can counter the negative aspects of society and the environment. Nazla stated:

> The only difference than other fashion design process that I must spend more time in the reaching goal. First, my passion for protecting the environment and wildlife became my artistic concept. In my mind, the biggest misconception about the Eco-fashion is aesthetics features that should be compromised to create low impact products. In the Eco-fashion design subject, the consumer's worries for purpose and design features are my initial thinking to start the creation idea. So, it is our responsibility to make sustainable clothing more attractive and appear trend-forward but also have longevity in terms of its aesthetics. Then I think we would follow their needs to encourage them purchasing. Why people are not interested in buying Eco clothes, undoubtedly the lack of variety and not be on their taste are most reasons for this problem.

Nur also indicated:

> I really am worried about what we are doing to the environment. From one side producing clothes with fabric waste and the other hand making clothing waste due to the lack of market demand and consumer's awareness of environmental pollution. However, I rely on young customers who have become more conscious and are

> looking for clothes with ethical labels. So, they expect me to observe environmental issues in the design. In addition, focusing on the sustainable design process needs more time and conscious. For example, If I want to follow the zero-waste design, I must spend more time planning in the pattern-making process, testing out the pattern to maximising utilisation of all fabric. I think that it is the main difference from the common fashion design process, where you ideate based on the consumer's concern and their wants, plan based on your perception of sustainability, and produce them.

In addition, most participants (92.31%) believed that they had at least somewhat altered their actions given the environment. They made some minor improvements like recycling, product maintenance for long periods and resource management. Responses are not varied from the limitation of knowledge resources and placing an emphasis on consumer's needs. Sina stated:

> I believe that anyone who designs products especially Eco-fashion knows how important it is to design with the people's concerns and demands. According to the fast-fashion industry, in the clothing design especially Eco-fashion, without searching the market and the people's needs cannot be successful. Consumers are interested in buying sustainable clothes at a fair price, good quality and variety of choice. Great ideas will not happen in a vacuum, I always review the notes collected from my consumer's viewpoint of sustainable clothing and make a mood board that took while organising all the information.

Dana said:

> I always easily think of what is important to my consumers in detailed ways because Eco-fashion is a new subject and I should find concept and designs to connect their

needs in sustainable ways. Consumer's needs, market needs and changes in the market are the main ideas in sustainable clothing and Eco-fashion process design. Also, all materials are able to dispose of, but yet mot too much consideration for biodegradable, and it is caused by contamination in our environment from such a large waste disposal site to all of those which affect air pollution water supply. Wondering if there is an interaction between these chemical materials which touch your skin if that has any impact on your health over time even.

**Product Design.** Regardless of varying descriptions rooted in professional experience, learning and understanding, Eco-fashion design is often formed from attitudes and perceptions that draws a person to seek further information to better understand such a novel component within the topic of sustainability (Question four and Question five). Jane stated:

> I first learned about the sustainability issue when I was in undergrad and reading Kate Fletcher's book. I saw that she cited some of the subjects to put design criteria in the process. One of them was material sourcing. Materials are selected based on my perception as well as customer's expectation about price, quality, and performance ability. Be recyclable or disposable at the end of life into another value stream or use not only to burning or landfill That is why I emphasise on the life-cycle system.

Julie stated:

> I think to reduce the consumption and waste of resources may occur by increasing the durability of relationships between people and products through design and collaborate with them. I believe that identifying consumer’s needs and designer’s

ability provides a means for establishing design criteria such as quality of the fabric, comfort for the season and longevity. Also, the actual life span of the clothes and how long the consumer is going to keep and not throw it away or hand it down are understandable sustainability ways to extend life span the clothes before decision-making and choosing design techniques.

Nazla said:

The quality value is essential to any success of a created product, also sustainable technique. Designers need to understand and apply new trends, concepts, and techniques as these are forming the designer's perception and improve designer's ability to adapt and perceive functional, aesthetic technological features in the modern Eco-fashion design. I mention where you are getting the fabric from so maybe it is created where it has sustainable processes or is renewable. But here the remarkable point is after usage, clothing will be recycled. Since materials become usable at the end of life instead of buried. So, all can be recycled and transformed into the new fibre through new technologies that nowadays They have made it easy for all the invisible.

Janet confirmed:

I believe junior designers may exclude sustainable design or materials due to the lack of confidence that their customers will pay for any cost increase. Producers in mass-volume are more likely to exclude sustainable choices because they have very low-cost targets. And maybe the sustainable activity is do everything in CAD which lead to decrease the waste. This is the winning design better say it is an opportunity for young designers. They make a pattern, make a marker and then bring it to the dress

> form and go from there through 3D features and computer-aided programmes by producing zero waste. In addition, using fewer materials to design and making something that is going to hold up to repeated wearing and repeated washing can foster creativity and resourcefulness during define design criteria and design details.

Regardless of varying descriptions rooted in professional experience, feeling and psychological themes help to put sustainable criteria during Eco-fashion design. Sina said:

> The sustainable fibres give me a good feeling; I feel a sense of nature. Ability to adapt in any style and design is interesting. I think during apparel design attention to aesthetic issues such as style, matching the colour and incorporate between fabrics are important because sense aesthetic understanding has an element of synesthesia in people in sustainable apparel. Also, uniqueness and timeless styles can persuade most designers toward sustainable design, as well as ordinary people.

Suzy believed:

> I have mentioned in some cases, the apparent charm of the recycled fabrics makes me convinced to use them in design instead of burying, so I can focus on them! when I start to design clothes toward the sustainable issue, following on comfortability, practically, recyclability, quality, and longevity pursued me during the design. The important thing is where fabrics have sustainable processes or are renewable. It is maybe supporting a local community or continuing a specific cultural process of an area. Simple designs have better functionally and less likely to have problems.

Moreover, Nur also mentioned:

> The material is closely related to the sustainable design process. Also, a good connection between consideration sustainable detail such as functionality and durability in design with criteria are issued in the design process considered as the main subjects in Eco-fashion clothing design. I prefer classical design and not trendy or fashionable. Our needs change according to the culture, most of all the waste of perfectly good materials are made into something useable and beautiful, colour and proportion.

Dana stated:

> Sense aesthetic understanding is an element of synaesthesia. These features changed my perception and belief toward Eco-fashion materials. Also, fit well through weight gain or weight losses or multifunctional features instead of going buy new clothes or purchasing only for one purpose you just alter what is pre-existing and multi-purposing. I believe the search for changes helps the designer to assess requirements, experience toward fitting to the target market. You can eliminate some of the fabric in the development either the muslin or the fashion fabric used in the sample and the final design, respectively. What clothes' characteristics are needed to have for people to wear them, for them to be happy to wear it, and the techniques that I know? In all of those things and all of those processes, I try to keep educating myself with "okay what is the best way I can do this?", "What are the newest things that maybe I do not know about?

**Product Evaluation and Implementation.** Besides, Eco-fashion design process is often derivative from design techniques and sustainable development that draws a person to

seek further information to better understand and evaluate within the topic of sustainability (Question Six and Question Seven). For example, pre-costing is essentially performed during the development of the sustainable or Eco-friendly samples. If the cost is higher than expected, they discuss options for using less expensive materials. Then, once the style is selected, designers contact manufacturers for production or freelance designer start to produce them. Janet stated:

> Sustainability is part of product quality usually. I focus on the multi-functional designs which can support my consumer's needs. For development in Eco-fashion design, for me, I start looking at the pattern. There could be sustainable practises in pattern-making techniques and zero waste. I always go back and forth between my design features and design principles several times. I evaluate my prototypes based on consumer's wants to be based on the price and quality, as well as my experience in the design. They must have a good appearance, not very difficult to wear, uniqueness, priceless, fit to the body and material quality.

On top of that, Jane said:

> From the designer's point of view, the more someone wants to be involved, the more it costs. The more you bring in from the consumer's perspective, the less it will cost. Therefore, I think that the price would impact, but I am not sure in which way since it depends on the necessary design and development.

Suzy stated:

> I started to read more books that talk about in general Eco-fashion systems. Therefore, I have several books in the fashion industry and sustainable product

design. I have read many people blogs that love to sew and share their expertise. They gave me a better idea of what it meant and development. So, for my undergrad, I drew on the idea of like Eco-fashion meaning contributing to the development process. Hence, I can follow the most functional and aesthetic features to my design because it is tested at least one time and their feedback are still available. Thus, to put it in a result, I focus to develop designs based on the recent feedback; comfortable, easy to wash maybe not dry-clean only, be made of sustainable materials and distributed in a sustainable manner and ethical issue based on the consumers and market demands.

Nur also believed:

Technologies for our daily design work starts mostly around the development phase. I try to learn from past failures in design and resulted in the stock. Although most of my clothes had a good visual appearance and quality, it was seeming quite expensive because this was a special style, so the understanding of consumer's budget and their perception changed my ideal, where if they want to purchase sustainable clothing within the higher price, only their real needs can have encouraged them. So, the quality and price of materials are my design borderline. I think to decrease consumers psychological discomfort with the quality of Eco-fashion clothes, the industry and designers should use modern strategies to provide the best solution.

Julie said:

My carbon footprint is estimated. That is something I have been wondering about. So, then I have done some work to find out whether I have ordered Amazon to destroy the planet. All designers will have an interest, but they probably do not know

how! It is very easy to learn and apply technology. I can save time and money to make a sample using Eco-fashion materials, so it is my main goal in Eco-fashion design; enjoy with good design features, reduce waste, and save money and time. Respect to the society in the field of a healthy working condition has persuaded me to use high technology in design. I think most designers are conscious about it (sustainability), but creating a sustainable product involves a lot more than just design such as to develop the education system and to give awareness to the society.

Moreover, Sina stated:

I try to learn from past failures and my experiences. Well-made clothes; making things of the best quality; wear them for the rest of their life are descriptions of good Eco clothing. So, what do I want as a designer in sustainability design should be in the same way with really drives the Eco-fashion design process such as meeting consumer's needs in generation my idea? I always try to keep educating myself with these kinds of questions on the board and answering, "what is the best way I can do this?", "which one is the newest things?" and "What are the bad features of the material" that maybe I should change them. Then they can improve the right product and the right attributes for improving the performance, to look the way it needs to look and to last a long time. So that at the end of the evaluation and making samples, the clothing has had everything thought about and everything should be considered. Yet often the question of development in Eco-fashion design is rooted in asking questions about the new movements in technology and 3D design and other aspects of design. It is an introspective look, reminiscent of other Eco movements, that seeks a connection with intent.

Hence, Dana stated:

> I am always trying to save material as well as reduce the time in Eco-fashion design. Working with zero-waste technology has brought me closer to my goal. I always use materials with high quality, considering the number of times that they can be washed or cleaned to prolong its life and simple and nice design with the functional aspect. I believe that technology is helping fashion become more transparent and stable. Consumers are more conscious, so they are looking for new trends to be adaptable with the technology, in other words, sustainable developments. If it is easy to use the system for transparency from the raw material to the outcome, they can understand the story of renewable materials, recycled materials, and other Eco-fashion materials. It is win-win; because with the improvement the level of environmental knowledge, designers can connect with consumers to hear their needs, their physiological barriers, and their suggestions.

Jane said:

> Sustainability can be achieved through a strong connection between the design strategy and 3D technology as well. Design for sustainability is the concept of my design, as I know the zero-waste design is one of the best methods, though takes time during the design process, this technique has strengthened me toward sustainability. I think to improve sustainable issues and decrease consumers psychological discomfort with the quality of Eco-fashion clothes, the industry and designers should use modern strategies to provide the best solution. Maybe you cannot find development in the common design process, that is why for Eco-fashion production

you make sure that it is fair trade, locally produced, and well-made based on the consumer's need.

Dana indicated:

> It is like art. You know it when you see it. Details in clothing design and production should be based on the criteria which you can see any time, indeed up-to-date features. I think design features are the essential issues that can lead to being a success or not. New technological developers can influence knowledge and competencies to broaden their comprehension of the design process and assess production. Working with multi-functional features is one of the manipulations of the designer's activity in Eco-fashion process that the designer can improve sustainable goals and development.

Also, Nazla mentioned:

> I think sample constructions in selected design and material based on the design criteria should be, during this way collaborate with other designers are necessary. For example, clothes cannot be going to fall out of fashion in six months because Eco-fashion is coming to a new trend recently. In our design process, each prototype will be judged on its success in meeting the design criteria needs previously specified for the product. Criteria can be created through the consumer's needs, the environment and my beliefs and expectation from a good and a success sustainable clothing product.

Table 4.17 reveals the content analysis of important factors (criteria) mentioned in during design process of Eco-fashion clothes from the interviewees' responses. As seen from

the finding, environmental knowledge and concerns occur rather than other factors during the Eco-fashion design process (more than 92.39% of all explicit utterances in each phase).

The finding shows environmental knowledge and concerns are not only for the discovery of the problems but also to design and development of the product is a significant issue. It is not simply a piece of knowledge as to whether a problem is a threatened the environment or not.

Environmental knowledge and concerns find solutions for discovering design criteria and details toward improvement and evaluation of the Eco-fashion clothing product in the society and the fashion industry. The data also indicate the consideration of consumer's needs from the discovery of the problem to the implementation phase in the Eco-fashion design process is notable (more than 88.20% of all explicit utterances in each phase).

It is in line with common fashion and apparel design process which the end-user is the centre of the creating products. However, in previous research (Ramirez, 2014) in sustainable design and slow design stated that designers are the centre of the product and the idea is formed based on their wants in Eco and sustainable designs. However, findings show to success Eco-fashion design should consider the consumer's need to generate the idea and develop the outputs.

Conceivably, the Eco-fashion clothing products, especially made of Eco-fashion materials are new subjects that take time to get accepted by consumers. Additionally, consideration of the fair price and acceptable quality (economic) features rather than other needs are understandable subject (more than 93.59% of all explicit utterances in each phase).

Hence, considering the needs of the customer as well as the flaws that can be seen in other clothes, can be a good opportunity for designing in such clothes. Also, data suggest that in the design process of Eco-fashion design, it is very important to generate ideas, create design criteria and evaluate items concerning the designer's experiences and perception, as well as consumers.

All in all, the finding shows that the consumer's needs and their attitude can influence on the designer's (designer's team) perception and how she/he (they) decides (decide) to choose the materials and design techniques during Eco-fashion design process. However, the attitudes and beliefs of a designer (designer's team) strongly affect the design of clothing toward sustainability.

The interviews provided this study with the opportunity to further analyse important design criteria, effective factors and considerations are vital to the Eco-fashion design process. What is particularly important with this aspect of the research is the first-hand experience the interviewees can describe and relay. Interviewees were asked about the various important factors referred to throughout this study. Table 4.17 provides the content analysis of the interview transcripts wherein themes regarding Eco-fashion design process were found by using NVivo software. A frequency analysis of the Eco-fashion design considerations and comparison results are found in Appendix 12.

**Table 4.17:** Interview Content Analysis of the Factors Description in Eco-Fashion Design Process

| No. Interviewee | Define Consumer's Needs and Define Idea | Design Criteria Product Design | Product Evaluation and Development |
|---|---|---|---|
| **1** | ● Consumer consciousness<br>● Sustainable fabrics<br>● Extend life span<br>● Consumer's needs based on the Fair price<br>● Designer's perception<br>● Consumer's needs regarding good price and quality | ● Quality fabric choice<br>● Durability<br>● Material sourcing (donated fabric)<br>● Cost<br>● Using fewer materials<br>● Multi-function<br>● Zero-waste Design | ● Multi-functional designs (not very hard to wear)<br>● Consumer's needs based on price and quality<br>● Experience in the design<br>● Good appearance<br>● Priceless<br>● Environmental knowledge (zero-waste design) |
| **2** | ● Material sourcing<br>● Consumer's needs regarding good price and quality<br>● Market needs<br>● Consumer consciousness | ● Sustainability<br>● Be recyclable<br>● Material sourcing<br>● Zero-waste technique | ● Design strategy<br>● 3D technology<br>● Quality and price<br>● Psychological and Environmental knowledge<br>● Fair-trade |

**Table 4.17** continued

| | | | |
|---|---|---|---|
| **3** | ● Economic issues among consumer's wants<br>● Market needs<br>● Environmental concern<br>● End-user<br>● Designer's perception | ● Material (natural fibres)<br>● Comfortability<br>● Recyclability<br>● Quality and price<br>● Longevity<br>● Fair-trade<br>● Classics/ Timeless<br>● Simple designs<br>● Functionally | ● Last experiences and Recently feedback<br>● Comfortable<br>● Easy to wash maybe not dry-clean only<br>● Be made of sustainable materials<br>● Distributed in a sustainable manner<br>● Market need |
| **4** | ● Market needs<br>● Consumer's concerns<br>● Consumer's attitude about quality material and design<br>● Efficient use of materials<br>● Emotional benefits<br>● Consideration consumer demands from quality and price | ● Multifunction/ Flexibility<br>● Life cycle aspects of the garments (Extend life span)<br>● Co-design<br>● Quality of the fabric<br>● Comfort for the season and longevity.<br>● Adaptable to changes in the body | ● Environmental concern and knowledge (calculated my carbon footprint)<br>● Apply technology<br>● Good design features<br>● Reduce waste<br>● Save money and time<br>● Education system<br>● Market needs<br>● Implementation Product-service system |

**Table 4.17** continued

| | | | |
|---|---|---|---|
| **5** | ● Customization design (consideration functional needs of the user)<br>● Consumer's concerns about the quality of material and fair price<br>● Good quality<br>● Variety of choice.<br>● Collection of Consumer's viewpoint | ● Material sourcing, in general (fibre content)<br>● Aesthetic issues such as style, matching the colour<br>● Uniqueness and timeless styles<br>● Psychological design<br>● User-centric<br>● Quality and logical price<br>● Multi-use of garment | ● End-user (reflect the needs of end-user)<br>● Quality<br>● Longevity<br>● Extend life cycle Span<br>● Technology programme |
| **6** | ● Length of garment life span (quality of the material)<br>● Market demands<br>● Consumer's awareness of environmental pollution<br>● Subjective norms<br>● Consumer's needs from acceptance price<br>● Psychological subject | ● Efficient use of materials<br>● Silhouette<br>● Cost and acceptance of quality<br>● Aesthetic feature of the materials<br>● Functionality and durability<br>● Classical design and not trendy or fashionable<br>● Traditional design | ● Consideration Social and Psychological needs<br>● Past experiences and feedback<br>● Quality and Price<br>● Market needs<br>● Environmental knowledge |

**Table 4.17** continued

| | | | |
|---|---|---|---|
| **7** | ● Environmental knowledge<br>● Aesthetics features<br>● Consumer's worries<br>● Design features | ● Quality and fair price<br>● Sustainable technique<br>● Material sourcing (organic; renewable resources; animal fibre), Be recyclable | ● Technological features<br>● Consumer's needs from acceptance quality and price<br>● Design features (classic) |
| **8** | ● Acceptable price<br>● Connecting between designer with the user<br>● Users' needs (end-user)<br>● Concerns about Eco-fashion clothes<br>● Market demands | ● Emotional features<br>● Multiplicity<br>● Reparability<br>● Multi-functionality<br>● Sense aesthetic<br>● Search for changes<br>● Efficient use of materials<br>● Quality and price requirement | ● Longevity<br>● Market demands<br>● Technology development<br>● Functional aspect<br>● Consumer's needs based on the valuable price<br>● Environmental knowledge |

Hence, the most interviewees (92.31%) believed that the first step is started with a definition of the problem and the consumer's needs which affected by personal behaviour such as belief, perception, and their concerns ($\kappa = 0.93$). Indeed, people's perception and attitude are discovered as effective factors to find solutions regarding existing problems. All interviewees stated after understanding problems, consider the ideas which can reduce the stress of having such problems are given priority. Moreover, 92.39% said that they always consider the fashion market needs to find the best solution. Also, the price, quality, and design of Eco-fashion products in the fashion market play a powerful role in fins the selective idea ($\kappa = 0.92$). On top of that, almost most of them (95.35%) prefer to have their consumer's

demand toward Eco-fashion clothing subject before starting any procedures. Henceforth, understanding consumers needs regarding economic qualities and design features are raised among sustainable designers ($\kappa = 0.95$, $\kappa = 0.87$, respectively).

In the second step, the interviewees believed that issued design criteria affect their way to follow sustainability subjects. 92.44% of them announced that their perception and concern about the environmental issues push them to choose the right decision during making design criteria ($\kappa = 0.91$). Moreover, 97.11% and 95.68% agreed with that their needs in preparing the materials and techniques regarding the price-quality and design features are most effective factors to issue design criteria, respectively (with the same $\kappa = 0.95$). Hence, they believed that their perception and in other words their behaviour is the most factor that effects on the issuing criteria, as well as search for details.

All interviewees believed that the evaluation step is most restrict and critical part of the design process. 93 % of them agreed that consumers and their taste affect the fate of the products. If they are worried about the environment, their perception convinces them to accept such product ($\kappa = 0.93$) and 93.59% believed that consumer's needs concerning price and quality are most effective factors to accept such clothes ($\kappa = 0.93$). On the other hand, only 91.21 % of interviewees confirmed that consumer's demand regarding design features is able to affect purchasing such clothes in society ($\kappa = 0.86$). Moreover, based on the feedback from the 92.29% of interviewees, the price, quality, and design of outputs in the fashion market are important factors which affect to develop or refine of the products during the evaluation and implementation step in the production of Eco-fashion clothes ($\kappa = 0.87$) (Refer to Appendix 12).

### 4.3.3 Development of Eco-Fashion Collection Design Process Model

As shown in Table 4.18, one of the objectives of the research study was to develop a model of Eco-fashion design processes. This model consists of three main steps: problem definition and research, creative exploration, and implementation.

The development model is created through an investigation between existing apparel and Eco-fashion design models and develop related factors through the data obtained from the interview sessions. It means each step is covered with the most related factors which should be considered by the designer's team. As stated, the related effects were recognised and coded through an interview study of this research. Besides, for identifying essential steps and significant factors, the most focus of this study is on the design stage and the designer's role. The three steps in the Eco-fashion design process model is described below:

- **Phase One: Problem Definition and Research**

The first step is started with a definition of the problem and the consumer's needs. Designer's team seek to identify the problems and analysis them in the Eco-fashion subject. Personal behaviour such as belief, perception and their concerns are most problems which reported regarding Eco-fashion clothes. Then, the designer's team can search for alternative options to conduct the solution for the identified problems. Consumer's belief and their attitude (in fact their behaviour) are effective factors to investigate the problems and seek to find solutions. Therefore, the designer's team generate a concept to find the best and definitive idea to propose resolving the problems. Sometimes, knowledge of the environmental issue and concerns guide the designer's team to select a related solution.

In this step, the designer's team should discover the needs of the fashion market and consumer's demand toward Eco-fashion clothing subject. Henceforth, understanding of

needs of consumers regarding function, taste, and aesthetic (design features), price and quality (economic features) are raised.

- **Phase Two: Creative Exploration**

In the second step, the designer's team issue design criteria regarding support sustainability issues. Therefore, knowledge of the environmental problems and concerns can help the designer's team to put the right design criteria. So, environmental protection factors should be considered in the choosing materials, techniques, and other subjects during the design process. For example, it can be created and extracted through using Eco-fashion materials which supports three pillars sustainability. They are technical nutrients or biological nutrients, where they can be composted or recycled for further purposes. As stated, in the recycling process, the technical nutrients can be developed into yarns, fabrics and eventually become clothes. Also, the biological nutrient is a material which can be composted returning nutrients to the earth.

Moreover, quality and pricing value requirements may lead to an effect on the designer's perception and their actual intention. Also, the designer's team are required to put functional and aesthetic requirements after selective style and idea into the design. Designer's behaviour is the most factor that effects on the issuing criteria, as well as search for details. Hence, material features such as quality, price, the functional and aesthetic attributes should be considered and evaluated based on the goals. After issuing the design criteria, the designer's team seek to find detail design to complete the idea. Hence, conceptual designs should be created due to this issue is related to support sustainability, therefore, using a computer-aided design programme used to draw the basic idea with consideration criteria. Collaboration with other designer's team and manufactures is

necessary to reach and consider criteria issued in the design process. Besides, for designing a visible form of an idea (embodiment design), optimization and development are connected to issue design features such as functional and aesthetic attributes. Hence, in regard to developing the Eco-fashion subjects, the outlook of technology can support the designer's team to reach the goals. Hence, the design phase is investigated dipper and proposed with the concept of multifunctional convertible design and zero-waste techniques (Cao et al., 2014; Jin Gam et al., 2009; Kälkäjä, 2016; Koo et al., 2014; McQuillan, 2011; Rahman et al., 2014; Rissanen, 2013; Rissanen & McQuillan, 2016).

- **Implementation**

In the third step, the designer's team evaluate and estimate the cost, design, and quality of the materials before producing in the mass-production. In the evaluation part, the designer's team should consider all the design features of quality, price, functional and aesthetic attributes; all consumer's need (such as function, suits consumers taste (aesthetic), price and quality features and needs of the market. However, personal belief and the consumer's willingness under personal behaviour affect the evaluation of Eco-fashion clothes. Besides, the knowledge and concerns of the environmental problems are identified as success factors in the evaluation step. Based on the feedback and evaluation, the designer's team develop the design outputs and refine them to follow the design criteria and other issues neglected during the process. After following all the steps with related factors, manufacturers (designers in the small market) decide to implement and produce the Eco-fashion clothes.

**Table 4.18:** Eco-Fashion Collection Design Process model with Related Factors

| **Step One**<br>**Problem Definition and Research** | **Step Two**<br>**Creative Exploration** | **Step Three**<br>**Implementation** |
|---|---|---|
| (1) Define Consumer's Need by designer's team<br>• Problem Identification<br>• Analyse/Problem<br>• Definition Search for Alternative | (3) Design Criteria by designer's team<br>• Environment Protection<br>• Quality and pricing value requirements<br>• Functional and Aesthetic requirements. | (6) Product Evaluation by designer's team<br>• Cost Evaluation and Estimation<br>• Evaluation of Design and Quality of the Materials |
| (2) Define Idea by designer's team<br>• Generation a Concept<br>• Select Definitive Idea | (4) Product Design by designer's team<br>• Conceptual Design<br>• Embodiment Design | (7) Product Development by designer's team<br>• Refinement<br>• Development |
| | (5) Collaboration and Evaluation | (8) Deliver by manufactures<br>• Implement / Production |
| Related Factors<br>• Market needs<br>• Consumer needs<br>• Environmental Knowledge and concern | Related Factors<br>• Environmental Knowledge and concern<br>• Material features of quality and price outlook<br>• Design features of aesthetic, functional and technology outlook | Related Factors<br>• Market needs<br>• Consumer needs<br>• Environmental Knowledge and concern<br>• Design features |

According to Table 4.18, the Eco-fashion design process model consists of three main steps of LaBat and Sokolowski (1999); problem definition and research, creative exploration and implementation. Also, these steps are covered by Koberg and Bagnall (1972) model; analysis, synthesis and evaluation. However, the steps of the proposed model are developed based on the sustainable apparel design process (C2CAD) model of Jin Gam et al. (2009). Indeed, all three main steps in the proposed model are supported with pervious researchers and specific focus on the sustainability and Eco-fashion subjects. Hence, this is discussed in the following.

**Step One in the Proposed model.** As shown in Table 4.19 and Figure 4.4, step one includes define consumer's need and define idea with supporting literature.

**Table 4.19:** Detail of Step One in Eco-Fashion Design Model with Supporting Literature

| Step | Subset | Authors |
|---|---|---|
| Define Consumer's Need | A-Problem Identification | (Lamb & Kallal, 1992; Orlando, 1979; Regan et al., 1998) (Jin Gam et al., 2009) |
| | B-Analyse/Problem Definition | (French et al., 1985; Watkins, 1988) |
| | C-Search for Alternative | (Regan et al., 1998) |
| Define Idea | A-Generation a concept | (Lamb & Kallal, 1992; Watkins, 1988) (Cross, 2003) |
| | B-Select Definitive Idea | (French et al., 1985; Pahl & Beitz, 1984; Watkins, 1988) (Jin Gam et al., 2009) |

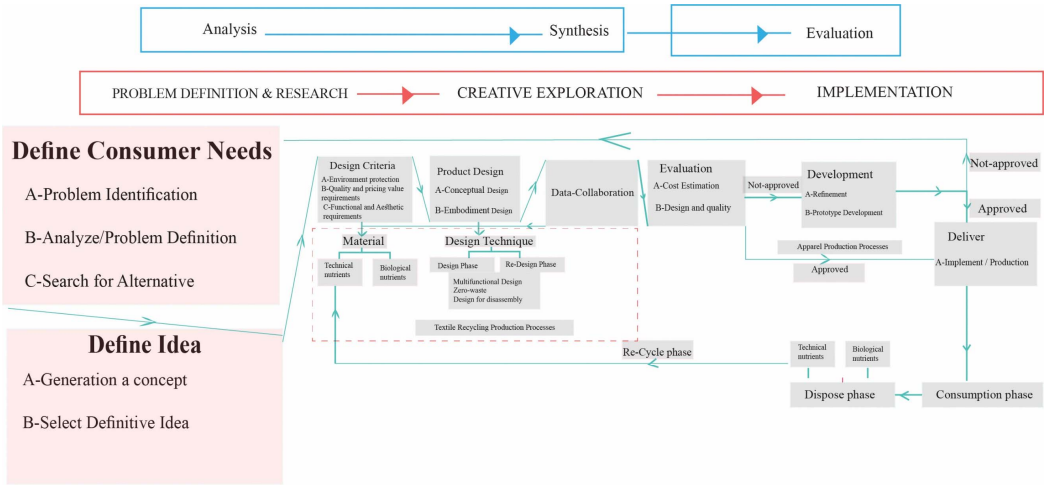



**Figure 4.4:** Detail of Step One in the Eco-Fashion Design Model

**Step Two in the Proposed model.** As seen in Table 4.20 and Figure 4.5, step two includes design criteria, product design and collaboration, where materials choice and design techniques are selected. Material choice is supported through McDonough and Braungart (2002). The design technique is divided into two categories: design phase and the re-design phase. The difference between design and re-design phase is only related to the material sourcing. The raw material for re-design part is not attractive or not proper to the design.

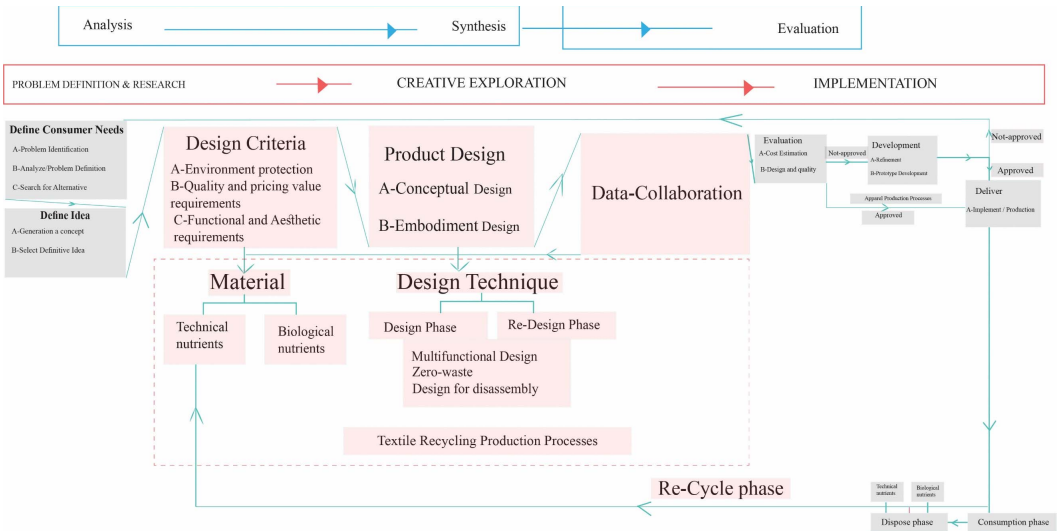



**Figure 4.5:** Detail of Step Two in Eco-Fashion Design Model

Design phase consists of all the techniques which support reduction waste, contamination and protect human health such as multifunctional design, zero-waste design, and design for disassembly.

**Table 4.20:** Detail of Step Two in Eco-Fashion Design Model with Supporting Literature

| Step | Subset | Authors | Subset | Authors |
|---|---|---|---|---|
| Design Criteria | A-Environment protection | (Jin Gam et al., 2009) | Material Choice | (McDonough & Braungart, 2002) |
| | B-Quality and pricing value requirements | (Jin Gam et al., 2009) | | |
| | C-Functional and Aesthetic requirements | (LaBat & Sokolowski, 1999) | | |
| Product Design | A-Conceptual Design | (French et al., 1985; Pahl & Beitz, 1984; Poyner & Simon, 1995) | Design Technique | (Cao et al., 2014; Jin Gam et al., 2009; Kälkäjä, 2016; Koo et al., 2014; McQuillan, 2011; Rahman et al., 2014; Rissanen, 2013; Rissanen & McQuillan, 2016). |
| | B-Embodiment Design | (French et al., 1985; Pahl & Beitz, 1984; Poyner & Simon, 1995) | | |
| Collaboration | (Jin Gam et al., 2009) | | | |

As shown in Table 4.21 and Figure 4.6, step three includes evaluation, development and delivery. After production Eco-fashion clothes, as this proposed model supports cradle to cradle (McDonough & Braungart, 2002) model. Hence, after usage and dispose of the Eco-fashion clothes, these clothes will be categorised by professional persons (or designers) based on the materials to two types: technical nutrients and biological nutrients. Technical nutrients such as polyester clothes will be sent to re-cycle life. So, they will convert to new fibres under the textile recycling production process. On the other side, biological nutrients such as cotton and bamboo clothes can be upcycling for other purposes, however, new technology can support recycling programmes of biological nutrients.

**Table 4.21:** Detail of Step Three in Eco-Fashion Design Model with Supporting Literature

| Step | Subset | Authors |
|---|---|---|
| Product Evaluation | A-Cost Estimation | (Jin Gam et al., 2009) |
| | B-Design and quality | (Jin Gam et al., 2009; Poyner & Simon, 1995) |
| Product Development | A-Refinement | (Lamb & Kallal, 1992) |
| | B-Prototype Development | (Lamb & Kallal, 1992; Orlando, 1979) (Jin Gam et al., 2009) |
| Deliver | A-Implement / Production | (LaBat & Sokolowski, 1999; Lamb & Kallal, 1992; Watkins, 1988) (Jin Gam et al., 2009) |

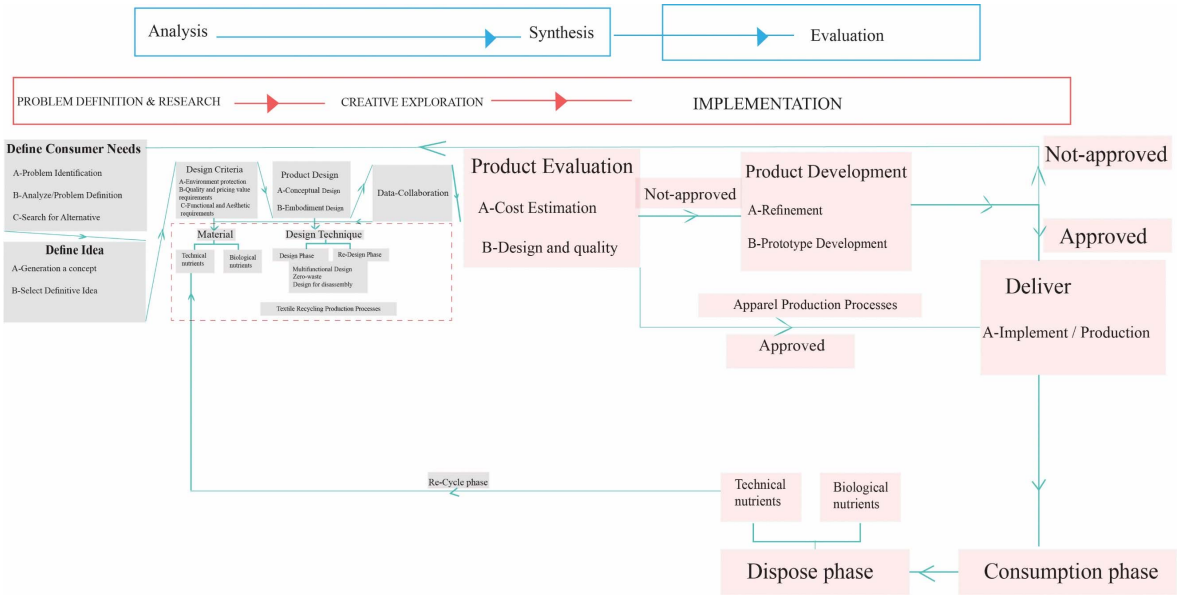



**Figure 4.6:** Detail of Step Three in Eco-Fashion Design Model

**Summary.** An Eco-fashion design model was developed based on the existing literature and investigation between the professional designer's artwork, as well as analysing their Eco-fashion design process. Therefore, this model consists of three main steps: problem definition and research, creative exploration, and implementation with related social-psychological-environmental factors. Each step in the Eco-fashion design model describes the important factors and criteria which the designers' team (designer) should consider in producing Eco-fashion clothes. Hence, this model can set up with the designer's team artwork to define the problem and help to select the best solution and select effective idea. Therefore, based on the idea, the designer's team may put on the design criteria of the proposed model regarding sustainability and achieve the minimum requirements toward detail design and start to create conceptual and embodiment outputs. Finally, according to the model, the designer's team evaluate the output designs based on the cost and design features mentioned to develop and deliver to the fashion and apparel market according to consumer's willingness and market needs.

## 4.4 Evaluate Society's Willingness and Perception to Eco Capsule Wardrobe (Objective Three)

The third objective of this study is to evaluate design outputs regarding the consumer's willingness to possess and accept the Eco-fashion collection based on the clothing life cycle. Primarily, the researchers briefly explained the multifunctional features of the prototypes and the chemical production process of recycled fabrics used in this capsule wardrobe. The reason was that based on findings of Reiley and DeLong (2011), a common perception of recycled clothes in society is considered as used or second-hand clothes.

The discussion was started after participants had the opportunity to touch the clothing prototypes with the researchers available to answer any questions. Table 4.22 and Table 4.23 show the information details of two focus group respondents. All in all, findings indicate that environmental awareness, product functionality and appearance positively affect their willingness to buy Eco capsule wardrobe.

**Table 4.22:** Demographic of Group Number One - Ordinary Consumers

| No. | Name | Age | Occupation | Education Level |
|---|---|---|---|---|
| 1 | Azar | 29 | Graphic designer | Diploma |
| 2 | Safa | 22 | Student | Bachelor |
| 3 | Nooshin | 21 | Student | Bachelor |
| 4 | Saba | 24 | Nurse | Bachelor |
| 5 | Amene | 30 | Fashion designer | Bachelor |
| 6 | Fateme | 28 | Writer | Master |
| 7 | Behnaz | 26 | Teacher | Bachelor |
| 8 | Sahar | 24 | Student | Bachelor |
| 9 | Hana | 24 | Student | Bachelor |

**Table 4.24** continued

| | | | | |
|---|---|---|---|---|
| 10 | Shokoofe | 25 | Civil engineer | Bachelor |
| 11 | Mahya | 28 | Teacher | Master |
| 12 | Farnoosh | 23 | Makeup artist | Diploma |

**Table 4.23:** Demographic of Group Number Two - Art and Fashion College Students

| No. | Name | Age | Work Experience | Occupation |
|---|---|---|---|---|
| 1 | Mahna | 22 | 2 | Student and designer |
| 2 | Mahsa | 28 | 6 | Student and designer |
| 3 | Elham | 30 | 10 | Student and designer |
| 4 | Pardis | 27 | 2 | Student |
| 5 | Afsoon | 26 | 3 | Student |
| 6 | Farzane | 30 | 4 | Student |
| 7 | Maryam | 24 | 3 | Student |
| 8 | Parisa | 26 | 4 | Student and designer |

The creation of a trend in the Eco-fashion design is derived from the sustainable activity's movement. Knowledge and acceptance of Eco-fashion designs are often originated from the knowledge of sustainable issues, environmental concerns and the various aspects related to evaluate such designs between end-user. The product functionality and appearance such as the quality, durability and design features are often the most highly mentioned and associated themes related to the evaluation of Eco-fashion design.

The Eco-fashion clothes design questions are rooted in asking questions about the material's quality, functionality, and other aspects of design. Regardless of varying descriptions rooted in experience and understanding, Eco-fashion design is often derived from the behaviour and related factors that draws a person to seek further information to better understand such environmental concerns and knowledge related to the environmental protection. Interviewees were asked about the evaluation of designed Eco-clothes in capsule wardrobe (Refer to Appendix 8 - Question two to Question four). They were asked to provide what they like/dislike or add/change to be general qualities referring to Eco clothes from a young woman consumer standpoint. Interview questions (Refer to Question five in Appendix 8) elicited feeling and expressions from the various participants' points of view. Moreover, interrater reliability (Overall Cohen's kappa ) was 0.889, above the recommended threshold identified by Creswell and Clark (2017); Product Functionality and Design Features ($\kappa = 0.875$ in group one , $\kappa = 0.823$ in group two), Quality of Materials ($\kappa = 0.88$ in group one, $\kappa = 0.866$ in group two) and Environmental Knowledge and Concern ($\kappa = 0.914$ in group one, $\kappa = 0.958$ in group two) (More details in Appendix 12).

Group one was included twelve young women with age between 20 to 30 years old with at least having a diploma certificate; 66.6% (n = 8) have a bachelor's degree and two women (16.6%) have master's degree. Almost most of the participants (66.66%, n = 8) are an employee and has an income source. Besides, group two was consisting of eight classmate women (age between 20 to 30 years old) of art college that they knew each other before. Four (50%) participant had a business job during their education degree. Most of them (75%, n = 6) had more than 3 years' work experiences in fashion and clothing design which can help to evaluate the design in detail. Hence, the finding of group one is analysed first and then the achievements of group two will be studied.

**Product Functionality and Design Features (Group One).** Most of the interviewees (90.66%) in group one emphasised that the product functionality and appearance of Eco-fashion clothes affect their decision to accept such clothes. Azar stated:

> When I wear them, I had a good feeling, also a limited number of clothes make more decision with replaceable parts. It can satisfy a desire for change without spending money and costs. This concept is good, especially for the young consumer fashion market. I would like to have more choices in sleeve length (dropped-long and short) and more collar styles but the simple design of these clothes is a clever idea.

Similarly, Nooshin felt like these clothes because of the psychological subjects, she said:

> I feel comfortable with sustainable fabrics. It gives me a good sense, but the concept of the Eco-fashion material is too new for me. If I want to tell you the truth, should say when thinking about colourful pieces in the wardrobe, almost start to feel better, the colour's combination is nice, because of this I am interested in.

Also, Shokoofeh and Farnoosh explained feelings of multifunctional convertible clothes when thinking about what they desired to buy in the past. They said, respectively:

> I am always looking for design clothes with capability removing sleeves. They are cool, but people think the Eco clothing are not wearable most of the time. Because it is common in the community. I am really worried about the future of the earth, so I will explain the features of such clothes to them.

> I like the design of the mid-length dress and the special details, including the accordion pleat piece and the skirt design. Because some situations where you are

> invited and when you wake up in the morning and you are thinking yeah this is exactly how I want to look today and then you look at your closet and you do not have it, almost your clothes are done. You feel like nothing else. But I think multifunctional clothes can give you creativity, you can adorn them as you want.

**Quality of Materials (Group One).** Another challenge for almost all the participants was that the recycled fabrics were used to design this collection, where the positive feedback of utilisation them was achieved. As most of the participants (90.91%) showed a good reaction to touch and feel the used materials, however, only two women were desired to meet natural fabrics with good quality in this collection. Saba, as a fashionable girl, explained:

> I have never seen recycled fabrics before, the quality is good, they can be part of the fashion product in the future. Most of the clothes are casual and simple silhouette which is fashionable. However, clothing styles are closely related to the current fashion trend. Also, it was interesting, different ways to wear clothes and it is fashionable. When I saw it, though this would design with same the other casual clothes, now that I know It is sustainable, I would definitely push people to buy them.

Hana, for example, described how she felt when she was invited to recycled or sustainable clothing workshop. She stated:

> I am interested in the design for day-to-day use. The selected style for jumpsuits and mid-dress length is a nice idea and suitable for my age. If I want to tell you truth, when I have invited to this workshop, I thought that it is unpractical designs made of trashes such as plastics, papers, and such materials. But now I am surprised to see that there is this kind of sustainable clothing.

Almost all the participants were affected by some kind of ups and downs and discussion about Eco-fashion clothes. As previously mentioned, after the starting session, participants sated suggestion and features which needed to be changed. Behnaz was not satisfied with the chosen style, she said, “the cardigan is chosen as a good outwear for the summer season because it was slightly sheer without being too heavy. I think casual style should be designed in more floral and patterned fabrics!” Similarly, Sahar also wants to make some alternations, as she is a fashion student, she emphasised:

> I like to change the material and type of buttons and see other attachments such as snaps. I think the zipper may be a better option, so it can encourage me to buy them. If it were in a store, there would need to be a sign that tells you what it is made of. Otherwise, consumers would not know.

When Fateme was asked to talk about how Eco-fashion clothing was for her and if she will see such clothes in the market, the desires to buy them. She answered:

> Actually, I am not sure to say yes. The chiffon fabrics are too sheer, especially for the mid-length dress. Never mind, it is a creative design, wearing clothes separately for different occasions. I like simple designs but prefer to see more pockets in skirts, jumpsuit and trouser because the pocket is one of the main features of functional clothing.

Furthermore, Mahya agreed with some change, however, she was happy to see and talk about this style of clothes which never seen in the market before, she said:

The type of texture especially in crepe is heavy for me but can wear it easily. The zipper in the trouser is a well-received and practical feature. I am always thinking to purchase such trouser, but I could not find in the fashion market.

**Environmental Knowledge and Concern (Group One).** Since the Eco-fashion clothes support and preserve the environment form the contaminants, most of the participants (92.60%) agreed with that environmental concerns which push to accept such clothes, though, they were not interested in this style. Safa for example stated:

> I am not interested in wearing casual dress, I would prefer other styles. But I think all the clothes in this capsule are essential and useful products. If I knew what it was made of, I would be drawn in. I would like to support animals and the environment.

Moreover, Amene was concerned about the quality of the fabrics. She added that she noticed like she was wearing organic clothes longer and more frequently. She said:

> I prefer to choose only organic fabrics for casual clothes especially lining, I am not going to buy clothing made of synthetic fabrics. This is my favourite closet, if the jacket was shorter in the front, it is more casual. There are too many buttons, at first look, I thought it is difficult to wear but there was no such thing. This is considered an as an attractive point.

**Product Functionality and Design Features (Group Two).** Similarly, most of the interviewees (94.61%) in group two agreed with that the positive product functionality and appearance of Eco-fashion clothes affected her decision to accept such clothes. However, this session was included in the group of art and fashion students those are familiar with the design features and conceptual design, as well as be aware of sustainable issues in Eco

clothing. Hence, a closer look at the design and performance of the outfits in this group is more intriguing.

Mahna was one of the students interested in sustainable design and explained each of the clothes precisely. She stated:

> The recycled fabric is too thin, but, when It is layered, it looks good. One point of this collection is different ways to wear which are not common in the fashion market. The lighter colour looks significantly nicer, that is something pretty, I think changing the navy colour should be a good point. When you talk about Eco-friendly characteristics, I really would like to possess it, it may help to save the planet.

Frequently, several customers feel awkward when wearing a regular object, Elham said it and she continued:

> A complete set of essential clothes in each woman's wardrobe but maybe should add more styles such as formal. It was good if you design a multifunctional skirt which can be a long and short size. I prefer to wear classic design with plain fabric rather than patterned fabric.

Similarly, Maryam advocated with her and said, "that is true, you know a limited number of clothes make more decision, as well as wearing different outfits with replaceable parts."

**Quality of Materials (Group Two).** Along with 90.17% of agreement in quality of materials, Mahsa and Farzane were struggling a lot to create her design in natural fabrics and believe that synthetic fabrics are harmful to human health during consumption usage rather than in the production system. They explained their concerns and said, respectively:

> I feel that the material was not very suitable for clothing items, especially those worn against or close to the skin. It cannot be a guide to wearing different outfits for one month because each person has their style. I keep it until wears out and I am confident that they do not have any pollution on the environment, as they are recyclable.

> I am not satisfied with the fabrics. I am concerned about synthetic material performance at high temperature in summer days. It is better to focus on pastel or warm colour for casual dress, colour combination is not in my taste.

**Environmental Knowledge and Concern (Group Two).** As stated, environmental concerns may affect the consumer's perception and emotion. Most of the participants (95.01%) in this group were aware of environmental issue in production fashion and clothing and all indicated positive reaction about the description of the Eco capsule wardrobe. Hence, Elham was the first participant indicated this issue and believed that this trend will be famous as the world will be sustainable. She said:

> I like my purses to look a little bit older, mature. The multipurpose style makes them look kind of unique. There are a lot of vegans who dislike buying organic products which made of woollen and other animal products, sometimes, it is difficult to find things. This wardrobe is an interesting closet for them, so is needed more awareness and information.

Similarly, Pardis added that she feels that all clothes will be designed based on the sustainable design process. She stated:

> I am a vegan, so definitely it is my favourite closet, but I want to see more cotton fabrics instead of synthetic fabrics. Save time and money are all my favourite thing

about purchasing. I am interested in buying less but more practical because I dislike making waste in my clothing wardrobe.

As a side note, Maryam believed the transparency issue is not common in sustainable clothing and she suggested to consider this factor, as well as design features. She stated:

> I have seen lots of organic clothing. I do not like too many organic brands or the aesthetics of sustainable brands. There is a brand called "Tan-Dorost," from which I purchased some basics because they are transparent about their processes.

Almost all participants in group two at one point experienced some success moments when they felt to design something in regard to preserving the environment in the future and will be proud of themselves; however, they explained some suggestion to improve the design and definitely acceptance between the consumer. Parsia believed:

> Mostly well done but Linen fabric can be designed for this collection as well. Most of the design is too young or childish. I think should add more coat or trouser in this wardrobe. If I can see such clothes, I will change my perception to buy fewer clothes, but still interested in buying more accessories.

Afsoon had an important suggestion about the style and colours used in designing Eco clothes. She explained her feeling about this wardrobe as:

> I do not really seek out sustainable clothes or organic clothing or not very often fair trade because I tend to dislike the style of the clothing of fair trade. At first look, this collection made me think only because of the colour. But I want something different, a little more cutting-edge, or fashion-forward such a new-look style. So, I do not find

very many options in the Eco-fashion market. I think the colour palette is another reason why I do not buy organic and fair-trade clothing. It just does not appeal to me.

**Summary.** The results reflected that evaluation of the quality and design features for the Eco-fashion clothes in the capsule wardrobe was considered good, functionality with good design features. Hence, after touching fabrics, as well as wearing clothes and discussion, the researcher found that Eco capsule wardrobe is perceived as casual, good quality and materials, multifunctional and comfort, good appearance and colours and nice design features. This result indicated women consumers could easily communicate with wardrobe phenomena. Therefore, the acceptance and possess the Eco capsule wardrobe is observed positive reactions among participants. Moreover, results show that along with product performance and appearance features, environmental knowledge has a direct effect to accept such clothes among young women consumers.

## 4.5 Chapter Summary

This chapter analysed all objectives of the research with details as follows.

(1) Consumer's behaviour toward sustainable activities and reduction the clothing waste demonstrated significant high level. As shown in results in SPSS, the validity and reliability statics analysis outcome with Cronbach alpha (α), Average Variance Extracted (AVE) and Heterotrait-Monotrait (HTMT) ratio test of variables consumer's behaviour which demonstrated significant high level of intention purchasing Eco-fashion clothes. moreover, 91% of the variance in purchase behaviour is affected by the perceived behaviour to dispose of clothing and purchase intentions of Eco-fashion clothes with the reading of multiple regression analysis resulted in $R = 0.932^{a}$, $R^2 = 0.915$, and an adjusted $R^2 = 0.916$.

As shown in results in SmartPLS, the model was significant, and all hypotheses were supported. Therefore, the following variables had a positive association with the consumer's purchase intention toward Eco-fashion clothes: attitude ($H_1$) ($\beta = 0.459$, t-value = 4.981), subjective norm ($H_2$) ($\beta = -0.105$, t-value = 2.293), perceived control behaviour ($H_3$) ($\beta = 0.272$, t-value = 3.021) and perceived behaviour to dispose clothing ($H_4$) ($\beta = 0.393$, t-value = 2.611). Finally, behavioural purchase intention and perceived behaviour to dispose clothing play important roles as predictors variable for purchase behaviour toward Eco-fashion clothes which supports $H_5$ ($\beta = 0.381$, t-value = 7.933) and $H_6$ ($\beta = 0.595$, t-value = 3.854), respectively.

Moreover, the results of the in-depth interview as a focus group show to promote sustainable issues, both society and industry must have sufficient knowledge in this area. Additionally, the quality features were valued by many of the women interviewed. All in all, based on the finding of the in-depth interview, the most important factors that had influence consumer's attitude in buying Eco-fashion clothes are good quality, fair price, environmental knowledge, design features and multipurpose style.

(2) Besides, the designer's intention toward minimisation the clothing waste and utilising the Eco-fashion materials demonstrated significant high level. As shown in results in SPSS, the reliability was significant with a high level of Cronbach alpha ($\alpha$) between affecting variables on the designer's attitude and subjective norms toward behavioural design. Hence, the model coefficients imply that the "environmental knowledge", "perceived quality and price", "perceived functional and aesthetic", and "perceived ease to use and usefulness of technology" account for 87.4% ($R^2 = 0.874$) of the variation in the designer's attitude significantly. However, the linear regression analysis shows environmental

knowledge is an important predictor toward strengthening the designer's attitude (β = 0.52, p = 0.00). In addition, the attitude is a strong predictor toward design intention more than subjective norms (β = 0.914, p = 0.00; β = 0.295, p = 0.01, respectively). The result indicated different level of all factors made an effect on the designer's attitudes and subjective norm made an effect on the design intention confirmed by all two tests; Pillai's trace= 1.084, F (54.427) = 2.924, Wilks' Lambda = 0.202, p = 0.00. In addition, the designer's intention made an effect on implementing waste reduction by design confirmed by Pillai's trace = 1.511, F (56.452) = 9.328 and Wilks' Lambda = 0.016, p = 0.00.

As shown in results in SmartPLS, all hypotheses were supported through structural equation modelling (SEM) technique. Thus, the following variables had a positive association with the designer's attitude: environmental knowledge ($H_1$) (β = 0.52, t-value = 13.34), perceived quality and price ($H_2$) (β = 0.30, t-value = 7.60), perceived functional and aesthetic ($H_3$) (β = 0.18, t-value = 3.87) and perceived ease to use and usefulness of technology ($H_4$) (β = 0.13, t-value = 2.72). In addition, the Eco-fashion design can lead to the designer's intention by using Eco-fashion materials ($H_5$) (β = 1.01, t-value = 5.37) and $H_6$ (β = 0.08, t-value = 2.20). Finally, behavioural intention played an important role as a predictor variable for implementing clothing waste reduction by design in the quantitative results ($H_7$) (β = 0.82, t-value = 23.97).

(3) The design concept of a capsule wardrobe as a new trend to reduce clothing waste between the young women in age between 20 to 30 years was a significant score. According to the quantitative findings, the capsule wardrobe means interesting (M = 4.87), exciting (M = 4.84) and important (M = 4.72) to them, respectively.

(4) All designers who invited to the interview session knew about environmental problems in fashion and apparel design and production. As seen from the finding, environmental knowledge and concerns occur rather than other factors during the Eco-fashion design process (more than 92.39% of all explicit utterances in each phase). The data also indicate the consideration of consumer's needs and market's demand from the discovery of the problem in the Eco-fashion design process is notable (more than 88.20% of all explicit utterances in each phase). Additionally, consideration of the fair price and acceptable quality (economic) features rather than other needs are understandable subject (more than 93.59% of all explicit utterances in each phase). The data also show the significant role of personal belief, behaviour and experiences in the Eco-fashion design process. Since more than 92.2% of the implicit utterances were coded as personal belief and perception. All in all, the finding shows that the consumer's need and their behaviour can influence on the designer's (designer's team) perception and how she/he (they) decides (decide) to choose the materials and design techniques during Eco-fashion design process. However, the behaviour and beliefs of a designer (designer's team) strongly affect the design of clothing toward sustainability.

(5) After touching fabrics, as well as wearing clothes and discussion, the researcher found that Eco capsule wardrobe, which was created from the steps of the proposed Eco-fashion design model, is perceived as casual, good quality and materials, multifunctional and comfort, good appearance and colours and nice design features. This result indicated young women consumers could easily communicate with wardrobe phenomena. Finally, the Eco-fashion design processes model with related factors was created in this chapter. This model consists of three main steps: (1) problem definition and research, (2) creative exploration and (3) implementation.

# CHAPTER 5

# DISCUSSION

## 5.1 Introduction

This chapter is an overview to discuss research questions and conclude the overall three outcome surveys and interviews of data collections pertaining the consumer's and designer's behaviour of the Eco-fashion clothing design, the development an Eco-fashion design model; and the evaluation of society's willingness (especially young women consumers) on the Eco-fashion collection prototype.

Hence, each three research questions which support all the objectives of this study are discussed below. The contribution and implication of the research were also covered.

## 5.2 Discover Consumer and Designer's Behaviour Toward Eco-fashion design

**Research Question 1.** What are the significant factors of consumer's and designer's behaviour toward purchasing and designing Eco-fashion, respectively? Indeed, this question is divided into two main parts; the first part discusses consumer's purchasing behaviour and the second part focuses on the designer's behaviour toward Eco-fashion design and other activities related to it.

### 5.2.1 Consumer's Behaviour Toward Eco-Fashion Clothing Purchase (Part One)

This study for the first time, discovered the role of attitude, subjective norm, perceived behavioural control and purchase intention toward Eco-fashion clothes especially those made of recycled materials.

The study also explored the role of perceived behaviour to dispose of clothing toward purchase intention. The model of consumer's behaviour which a part of the whole conceptual model of this study, uncovered the factors that affected on the intention to purchase Eco-fashion clothes with 0.96 of its variance explained by the four identified variables (i.e. attitude, subjective norm, perceived behavioural control and perceived behaviour to dispose of clothing).

The structural equation modelling of the TPB model to forecast the disposal of clothes and purchase behaviour is a unique contribution to this research. The pattern of results in this study is generally consistent with Kumar et al. (2017) of TPB research and its measures were fit for the Eco-fashion studies.

- **Attitude and Purchase Behaviour of Eco-Fashion Clothes**

As expected, attitudes favourable toward purchasing Eco-fashion clothes, norms supportive of purchasing Eco-fashion clothes, and perceived behaviour control are positively associated with purchase intention. Furthermore, a unique contribution of this research is to identify clothing disposal behaviour as one important predictor of a consumer's purchase intention towards Eco-fashion clothes. The results offer insights into practical decisions related to clothing disposal toward sustainability. A notable finding of the current study supports attitudes and perceived behavioural control.

In both quantitative and qualitative findings, the best predictor for clothes purchase intention especially made of Eco-fashion materials is the positive attitude toward quality, price, colour, style, and design in other words psychological shopping. Moreover, according to qualitative results, touching the clothes is the most important factor, particularly for women.

Accordingly, findings in both the questionnaire survey and focus group of this study indicate that consumers are not interested to purchase clothes made of recycled materials if the price of products exceeds more than similar clothes in the market. This suggests Eco-fashion clothes made of recycled materials should have a reasonable price. Indeed, consumers are more interested in finding their fashion needs and then focus on ethical issues.

- **Subjective Norm and Purchase Behaviour of Eco-Fashion Clothes**

It is claimed that subjective knowledge directly affects the purchase intention of Eco-fashion clothes. Nevertheless, it is observed that they have no significant impact on the decision to buy in this study. It can be triggered by society's psychological concerns regarding the Eco-fashion clothes made of recycled materials.

- **Perceived Behaviour to Dispose of Clothing and Purchase Behaviour**

Besides, the research indicates that 91% of the variation in purchase behaviour is due to perceived behaviour to dispose of clothing and purchase intention. It is a logical finding of this study that perceived behaviour to dispose of clothing is a significant factor in the purchase behaviour of Eco-fashion clothes.

In the in-depth interview, people interested in purchasing these products talked about donating their unwanted clothes to the community and putting in recycling boxes. Perhaps the consumers are becoming more inclined to partake in environmental activities like shopping as they feel that their efforts are successful in saving the environment.

Interviewees also stated that they might consider altering their purchase behaviour if they were more aware of Eco-fashion clothes. Conscious consumers are also not willing to deliberately pollute the environment.

Furthermore, if the amount of perceived behaviour to dispose of clothing is positively associated with purchasing Eco-fashion clothes made of recycled materials, businesses should become more involved in this consumer behaviour, for instance, Hennes & Mauritz (H&M), a Swedish clothing brand. In 2017, this company launched a campaign as named "Bring It" that it was a universal garment collecting programme. The programme resembled that each consumer could bring packages of unused clothing of any brand and put it in the recycling box in an H&M store. Therefore, consumers can take a discount coupon for their H&M purchases at next time. H&M sells some of the unused clothing as a second hand to the developing countries. The rest, it is recycled for new production.

To summarise, to make a behaviour pattern toward purchasing for Eco-fashion clothes made of recycled materials, first, it must be promoted a positive attitude toward clothing disposal and the steps in which unwearable clothes become new fabrics or new designs. Thus, the results of this study are significantly useful to designers and developers alike.

### 5.2.2 Designer's Behaviour Toward Eco-Fashion Design (Part Two)

Regarding the lack of social science research on the Eco-fashion design issues, this study applies insights from psychological theory to examine the relationship between the fashion designer's motivation and the principles of Eco-fashion concept in their design. The Theory of Reasoned Action (TRA) for Fishbein and Ajzen (1975) was adopted in this study to explain that if designers desire to design clothes with Eco-fashion materials, which factors can influence their design intention.

Based on the results, all hypotheses constructed in this study are supported. Therefore, the selected variables appear to be good indicators of the designer's inclination

towards Eco-fashion design. In general, the Eco-fashion design intention among designers shows a satisfactory image. For most of the designers interviewed before, the pursuit of Eco-fashion issues in their design has a psychological dimension.

They felt that Eco-fashion should be incorporated by themselves and other designers, as the best activity. The supporting results indicate those fashion designers interested in Eco-fashion design believed that environmental knowledge, the perceived value of quality, price, functional, aesthetic, and technology are important factors in forming their attitude toward Eco-fashion design.

- **Environmental Knowledge and Attitude Toward Eco-Fashion Design**

Environmental knowledge shows a significant impact on the designer's perception. The designers have a positive attitude towards design with Eco-fashion materials if they have a high level of environmental knowledge; therefore, environmental knowledge plays the main role in their actual behaviour. This is understandable because awareness to preserve the environment can improve the designer's attitude toward sustainable issues. Hence, fashion designers can develop products that will be more Eco-friendly and share knowledge of sustainable design to encourage other designers to be involved in the sustainable fashion practices, as well as contribute to reducing clothing waste. Further, the present study considers some predictors overlooked by previous studies.

- **Perceived Quality and Price and Attitude Toward Eco-Fashion Design**

The second strongest predictor of attitudes to Eco-fashion design is perceived quality and price. The emergence of this variable is understandable in the designer's attitude toward design with Eco-fashion materials. The reason is that a significant proportion of these materials are produced in the recycling process. Indeed, designers emphasised that the

acceptable quality and price of the Eco-fashion materials can encourage them to think about design with this type of materials.

According to the findings of the qualitative part, the acceptability of quality, as well as price in Eco-fashion design, are the onset of an idea in the implementation of waste reduction by design. Sometimes both are the most restricting factor in carrying out Eco-fashion design. The respondents explained that by decreasing the costs of Eco-fashion materials, their motivation to design potentially increases. Hence, it should be noted that the design for Eco-fashion clothes is demanded only when the price is a reasonable point and the quality of materials was acceptable for designers.

- **Perceived Functional and Aesthetic and Attitude Toward Eco-Fashion Design**

This research also shows another factor which is largely overlooked in past research: the perceived functional and aesthetic. The functional attribute and attractive appearances of Eco-fashion materials in structural modelling show that this factor mediumly affects the designer's attitude toward Eco-fashion design. It is worth noting that fashion is inherently functional, undoubtedly designers would not only see sustainability in Eco-fashion materials as well as clothes. Hence, designers need to understand that Eco-fashion clothes deserve appreciation in the field of performance and appearance, especially if designers want to add extra effort to make more sustainability achievements in fashion and apparel design.

- **Perceived Use of Technology and Attitude Toward Eco-Fashion Design**

The recent factor for the model is the perceived ease of usage and use of technology. The qualitative results of the current study present the using of technology regarding saving money, time and reducing the waste. Such variables strongly influence on the mindset of the model and a favourable correlation between such influences was confirmed by the

quantitative evidence. The findings demonstrated that designers believe to use a computer-aided fashion design to solve problems in sustainable fashion design. Moreover, technologies in the recycling programme can improve the designer's attitude toward converting waste to renew fabrics. Likewise, technology can even resolve the development of applications between designer and customer to create a link toward design customization service through customising the design with the customer's Eco-fashion materials.

Nevertheless, technology is not a strong predictor toward the designer's attitude of Eco-fashion design. Perhaps it is related to the roots of education which the logical cause is the digital gap in the education system between the Asian and Western countries. Since (70%) most of the respondents in the survey were educated in Asia and in fact, the Asian education system has not paid much attention to use technology in the fashion design. Moreover, the result shows designers with higher education know more about the role of technology in sustainability.

- **Attitude and Subjective Norm Toward Eco-Fashion Design**

The finding indicates that a significant percentage of changes in the behavioural intention toward the Eco-fashion design is affected by the designer's attitude and subjective norms. It reveals that attitude has a more important effect on the design intention in comparison with subjective norms.

The subjective norms cannot be related if attitudes toward the Eco-fashion design did not develop correctly. Perhaps, the point is that socialism is successful in many areas of daily life in a Southeast Asian country such as Malaysia, where social pressure worked a significant role in forming behaviour.

All in all, results show that TRA provides a reasonable theoretical framework to understand the designer's behaviour toward designing with Eco-fashion materials. So, to make a behaviour pattern toward Eco-fashion design, especially made of recycled materials, first, it must be promoted a positive attitude toward Eco-fashion materials and this is done when environmental awareness is raised as well as in enhancing issues that have a direct impact on designer's vision and attitude.

**Summary.** Therefore, investigation on the consumer's behaviour shows that attitudes have the main role in forming actual behaviour toward sustainability issues, where some factors such as quality, price, design, environmental knowledge affected directly on the consumer's attitude to purchase Eco-fashion clothes, especially made of recycled contents. Moreover, the analysis shows that environmental knowledge; perceived quality and price; perceived functional and aesthetic; and perceived easy to use of technology, influence directly on the designer's perception and their attitude to design with Eco-fashion materials for minimising waste.

## 5.3 Develop Eco-Fashion Design Model

**Research Question 2.** How is an Eco-fashion design model shall be constructed to meet the concept of the clothing life cycle phases toward supporting three sustainability pillars: economic (profit), environment (planet) and society (people)?

The second objective of this study is to develop the Eco-fashion design model. Hence, regarding increase contaminants generated by the fashion industry whether, in production, consumption and disposal, this study develops an Eco-fashion design process model. In this model, the phases involved in the clothing life cycle are developed through Eco-fashion subject and support the three main pillars of the sustainability issue.

Hence, Eco-fashion design process model shows that for designing all Eco-fashion clothes should consider all the related factors in the phases of clothing life cycle such as consumer, designers, design process and materials during the design process. This indicates these phases are known as the related factors connected like a cycle and by eliminating one of them the cycle would be disappeared.

The findings show that for making more profit and protecting the environment as well society's health should; investigate of the consumer's behaviour and improving their environmental knowledge, the discovery of the designer's behaviour and development of their knowledge, explore to the recyclable materials and more Eco-friendly and finally study on the most related and easy to use Eco-fashion design techniques, are important to develop a model to produce Eco-fashion clothes in the mass-production.

Behind of the second objective, the design concept for the Eco-fashion design process was investigated among young women from the age group of 20 to 30 years old.

Indeed, the concept of Eco-fashion design was developed based on the outcomes form the survey of possessing the Eco capsule wardrobe.

Investigation among young women, those of women respondents possessed at least a bachelor's degree (80%) with most purchasing every 3 - 4 months (67.9%), showed that they agreed with possessing a capsule wardrobe, and the answers indicated that the capsule wardrobe which includes only essential clothing is an interesting, understandable, and acceptable phenomenon for them. Hence, focus on the creation of a capsule wardrobe as a catalyst to reduce the consumption based on the market needs is reasonable.

From the centre of the Eco-fashion design model, there is extracted a suitable tool for the design process of Eco-fashion clothes with consideration sustainability factors as well as life cycle clothing concept. This model consists of three main steps; problem definition and research, creative exploration and implementation, where all steps are controlled and managed by the designer's team (designer).

The first phase of the Eco-fashion design process model is to define consumer's need and define ideas to set a scenario supported with four factors: needs of the market, needs of the consumers such as desired end use (function); suits consumers taste (aesthetic), price and quality features (economic), individual's environmental knowledge and concerns. Hence, this step should be considered all these selected factors to define a problem and generate ideas toward sustainability and well-being subjects.

For example, it should consider aspects of economic features, aesthetic and function features, as well as an individual's belief and values. So, discovering the consumer's behaviour guided through their needs and beliefs is one of the related factors which designers need to know before designing Eco-fashion clothes. Hence, in this phase, the designer's team

(or designer) seeks to identify and analyse the problems in the field of fashion and apparel subject to create and select the definitive idea toward sustainability with consideration related factors.

The second phase is to discover the design criteria by focusing on the details in the design process. It can lead to developing the Eco-fashion designs through creation idea toward supporting the sustainable criteria by consideration these four factors; individual's environmental knowledge and concerns; material features such as quality and price attributes; and design features such as functional, aesthetic and technology attributes.

Designers should explore all these important factors which help to form the criteria to design with Eco-fashion materials. Therefore, initial imagery of the designer's thoughts and her/his perceptions of sustainable issues as well as Eco-fashion materials should be exposed in this step for further interaction with the design team. According to the results from the in-depth interviews, the perceptions of the quality, price, aesthetics, and functionality are common features that designers used to set up the criteria in the Eco-fashion design process. Therefore, design features are created based on these criteria and designers generate conceptual and embodiment design through collected sustainability issue information.

Therefore, based on the interview's findings in the conceptual design phase, first, a design sketch including ideas and concepts in text or graphics can be developed through utilisation the computer-aided design (CAD) programmes. Indeed, it seems that utilising the computer-aided design programme is an intelligently way in the sustainability subject to reach the goal with saving time and money. Consequently, in the embodiment design phase, considering the related factors, qualified designs are selected, and the designer's team can

prepare samples or consult with other companies for improvement them to meet the designated criteria.

According to the results from the in-depth interviews, the techniques which designers commonly used to display sustainability perspective during the embodiment design phase were zero-fabric-waste design, redesign techniques, minimal seam construction, design for disassembly and multifunctional design, where all are originated from designer's environmental knowledge and concerns. Hence, an effective sustainable design technique can be proposed at the end of this phase in response to the original objective.

The third phase is about the evaluation and development of the prototype to deliver the real design outputs before the mass-production. In this step, four categories are recognised to help for judgement, therefore design outputs should be checked based on the: needs of consumers; desired end use (function); suits consumer's taste (aesthetic); price and quality quote (economic); design features of quality, price, functional, aesthetic and technology attributes; needs of the market and individual's environmental knowledge and concern (both consumers and designers) (For more detail refer to Table 4.18).

All criteria and design features identified by the designer's team will help the design team to check and make a correct decision in the Eco-fashion design issues in the evaluation stage. During this phase, the Eco-fashion design output may require the modification based on the evaluation by young women consumers. This phase also provides some suggestion to improve environmental knowledge and concerns in society.

This model is applied to create an Eco capsule collection with ten clothing items made of Eco-fashion materials by focusing on the multifunctional convertible design. As

shown in the findings, each step has the specific concepts that should follow by designer's team (designer) based on the design criteria achieved in this study.

As seen in Table 5.1, fashion and apparel designers should discuss the three foundations of the environmental design process through the suggested Eco-Fashion design model, and its structure generated by the Eco-fashion wardrobe.

Therefore, the importance of incorporating the existing Eco-fashion and apparel models into the new concept of phases involved in the clothing life cycle to develop Eco-fashion design model shows the positive effects on the consumer, environment (planet), and making the profit (three pillars of the sustainability).

In other words, applying the proposed Eco-fashion model with consideration related factors can lead to reducing the environmental and social impacts. So, this model can help the designer and manufacture to identify the material, therefore, the amount of unsafe material released into the environment and living place which caused health problem of the current society could be reduced.

**Table 5.1:** Addressing Three Sustainability Pillars in the Eco-Fashion Design Model

| Elements | Features and Issues |
|---|---|
| Economic development (profit) | - Fashion designers and clothing manufacturers save lots of money and time in pollution prevention.<br>- Improved designer's label, brand, or company image in society.<br>- Saving time and money during the design process by utilising the computer-aided design (CAD) programme.<br>- Strengthening the economic system ,hence all clothing was designed in the design process can be recycled to the new materials and return to the economic system instead of burning.<br>- Multifunctionality increases the clothing utilisation in the people's clothing wardrobe, as a result of saving money and time in shopping.<br>- Reduction the need to purchase unnecessary clothes and eliminate clothing waste, as a result of saving money and time in shopping |
| Social development (people) | - Better working safety and health for employees in the design process.<br>- Better environment and living quality for communities with using Eco-fashion materials and Eco-technique design process.<br>- Better health for user' Eco clothing by utilising Eco-fashion materials and considers consumer's need by the designers. |
| Environmental protection (planet) | - Reduction the amount of harmful chemicals and clothing waste released into the local community through 1) using Eco-fashion materials, 2) adopting natural dye, 3) minimising material diversity, 4) applying the zero-waste pattern-making design process, 5) considering the consumer's needs and 6) the designer's ability to make the related design.<br>- Supporting recycling programmes and decrease the use of other material resources and creation of waste with excessing use of Eco-fashion material resources. |

In addition, all clothes were designed in the Eco capsule wardrobe can be recycled and returned to the economic system instead of burning. Hence, it can help to excessive use of Eco-fashion material resources, therefore, it supports the recycling programmes and decreases the use of other material resources and creation of waste.

Moreover, the Eco capsule wardrobe with multifunctional clothes would increase clothing utilisation, reduce the need for purchasing unnecessary clothes and eliminate clothing waste. Also, findings show that creating an Eco capsule wardrobe may save time and money which can be beneficial incentives for the consumer's acceptance.

Also, fashion designers and manufacturers can save money and time to make an Eco capsule wardrobe which protects the environment and at the same time, it can make profits. Moreover, the sustainable design and quality criteria of capsule wardrobe are achieved through using Eco-fashion materials, applying the zero-waste pattern-making and sustainable design techniques.

According to the results, people could save money and time or handle their clothes in the own wardrobe toward sustainability with consideration of the criteria achieved such as purchasing multifunctional clothes and choosing clothes made of Eco-fashion materials in shopping. Furthermore, the qualitative results show that integrating the environmental consideration into the design of the capsule wardrobe would be a successful phenomenon.

## 5.4 Evaluate Society's Perception of Eco Capsule Wardrobe

**Research Question 3.** What are the significant factors that affect consumer's perception to accept Eco-fashion outputs designed through the proposed Eco-fashion model?

The third objective is to evaluate consumer's perception of the design and quality of the Eco capsule wardrobe prototype. This prototype was designed and developed based on the proposed Eco-fashion model design of this study and design concept which achieved from the investigation between young women consumers. From the demographic it was received among the total of 20 participants, all were from the age group of 20 to 30 years old that 80% have an academic level at least a bachelor's degree.

The results of this research indicate that the Eco capsule wardrobe is perceived as casual, comfortable, good material consistency, use environmentally sustainable features, multifunctional and good design. According to the findings, if the consumer's evaluation of the Eco-fashion clothes is positive, therefore their willingness to purchase would be increase. This indicates with taking the suitable design and style as well as improving the quality, it can affect consumer's perception toward possessing Eco-fashion clothes. Hence, three main factors are identified which affect consumer's willingness during the evaluation of Eco-fashion clothes; quality of the materials used in Eco-fashion clothes, performance and design features of Eco-fashion clothes, and their environmental knowledge and concerns.

Besides, to discover of consumer's behaviour in the first step of this research, it is achieved that price, quality, performance, and design feature influence on the consumer's intention to purchase Eco-fashion clothes.

- **Quality of the Materials in Eco-Fashion Clothes**

In this study, Eco-fashion fabrics and unique style of clothing were considered as criteria in understanding the quality. The data suggest that the quality of the Eco-fashion materials was favourably perceived by the focus group and they expressed a good feeling after wearing and touching them. Finding shows that most consumers figure out an item are

made of recycled content or organic materials; they feel better about their purchase and themselves. Therefore, they believed that clothing is soft, breathable, and comfortable to touch, while more natural fabrics and a wide range of other fabrics required to be present.

Indeed, consumers are looking for good quality in recycled materials. All participants stated a strong preference for the cotton *Batiste* and recycled cotton (Jean) fabrics for some reasons such as good feeling and wearability. Nevertheless, the polyester recycled fabrics were observed cool, soft and with preference in pastel colours.

- **Performance and Design Features in Eco-Fashion Clothes**

The combination of design and colour in the Eco capsule wardrobe is perceived as appealing harmony and suitable for the casual summer style. However, the participants were interested in more pastel colours in the capsule wardrobe. The attaching and detaching parts in Eco-fashion clothes were easily figured out.

Additionally, convertible clothes in a capsule wardrobe provide a solution to control consumption and purchase clothes. However, it is necessary to understand the consumer's need for the target in the fashion market. Therefore, in this stage, the fashion industry needs to focus on the consumer's demand and Eco-fashion designs for their needs. Also, the participants liked the *railroad* button that could easily adorn or separate pieces.

In fact, the fabric and design of the jumpsuit were highly rated since it was easy to wear. This suggests the modest silhouettes with a simple design may help to get a positive evaluation of such Eco-fashion outfits. Hence, the design of sustainable clothes can be most attractive with only focusing on a simple design.

There is a dissatisfaction with the functionality of sustainable products and design features in the market. Nevertheless, they are concerned about the limited items of sustainable clothing that may negatively affect their self-confidence.

In this study, participants expressed good feeling for multifunctionality property of clothes, because they could detach and attach easily. The multifunctionality feature of the Eco-fashion clothes in the capsule wardrobe was interesting and rated as nice and suitable for casual summer style. However, some of the participants mentioned that the concept of Eco capsule-style is too new, and modification is needed in some part of design features.

They preferred lining and liked the tying options that could have the ability to detach and change the clothes appearance. Several were surprised by the jacket silhouette with different appearances. On the other hand, the participants agreed that the mini coat style is too young and trendy, so it is only deemed a fitted silhouette for the individual age groups.

The study participants suggested that the sleeveless coat with shorter in the front is a more casual style. Furthermore, they commented that the plain fabrics are more classic and fashionable, though it is not considered a suitable silhouette for this age group. They suggested printed fabrics with floral, spots and strips patterns for more casual style.

- **Environmental Knowledge and Concerns Toward Eco-Fashion Clothes**

Interestingly, the two participants in the focus group of the evaluation design outputs believed that there are no benefits in the capsule wardrobe. However, after discussion, they expressed a change of their mindset to earlier responses. It shows the ethical and environmental responsibility of Eco capsule wardrobe which two women claimed that this feature has changed their perception toward accepting and understanding such clothes.

Indeed, it is related to the education and awareness system about environmental knowledge in the clothing industry and their relationship with human behaviours such as consumption and purchase clothing. So, people are conscious about the impact of their consumption and decisions, it can positively influence the modifying behaviour. As stated in previous research, the environmental knowledge and awareness determined respondent's perceptions of their willingness to adopt Eco capsule wardrobe, especially multifunctional features.

**Summary.** According to the findings, it is shown that objective number three which is to evaluate design the Eco-fashion outputs of this study, is completely supported by objective number one which is to discover consumer's behaviour toward purchasing Eco-fashion clothes. All three factors regarding the evaluation of design outputs based on the consumer's willingness and acceptance of Eco-fashion clothes in capsule wardrobe are in line with identified related factors on the consumer's intention of purchasing Eco-fashion clothes such as the quality and price requirements; functionality and design features; and environmental knowledge and concerns.

## 5.5 Contribution and Implications

The contribution and implications of this study can be examined from the managerial perspective to form a related strategy to encourage an increased rate in the clothing disposal toward recycling. Therefore, it leads to clothes production made of recycled materials and finally distribute in the fashion market.

Regarding develop an Eco-fashion design model and the description of the implementation into the Eco capsule wardrobe, it can provide a guideline for fashion designers and apparel manufacturers who want to follow sustainable aspects in their work.

Using the Eco-fashion design model developed based on the existing fashion and apparel design models help designers and clothing manufacturers for more consideration to choose the materials and techniques based on human safety and environmental health.

It means that without harmful air, wastewater, and fabric waste release from clothing manufacturers, both the people as well manufacturer will able to save money in pollution prevention and treatment. As stated, this model supports the recycling activities, where all clothes can able to be recycled or upcycled at the end of their lifespan. Besides, investigation of the consumer's opinions and their feeling will be valuable for fashion designers and clothing manufacturers by showing that consumers will purchase Eco-fashion clothes, especially made of recycled contents.

However, it is stressed that consumers are very sensitive about the price and Eco-fashion products function rather than the environmental benefits. According to the findings, if the consumer's evaluation of the Eco-fashion clothes has positive feedback, therefore their willingness to purchase will be increased. So, fashion designers and clothing companies need to endeavour for making and improve the design and quality of materials during the Eco-fashion design process. It is shown that design features and quality of the materials are the effective factors on the consumer's attitude to willingness and acceptance of Eco-fashion clothes in the fashion market.

Indeed, the willingness to buy the Eco-fashion clothes is more closely related to the degree of the consumer's environmental knowledge, concerns and their perception of the product function and appearance. Therefore, fashion designers and apparel industry need to find effective approaches for giving awareness to consumers for improving their

environmental knowledge about Eco-fashion clothes, as well as Eco-fashion materials made of recycled contents.

### 5.5.1 Theoretical Contribution and Implications

This research provides important theoretical contributions to clothing disposal and purchase behaviour toward sustainability, which is currently under research. Therefore, it provides some significant insights into the fashion industry, government, and non-government organisations concerning the influential factors of purchase and design intention.

Through this study, it can be concluded that the attitude toward purchasing Eco-fashion clothes will contribute to the economy and embrace modern environmentalism. The findings indicate several implications that may lead to the advancement of sound Eco-fashion clothes and consumer purchase intentions.

Increasing the positive consumer's attitude toward clothes made of recycled materials may help the industry focus on the product, personal cost, and emotional benefits of Eco-fashion clothes rather than only a green strategy. Likewise, for increasing the purchase behaviour of Eco-fashion clothes, it is needed to improve consumer's attitude and clothing disposal activities toward sustainability. Therefore, a real clothing recycling disposal programme and the effective Eco-fashion clothes design process with using the recycled materials should be established to promote a high purchasing recycled clothes rate.

It suggests that the government, private sector, entrepreneur, and marketers should develop public involvements showcasing on how clothing disposal behaviour could help in reducing adverse impacts on the environment. This helps to increase the consumer's

purchase intention for Eco-fashion clothes made of recycled materials and impact positively the environment.

In addition, the finding of this research adds to the literature on the role of the fashion designer in the Eco-fashion design. It provides evidence that the psychological factors do not only benefit to form the designer's attitude but also, they can foster the consolidation of the Eco-fashion design intention. This study is as a framework to guide understanding designer's behaviour toward reducing the clothing waste through Eco-fashion design. The factors influencing on the designer's attitude indicate fundamental perceptions for the development of sustainable thinking. Additionally, mental factors motivate by self-interest intention provide better liability for the behavioural intention.

Empirical findings show that the positive effects on the attitude and social influence are significant variables in the process of personal behavioural intention forming toward sustainability issues in society. In other words, for increasing the behavioural intention of Eco-fashion design, it needs to improve the designer's attitude. According to the findings of this study for improving the designer's attitude, the level of environmental knowledge and perception about the quality and price of Eco-fashion design should be developed among the designer's community, as well as the fashion and apparel industry.

### 5.5.2 Practical Contribution and Implications

From a practical point of view, attitude plays an important role rather than social norms in forming intention behaviour toward sustainable activities. Therefore, fashion markets should take some tactics to attract consumer's attitude since this can help to influence in purchasing Eco-fashion products.

There are some barriers lead to stop consumers from recycling their unwanted clothing which is the lack of awareness and non-availability of the fabric recycling bin, misconceptions toward Eco-fashion clothes made of recycled materials and the limitations of the availability of this clothing style in the fashion market. However, these obstacles can be overcome by:

Firstly, showing a positive image to consumers by the fashion industry, such as clarifying the purposes of Eco-fashion clothes which is Eco-friendly and profitable (consideration two pillars of sustainability: environment and economy through making profits). If the fashion industry starts training and improving the clothing manufacturer's knowledge about the recyclable fabric, thus, it can make clothing disposal and purchase easier and more effective.

Secondly, promoting the advantages of clothing disposal toward sustainability such as recycling, which results in the production of Eco-fashion clothes made from recycled materials. Indeed, it may lead to support the Eco-fashion design model which shows all the clothes are able to be recycled, reused, and redesigned.

Thirdly, setting up specific bins for collecting clothes in the poor physical condition such as home collection services, fabric recycling bin in the universities and schools, drop-off and pick-up services which encourages people to dispose of their unused clothes and increases the clothing recycling rate.

In addition, this attempt would not be successful unless there is a cooperation between government, non-governmental organisation (NGO), fashion industries, fashion and apparel designers and society. Therefore, the government can invest in fabric recycling programmes related to sustainable practises for the implementation of this kind of product

to prevent waste pollution, boosting the nation's economy and enhancing the consumer's knowledge about the clothing waste. Moreover, it is worthwhile to note that thinking about preserving the environment as a citizen significantly influences an individual's attitude towards perceived behaviour to dispose of clothing. Hence, the government should strengthen the individual's attitude by focusing on awareness of environmental threats.

Finally, educating fashion and apparel designers toward Eco-fashion programmes should be performed by training and holding workshops. This serves as an indication that the fashion designer who desires to design with Eco-fashion materials, needs to pay considerable attention for ensuring that the Eco-fashion clothes are designed based on the acceptable quality, fair price, and good design.

Besides, based on findings in the interview part, the fashion industry should focus on improving functional, aesthetic and quality features to encourage consumers for purchasing Eco-fashion clothes made of recycled materials. The findings confirm that it may challenge to design Eco-fashion clothes for mass-market that meets the aesthetic, function, and economic demands, as there are so many personal variations in preferences. Regarding this matter, focus on user-oriented design and customization can offer solutions to this challenge.

Besides, designing labels as a guideline to give awareness in society is an understandable solution which some interviewees indicated to this subject. Therefore, focusing on this idea can lead to improving the level of environmental knowledge in society. Furthermore, another significant perspective is that the designer's attitude has a notably greater effect on Eco-fashion design intention. These findings provide useful orientations for organisational decisions related to the Eco-fashion design. Firstly, policies should be

established to enhance the designer's attitude and decay the designer's perception of barriers in the Eco-fashion design process.

To order for manufacturers to use Eco-fashion material strategies, current criteria will be updated. Furthermore, initiatives will look at enhancing the designer's awareness of the consequences of fashion and textile waste management. Visual value of design with the Eco-fashion fabrics or successful fashion projects can stimulate the designer's enthusiasm towards using Eco-fashion materials.

In order to inform designers about the need to incorporate design using Eco-fashion products, training programmes and regulations should also be given. For having a sustainable fashion society with conscious designers, the perception of values for the fashion designers will improve their social impact toward design with Eco-fashion materials.

Conscious designers have become more and worried about the environmental future and health issues. Hence, they can encourage their customers to purchase and think about Eco-fashion clothes. Moreover, the fashion market must educate and improve environmental knowledge among customers. It leads to improve the positive levels of social pressure in the field of sustainability along to distribute Eco-fashion clothes in the fashion and clothing market.

Therefore, this issue can help fashion designers to participate more in Eco-fashion design programmes. It is noted that this study focused on freelance designers, however, in fashion companies and fashion brands, the designer is not the conclusive decision-maker in choosing materials, but they can persuade others to use Eco-fashion materials. Lastly, fabric recycling communities are an important partner for the Eco-fashion market. So, paying attention to produce materials with acceptable quality, good performance and beautiful

appearance can increase the collaboration between fashion and textile market regarding use of Eco-fashion materials.

## 5.6 Chapter Summary

The inspiration for this research was allured by the phenomenon where designers interested in Eco-fashion design may face problems by taking sustainability issue in their artworks and design process. Henceforth, the purpose of this study is to develop an Eco-fashion design process model to guide designers and manufacturers involved in sustainable issues. Due to, the goal of sustainable development is about human health and well-being in the economic, environmental, and social systems.

In addition, the designer's role is a topic primarily about fashion and clothes. Therefore, the designer's role as a trigger for progress in the creation of a sustainable style to the fashion industry should be centred. There are several Eco-fashion and apparel design process models, but in these models, there is no attention to the designer's role in helping to reduce clothing waste from an artistic and behavioural perspective, not from viewpoint of advanced engineering.

Hence, the objectives of this research are to discover consumer's and designer's behaviour toward purchase and design of Eco-fashion clothing which both are activities toward minimisation clothing waste, to develop the Eco-fashion design model with related factors which can support three pillars of sustainability; society, environment and economy, and finally to design an Eco capsule wardrobe as a prototype designed based on the proposed model and to evaluate consumer's acceptance about this prototype.

Consecutively, this research has focused on developing the Eco-fashion model based on the simple and comprehensible factors for fashion and apparel designer. Besides, making the prototype following the proposed model is behind the scope of this study. The prototype as named “Eco capsule wardrobe” aims to test and evaluate the developed Eco-fashion model with supporting the three pillars of sustainability or not.

The findings show that this model can help the designer and manufacture to identify the material, therefore, the amount of unsafe material released into the planet and living place which is threatening health problem of current society could be reduced. In addition, all clothes were designed in the Eco capsule wardrobe can be recycled and returned to the economic system instead of burning.

Hence, it can help to excessive use of Eco-fashion material resources, therefore, it can support the recycling programmes and decrease the use of other material resources and creation of waste. Moreover, Eco capsule wardrobe with multifunctional clothing would increase clothing utilisation, reduce the need to purchase unnecessary clothes and eliminate clothing waste. Also, findings show that creating an Eco capsule wardrobe saves time and money which can be beneficial incentives for the consumer’s acceptance. Additionally, a mixed-method was utilised in this study to obtain data collections and analysis.

(1) The initial subject of study involves two parts; to the discovery of consumer’s intention behaviour toward sustainability activities, the reliability and validity of behaviour features and contents variables, and to investigate the quality, price and design of the Eco-fashion clothing available in the fashion market. A survey and an in-depth interview method were used to discover the consumer’s behaviour toward two sustainable activities; dispose of the clothing and purchase Eco-fashion clothes.

(2) Also, another part of this subject involves to the discovery of designer's intention behaviour toward minimisation of waste and Eco-fashion design, the reliability and validity of behavioural intention features, and to investigate the factors which influence on the designing Eco-fashion clothes. An in-depth interview and a survey method were used to discover the designer's behaviour toward the minimisation of waste and utilising the Eco-fashion materials.

(3) In addition, the main subject is included to develop the Eco-fashion model with related factors in the sustainable design process with sourcing Eco-fashion materials and Eco-design techniques. An in-depth interview concerning the development of the model, as well as a survey to understand the design concept were assisted to develop the Eco-fashion design model with a new look. So, following the proposed model, an Eco capsule wardrobe was designed by a designer's team.

(4) Finally, the evaluation of design outputs "Eco capsule wardrobe" (prototype) was carried out to study the consumer's evaluation of the design features and material's quality. The analyses of the consumer's and designer's behaviour model were measured and validated through Statistic Package for the Social Sciences (SPSS) and Partial Least Squares Structural Equation Modelling (PLS-SEM/SmartPLS). The positive results derived from the validity and reliability statistical analysis outcome establishes significant high level of consumer's attitude and sustainable activities which can lead to developing Eco-fashion clothes in the future design; while the result of investigation about Eco-fashion clothing among the consumers indicates there is a significant difference among the intentions and real behaviours.

Likewise, the consumer's willingness is evaluated the design features and quality of the materials through focus group sessions with young women consumers. The design features and the Eco capsule wardrobe's quality perceived as a casual, acceptable quality of materials, use Eco-friendly features, multifunctional and good design. According to the findings, if the consumer's evaluation of the Eco-fashion clothes is positive, therefore their willingness to purchase would be increase. This indicates with taking the suitable design and style as well as improving quality, it can affect consumer's perception toward possessing Eco-fashion clothing.

Hence, it can result in that consideration to consumer's behaviour as a significant factor to develop a sustainable brain or trend such as the Eco-fashion clothing, as well investigation about the most related factors which are essential to design such clothes are two main topics for acceptance such clothes in society.

Nevertheless, the fashion industry should focus on improving functional, aesthetic and quality factors to encourage consumers to purchase Eco-fashion clothes made of recycled materials. The findings confirm that it may be challenging to design Eco-fashion clothes for mass-market that meets the aesthetic, function, and economic demands, as there are so many personal variations in preferences. Regarding this matter, focus on user-oriented design and customization can offer solutions to this challenge.

# CHAPTER 6

# CONCLUSION AND FUTURE WORK

## 6.1 Conclusion

This research includes the following studies (1) proposed the Eco-fashion design model; (2) development an Eco-fashion design process model; (3) assessment of the consumer's sustainable behaviour toward disposal and purchasing of Eco-fashion clothes; (4) assessment of the designer's sustainable behaviour toward minimisation waste and designing of Eco-fashion clothes; (5) development and production of an Eco-fashion collection as "Eco casual capsule wardrobe"; (6) assessment of the consumer's willingness and their acceptance of Eco-fashion clothes about the design and quality of the materials. The recommendations and limitation of the research are also covered.

## 6.2 Finding Model

The final model of Eco-fashion design process is constructed based on the phases involved in the clothing life cycle such as consumer, designer, material, and design process to try for extending the lifespan of clothing. Besides, when research focuses on individuals and their role, it means that the effects of social and psychological subjects are involving in the research area.

Hence, the proposed Eco-fashion design model combines two important subjects the structure of Eco-fashion and apparel design process and social area. Therefore, the developed model considers the consumer and their behaviour, the designer's behaviour, Eco-fashion materials and sustainable techniques in the existing sustainable fashion and apparel design model.

The findings related to the objective one show that attitude has the most effect on the individual's behaviour (Both designers and consumer). The plus side, the design features, quality, price value and environmental knowledge are related factors on the consumer's attitude. Moreover, interview with eight sustainable fashion designers indicates that environmental knowledge, perceived quality and price, perceived functional and aesthetic features, and finally perceived easy to use of technology are most related factors on designer's attitude toward minimisation of the fabric and clothing waste through fashion design.

The findings related to the objective two show that Eco-fashion materials, the sustainable design and easy to use techniques, as well as effective factors to choose materials and techniques are significant roles in the Eco-fashion and apparel design. In fact, people have some initial needs, for example, wearing clothes. Individual desires are a major component of human development which they are called the necessaries of life. Those basic needs are considered food, clothing, and accommodations which people should achieve their needs. Each person, depending on his/her specific needs aspires and a set of motivational expectations and attitudes.

Regarding clothing case, researchers showed that price, quality, and design are related factors which influence consumer's attitude toward all activities related to clothes such as purchasing, consuming, disposing of clothes. Moreover, attitude is a powerful factor for forming behaviour toward achievement the needs. Hence, different needs have different patterns of behaviour.

Also, findings related to the objective three present that the quality of materials and design features are important factors that most consumers consider when they evaluate the

Eco-fashion clothes. Therefore, these factors along with environmental knowledge affect consumer's willingness to possess such clothes. All in all, based on the findings of objective one and two, an Eco-fashion design model is created, evaluated by young women consumers (Objective three).

According to Figure 6.1, a schematic of the Eco-fashion design process model is created by supporting the existing sustainable fashion and apparel design models. Hence, the Eco-fashion design process model consists of three main steps: problem definition and research, creative exploration, and implementation.

The final Eco-fashion model supports recycling programmes at the end of clothing lifespan, therefore clothes designed in this model will be disposed of safely because of two reasons; the materials are chosen based on the cradle to cradle concept and they are made of technical or biological nutrients, and clothes are designed based on the multifunctionality and disassembly purposes, hence they can be disassembled easily after their lifespan.

Indeed, it means the investigation in each part of the conceptual model helped to develop and create an Eco-fashion design model. Therefore, based on the findings of objective one, two and three, a conceptual Eco-fashion design model is developed and illustrated in Figure 6.1.

From the scopes of the study, the Eco-fashion design model is developed based on the clothing life cycle, by switching the focus from preventing waste production to the maximum usage of the waste product. As seen in Figure 6.1, with an investigation of the phases involved in the clothing life cycle, the lifespan of the clothes can be expanded. Hence, this research discovered that Eco-fashion design model can able to support the three main pillars of sustainability (environment, economic and society) with preserving the

environment, improve the economic and consideration the society's needs and their behaviour.

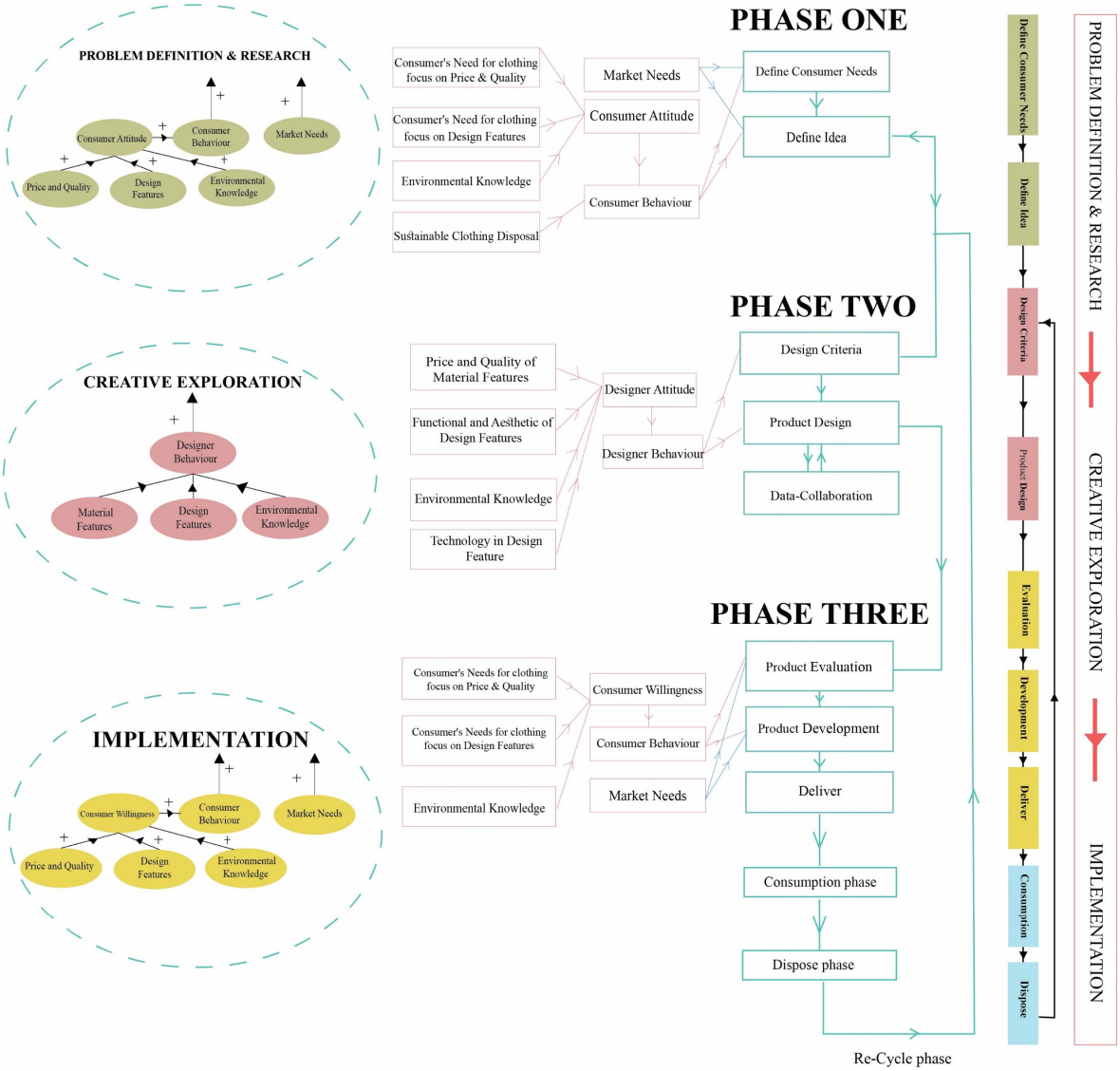



**Figure 6.1:** Proposed Eco-Fashion Design Process Model

Therefore, the finding in step one shows that related factors regarding the individual's behaviour (consumer and designer) and the market needs the influence to discover the problem and define consumer's need. Since the ideas are affected by personal behaviour. Therefore, this study surveyed the factors affecting consumer's behaviour toward

Eco-fashion clothes by using larger sample size, and a multivariate analysis method of partial least squares (PLS) path model was used to validate the structural equation modelling (SEM). In the next step, design criteria and product design are formed through the designer's behaviour. While the designer's behaviour is affected by four important factors: price and quality of material features, functional and aesthetic of design features, environmental knowledge and finally technology in design features. So, this part of the study evaluated the factors affecting designer's behaviour toward Eco-fashion design and a multivariate analysis method of partial least squares (PLS) path model was used to validate the structural equation modelling (SEM). Indeed, the finding of objective one is included in the Eco-fashion design model to the social-environmental aspect.

Finally, the finding shows the same result in step three with step one. Therefore, the individual's behaviour (consumer and designer) and the market needs affect the evaluation and development of sustainable products in the Eco-fashion design process. Hence, findings of objective two and three are included in the Eco-fashion design model to the environmental-economic aspect and the economic-social aspect, respectively.

## 6.3 Summary of Findings

Understanding the complexity of Eco-fashion issues can make some barrier for designers, especially those new to the concept of sustainability in design. Hence, there needs to be a greater understanding of the main subjects within the Eco-fashion issue.

The present study developed a model of Eco-fashion design based on the concept of the clothing life cycle. According to objectives of this study, the Eco-fashion design's structure with consideration of environmental impacts throughout the life cycle clothing from production to the disposal phase is an understandable concept for all designers whether

are expert in sustainability concept or not and also can help them to reach sustainability in extending clothing's lifespan. Hence, in this research was tried to discover phases involved in the life cycle of clothing such as consumer, designer, design process and material with supporting the three main pillars of sustainability in design which are consumer (society), process to make profits (economic) and planet (environment).

Therefore, the study has consisted of three main parts; the discovery of consumer's behaviour toward Eco-fashion clothes, the study of designer's behaviour toward the design of Eco-fashion clothes and the investigation of sustainable design techniques with supporting the Eco-fashion materials to develop the Eco-fashion design model.

As a part of these three perspectives, this model helps to produce Eco-fashion clothes based on the consumer's needs and their behaviour, designer's behaviour, Eco-fashion materials, sustainable techniques and process design toward minimisation of clothing and fabric waste regarding preserving the environment.

The Eco-fashion design model shows that consumer's behaviour and their needs can affect the designer's behaviour to make the best decision in choosing materials and effective techniques, as well as considering the fair price, good quality, best function and nice aesthetic features toward sustainability subjects. However, sustainability and focusing on this subject only grow in society when environmental concerns and knowledge are raised and promoted at the community level.

The proposed Eco-fashion design model allows to fashion and apparel designers and manufacturers for addressing and consideration all three sustainable development pillars toward making decisions in the production of Eco-fashion clothes. Based on the model of this study, all clothing can be recycled and returned to the economic system instead of

burning. Hence, it can help to excessive use of Eco-fashion material resources. Therefore, it may lead to support the recycling programmes and decrease the use of other material resources and creation of waste. In other words, extend the life cycle of clothes will be achieved.

Besides, the Eco-fashion design model shows reduction the amount of harmful chemicals and clothing waste released into the local community through using Eco-fashion materials, minimising material diversity and applying zero-waste pattern-making process, which it can lead to reducing the environmental and social impacts. Hence, this statement is valid that this model can help the designer and manufacture to identify the material, therefore, the amount of unsafe material released into the environment and living places which are threatening health problem of current society could be reduced. As stated, this model has been developed based on the phases involved in the clothing life cycle, so, consideration of these phases is a significant issue.

Firstly, consumers are the main part involved in the clothing life cycle, as well as one of the most important pillars of sustainability. Regarding the preservation of the environment, consumers can make sustainable decisions during the purchase of clothes as well as disposing of them, as an approach to reduce clothing waste. Therefore, decision-making is completely related to consumer's behaviour and factors formed the consumer's behaviour and their attitude.

In social psychology, theories such as Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), or Technology Acceptance Model (TAM) are usually used to explain the attitude and behavioural influence of the consumers. For the first time, this study discovers the role of attitude, subjective norm, perceived behavioural control and purchase

intention toward Eco-fashion clothes especially those made of recycled materials among consumers. Since a growing number of companies or designers are looking for consumer's attitude concerning Eco-fashion clothes, especially made of recycled materials, the structural equation modelling of the TPB model to forecast the disposal of clothes and purchase behaviour is a unique contribution to this research.

A major finding of this study is that the consumer's attitude and their clothing disposal behaviour are significant factors in consumer's purchase intention of Eco-fashion clothes. In both quantitative and qualitative findings, the best predictor for clothes purchase intention especially made of Eco-fashion materials is a positive attitude toward quality, price, colour, style, and design in other words psychological shopping. Psychological shopping is regarding the psychological factors affected on consumer's shopping behaviour.

This research also indicates that 91% of the variation in purchase behaviour is due to perceived behaviour to dispose of clothing and purchase intention among consumers. It is a logical finding of this study perceived behaviour to dispose of clothing is a significant factor in the purchase behaviour of Eco-fashion clothes. Therefore, to make a behaviour pattern toward purchasing for Eco-fashion clothes made of recycled materials, the fashion and apparel industry and government must first promote a positive attitude toward clothing disposal and programmes which unwearable clothes become new fabrics or new design.

The survey revealed that the lack of access and knowledge about Eco-fashion clothes are the biggest barriers that resulted in not paying attention to purchase such clothes. In addition, the study outcomes indicate that consumers choose clothes made of Eco-fashion materials by touching the quality, looking for the price, and design, firstly. Thus, it is valuable that Eco-fashion clothes should be produced in great features since they can save

the environment from pollution. This issue must be considered by designers and manufacturers as a guarantee which consumers would like to meet Eco-fashion clothes in the market.

The study confirms that the consumer with or without knowledge about Eco-fashion clothes shows positive clothing recycling and purchase behaviour. This signifies to achieve higher rates of clothing disposal behaviour toward sustainability, it is necessary to improve knowledge and easy access to charities or donation centres and recycling centre or recycling bins. Owing to this result, by increasing awareness about Eco-fashion clothes and design enhancement, more recycled and Eco clothing collection should be set up by designers.

There are some scenarios to encourage wider usage of recycled materials in the fashion and apparel industry by increasing attitude toward Eco-fashion clothes. These scenarios include promoting the advantages of perceived behaviour to dispose of clothing, clarifying the purposes of Eco-fashion clothes, training and improving the clothing manufacturer's knowledge about recyclable fabrics, setting up specific bins for collecting clothes in the poor physical condition and educating fashion designers toward Eco-fashion programmes, etc.

Secondly, in the second phase, it is involved with the designer's role in the clothing life cycle. Indeed, designers are the centre of each successful design model, where their behaviour may lead to the change in the clothing life cycle, as well as modify toward sustainability concepts. Therefore, this study presents a novel approach to understand why Eco-fashion design may be practised by the fashion and apparel designers and what scope exists to form their behaviour towards sustainability. Hence, the individual's motivations from the perspective of psychological concepts are examined.

The finding shows that perceived values influence on designer's attitudes which can manage real behaviour directly. Regarding environmental protection, designers can make sustainable decisions during fashion and clothing design as an approach to reduce waste. As mentioned, decision-making is formed in the individual's behaviour and developed based on psychological factors. Therefore, with supporting the existing psychological theories, TRA was applied to verify more constructs of the designer's intention to the understanding of designer's behaviour in detail.

Hence, another major finding of this study is the discovery of significant factors that are influential on the designer's attitude toward the behavioural intention of Eco-fashion design. In general, the Eco-fashion design intention among designers shows a satisfactory image. For most of the designers interviewed, the pursuit of Eco-fashion issues in their design had a psychological dimension. They felt that Eco-fashion should be incorporated by themselves and other designers, as the right thing to do.

The findings from the research are meaningful and the results show that there are factors, behind the forming of designer's attitude toward Eco-fashion design, which are categorised in environmental knowledge, perceived quality and price, perceived functional and aesthetic, and perceived easy to use and usefulness of the technology. The finding indicates that a significant percentage of changes in the behavioural intention toward Eco-fashion design is affected by the designer's attitude and subjective norms. It reveals that attitude has a more important effect on the design intention in comparison with subjective norms which it is in line with the findings of previous studies.

Besides, this study indicates that all perceived values of the Eco-fashion design are significant and influence the designer's attitude toward Eco-fashion design with using Eco-

fashion materials. The finding provide important additions to the literature on Eco-fashion design and designer behaviour.

Thirdly, the third and fourth phases involved in the clothing life cycle are material sourcing and design techniques during the process, where both are in the relationship together. The design process and material used are one of the related phases in the clothing life cycle toward sustainability, where this research developed the Eco-fashion design process model with supporting and focusing on both.

Therefore, the Eco-fashion design model has applied the concept of phases involved in the clothing life cycle discussed before, to existing sustainable apparel process model with supporting sustainable convertible design to create an Eco capsule wardrobe with ten pieces made of Eco-fashion materials. Investigation among young women consumers shows that they agreed with the idea of possessing a capsule wardrobe, and the answers indicated that the capsule wardrobe which includes only essential clothing is an interesting, understandable, and acceptable phenomenon for them. Hence, focus on the creation capsule wardrobe as a catalyst to reduce the consumption based on the market needs is reasonable.

The Eco casual capsule wardrobe provides a viable solution coming from Eco-fashion design for the reduction clothing waste and environmental problems in the fashion and apparel industry to preserve the planet and protects the people health, and making a profit to the economy through Eco-fashion clothes in capsule wardrobe which can be recycled and returned to the economic system instead of burning. Indeed, the Eco capsule wardrobe supports to increase clothing utilisation, eliminates the need to purchase the necessary clothing and reduces excess consumption, as well as clothing and fabric waste.

By the end of the research, it is apparent that this approach created considerable interest in the motivation to the acceptance of clothes made from Eco-fashion materials in the capsule wardrobe. Therefore, the Eco-fashion design model is recommended to fashion and apparel industry with consideration four specific phases of the clothing life cycle; understanding consumer's needs and willingness, understanding the factors affected designer's behaviour, understanding and applying most important sustainable materials and analysing the design process and sustainable techniques toward more Eco-friendly production.

Also, the framework of Eco-fashion design process created in the centre of the proposed model of this study is recommended to fashion and apparel designers interested in the sustainability issues to apply in their creative works. This important approach has other audiences; students and researchers are encouraged to explore and adopt the model of the Eco capsule design to create innovative sustainable products. Besides, findings can be used in the different types of clothing products to reduce the contamination of the environment and the resource depletion problems related to the fashion industry. While existing research provided valuable information about the Eco capsule wardrobe, it is suggested to perform some research to develop and analyse with a larger sample.

This step is essential to get closer to identifying the viable options for this segment of the fashion market. According to the findings, if the feedback from the consumer's evaluation of the Eco-fashion clothes is positive, therefore their willingness to purchase will be increased and they are interested to possess them. So, the proposed model is recommended and able to fit the fashion and apparel industry. However, designers may have a better understanding of their ability to design thinking into the design process based on

their experiences and the consumer's demand. In addition, students and researchers are encouraged to explore and adopt the proposed model to create innovative collections. This important approach has other audiences; fashion companies for the cost reduction, presentation new Eco-fashion collection, gaining a good image, society for financial benefits, being fashionable for low-income people, attracting customers which may lead to improve the cash flow, making the society more aware, creating jobs and finally preserving the environment form clothing and fabric waste.

Besides, the government does not forget about taking into concentration on environmental issues. The governments in most countries have started to consider effective policy measures to address textile and clothing waste prevention. In the ideal world, nothing should be wasted, therefore, all clothes should be designed in a recyclable way. In this case, the government and fashion and apparel industry can invest in the implementation of this model to prevent clothing waste pollution, boosting the economy and improving the consumer's knowledge regards to sustainable behaviour.

All in all, during the Eco-fashion design process, consideration of the consumer's needs such as the quality, price, and design of Eco-fashion clothing, as well as programmes to improve the environmental knowledge are important, firstly. In the second phase, consideration of the Eco-fashion materials, sustainable techniques, designer's attitude, and related factors on her/his perception are essential subjects. And finally, for the evaluation of the Eco-fashion clothes, the consumer's willingness regarding the quality and design features from the Eco-fashion clothes should be considered.

However, the improvement in the level of environmental knowledge is highly recommended. Therefore, the strangeness of environmental knowledge and concerns in

society is critical issue toward development Eco-fashion design subjects. Besides, the improved quality, consideration fair price and designing based on the utilisation and multifunctional purposes are factors which should be considered by manufacturers, designers, and fashion industry, where they desire to design toward Eco-fashion products in the world.

## 6.4 Limitations

This study has some limitations that need to be explained and considered for futures studies. The designing and developing clothes, especially in the sustainability area are involved with some limitations such as consideration culture, religion, gender, age, and design features based on the size, colour, and shape. Moreover, the fashion and clothing design and production processes are vary depending on the size of the company or designer's workplace and its relationships with supply chains. However, this study efforted to discover and describe general cases. Eco-fashion clothing products developed in the study were limited to use Eco-fashion materials, especially recycled contents for young women's clothing wardrobe. In addition, this study would not measure all variables related to the consumer's Eco-fashion clothing consumption and purchasing such clothes.

This research only focused on the consumer's willingness and their acceptance of Eco-fashion clothing designed based on the Eco-fashion design model. Indeed, the present study only established that the Eco-fashion clothes in the women's capsule wardrobe can be successfully designed by guided the proposed design model. Owing to the small-scale of this pilot study, therefore, it is very difficult to accurately evaluate the cost. Moreover, this research was performed under university research and there was no collaboration with the fashion and apparel industry.

Regarding the evaluation of Eco-fashion output designs, this study explored only Iranian women's consumers with age between 20 to 30 years old and live in Tehran. To achieve its purposes, the results of this study cannot be generalized beyond young women living in Iran, as well as other countries. In fact, the need for targeting other regions and other population segments is acknowledged for future studies. Also, generalizability requires data on large populations, quantitative research provides the best foundation for producing broad generalizability. The larger the sample population, the more one can generalize the results.

Although a mixed-method strategy was used in this study to increase the confidence in the findings, it also showed some limitations. Regarding the designer's behaviour, this study considers clothing design made of Eco-fashion materials, therefore the findings may be different for other types of clothing.

## 6.5 Future Work and Recommendations

This study does have suggestions that need to be acknowledged in future studies. Since, this study develops an Eco-fashion design model based on the phases involved in the clothing life cycle such as consumer, designer, material and design process, therefore, any improvement in all phases of clothing life cycle toward the strengthening of this model is highly recommended.

(1) First, when research focuses on individuals and consumer's role, it means that the effects on the social and psychological subjects have an important character in the research area. So, understanding consumer's needs for sustainable fashion and apparel products are needed more investigation. In this study, some purchase scenarios were used to examine sustainable behaviour and factors such as the design, price, and quality in the case of Eco-

fashion clothes. However, the factors that influence consumer's purchase behaviour toward other types of clothes can be further explored by future studies.

Although the Theory of Planned Behaviour (TPB) has proved to have considerable utility for identifying the factors which are likely to encourage purchase behaviour toward Eco-fashion clothes, several areas require further study, specifically adding further factors toward improvement in the problem definition and research phase. In the plus side, this study shows that sustainability and focusing on this subject only grow in society when environmental concerns and knowledge are raised at the community level, therefore, investigation on the related factors to improve environmental knowledge is extremely suggested to strengthen the research phase in the proposed model.

This study is conducted based on the new pieces of knowledge for further research regarding the consumer's perception to possess the Eco-fashion design product. To identify new subjects and issues within the field of the Eco-fashion clothing in the fashion industry, a larger population for evaluation and willingness to purchase such clothes is necessary.

Indeed, the research can be extended by getting responses from a wider range population. Although there are only a few consumers who have had experience in Eco-fashion clothes, these clothes will definitely become a trend. Therefore, the factors which influence on the consumer's needs of the Eco-fashion clothes may be improved or changed. Therefore, it is suggested that future studies can investigate deeply about other factors which affect the consumer's attitude toward Eco-fashion clothes. Also, method development is needed to measure other actual purchasing scenarios for further research.

(2) Second, as shown in the proposed design model, the design criteria and product design are formed through the designer's behaviour. Therefore, the insight investigation on

the designer's behaviour in sustainable design concepts is highly suggested. Although the Theory of Reasoned Action (TRA) has proved to have considerable utility for identifying the factors which are likely to support design intention toward Eco-fashion clothes, several areas require further study, specifically adding further factors. According to Crane (2012), fashion is defined styles of clothing worn by specific groups that are considerably influenced by culture, religion and lifestyle of people. Henceforth, most fashion designers already involved in sustainability design or interested in sustainable issues are offering new collections concerning the culture and traditions along with clothing senses of other countries ever season by following the proposed Eco-fashion design model. This investigation may help to improve the creative exploration phase in the proposed model.

(3) Third, the current study establishes the Eco-fashion clothes which can be designed successfully by guided the proposed Eco-fashion design model on a small scale. Hence, it is suggested to apply the proposed model in the apparel industry to make a strong connection between the research area and industry sector. Moreover, it may lead to improve the proposed Eco-fashion design model, especially the design techniques such as zero-fabric waste approaches in mass-production.

Moreover, collaborations with other industries, such as companies which support the recycling programmes of clothing waste to produce renewable energy, are needed toward more development in sustainability. Besides, this research was conducted to design the women's capsule wardrobe successfully by guided the proposed Eco-fashion design. Henceforth, more researches are needed to apply in other apparel sectors such as children's clothes and men's clothing. Likewise, in the future study, additional options for Eco-fashion design in many styles are suggested to make different outfits. Investigation of other

sustainable design techniques in the development of the Eco capsule wardrobe's style will be highly beneficial. Moreover, it is suggested to study and develop the concepts of design such as focusing on the culture and religion to make different sustainable capsule wardrobes. The present study mostly reported intention of the fashion design with Eco-fashion materials. Therefore, future research may investigate more information related to improving the Eco-fashion designs and focus on this issue. Additionally, in academic design studies, it needs comprehensive research about factors such as design and style which these factors have shown a significant effect on the purchase behaviour toward Eco-fashion clothes.

(4) Fourth, the proposed model concentrates on the Eco-fashion materials which support the cradle to cradle concept. The final Eco-fashion model supports recycling programmes at the end of clothing lifespan, so they will be disposed of safely because of two reasons; one is that the materials were chosen is based on the cradle to cradle concept and they are made of technical or biological nutrients; and the next one is that the most of clothes designed based on the multifunctionality and disassembly purposes, therefore, after their life, they can be disassembled easily.

Henceforth, it will be a beneficial deal for the government and industry to focus and investment for employing this model on a large scale. Therefore, it is highly recommended to investigate other types of Eco-fashion materials especially high-tech textiles to promote the role of technology in the Eco-fashion design model. Finally, based on the aims of this study, this analysis showed the current gap in fashion education and awareness system regarding Eco-fashion clothes that can be extended to fashion design education. The study's framework may serve as a guideline for future research by the larger sample size in the Eastern and Western world.

## REFERENCES


Aaijaz, N., & Ibrahim, M. D. (2010). Green clothing and eco-fashion: a growing sustainable market for SME's. *International Conference on Technology Innovation and Industrial Management,* (pp. 102-123).

Aakko, M., & Koskennurmi Sivonen, R. (2013). Designing sustainable fashion: Possibilities and challenges. *Research Journal of Textile and Apparel, 17*(1), 13-23.

Akermark, A. M. (2005). The crucial role of the designer in EcoDesign. In *PhD Dissertation, Royal Institute of Technology – KTH, Stockholm.*

Akin, O. (1984). An exploration of the design process. *Development in Design*, *1*, 189-207.

Allport, G. W. (1935). *Attitudes in CA Murchinson, Handbook of social psychology,* New York: Clark University Press.

Allwood, J. M., Laursen, S. E., de Rodriguez, C. M., & Bocken, N. M. (2015). Well dressed: The present and future sustainability of clothing and textiles in the United Kingdom. *Journal of the Home Economics Institute of Australia, 22*(1), 42-48.

Bailey, P. M. (1999). The creative apparel design process: A personal documentation and proposed conceptual model. In *Master's Thesis, University of Alberta, Canada*.

Banim, M., Green, E. E., and Guy, A. (2001). *Through the wardrobe: women's relationships with their clothes*, United Kingdom: Berg Press.

Bhardwaj, V., & Fairhurst, A. (2010). Fast fashion: response to changes in the fashion industry. *The International Review of Retail, Distribution and Consumer Research, 20*(1), 165-173.

Bhatia, D., Sharma, A., & Malhotra, U. (2014). Recycled fibres: an overview. *International Journal of Fiber and Textile Research, 4*(4), 77-82.

Bianchi, C., & Birtwistle, G. (2010). Sell, give away, or donate an exploratory study of fashion clothing disposal behaviour in two countries. *International Journal of Retail, Distribution and Consumer Research, 20*(3), 353-368.

Bianchi, C., & Birtwistle, G. (2012). Consumer clothing disposal behaviour: A comparative study. *International Journal of Consumer Studies, 36*(3), 335-341.

Biel, A., & Thogersen, J. (2007). Activation of social norms in social dilemmas: A review of the evidence and reflections on the implications for environmental behaviour. *Journal of Economic Psychology, 28*(1), 93-112.

Birtwistle, G., & Moore, C. M. (2007). Fashion clothing–where does it all end up. *International Journal of Retail and Distribution Management, 35*(3), 210-216.

Black, S. (2008). *Eco-chic: The fashion paradox*, United Kingdom: Black Dog.

Black, S. (2012). *The sustainable fashion handbook*, United Kingdom: Thames and Hudson.

Braudel, F. (1981). *The structures of everyday life: The limits of the possible,* United Stated; HarperCollins.

Braungart, M., McDonough, W., & Bollinger, A. (2007). Cradle-to-cradle design: creating healthy emissions: a strategy for eco-effective product and system design. *Journal of Cleaner Production, 15*(14), 1337-1348.

Broega, A., Ferreira, J., & Providencia, B. (2012). Re-design clothing another step in slow design. In *Proceedings of the CIMODE 20l2 lst International Fashion and Design Congress,* (pp. 192–195).

Brosdahl, D. J., & Carpenter, J. M. (2010). Consumer knowledge of the environmental impacts of textile and apparel production, concern for the environment, and environmentally friendly consumption behaviour. *Journal of Textile and Apparel, Technology and Management, 6*(4), 1-9.

Brown, S. (2010). *Eco-fashion,* United Kingdom: Laurence King Publishing.

Brown, S. (2013). *Refashioned: Cutting-edge clothing from upcycled materials,* United Kingdom: Laurence King Publishing.

Bryman, A., & Bell, E. (2015). *Business Research Methods*, Glasgow: Bell & Bain Ltd.

Butler, S. M., & Francis, S. (1997). The effects of environmental attitudes on apparel purchasing behaviour. *Clothing and Textiles Research Journal, 15*(2), 76-85.

Bye, E. K. (2010). *Fashion design*, United Kingdom: Berg Publishers.

Caelli, K. (2001). Engaging with phenomenology: Is it more of a challenge than it needs to be? *Journal of Qualitative Health Research, 11*(2), 273-281.

Cao, H., Chang, R., Kallal, J., Manalo, G., McCord, J., Shaw, J., & Starner, H. (2014). Adaptable apparel: a sustainable design solution for excess apparel consumption problem. *Journal of Fashion Marketing and Management, 18*(1), 52-69.

Cao, H., Frey, L. V., Farr, C. A., & Gam, H. (2006). An environmental sustainability course for design and merchandising students. *Journal of Family and Consumer Sciences, 98*(2), 75-82.

Carrico, M., & Kim, V. (2014). Expanding zero-waste design practises a discussion paper. *International Journal of Fashion Design, Technology and Education, 7*(1), 58-64.

Cassidy, T. D., & Han, S. L. C. (2017). Upcycling fashion for mass production. *Journal of Sustainability in Fashion and Textiles*, *1*(1), 148-163.

Cervellon, M.C., Carey, L., & Harms, T. (2012). Something old, something used: Determinants of women's purchase of vintage fashion vs second-hand fashion. *International Journal of Retail and Distribution Management, 40*(12), 956-974.

Chan, L., & Bishop, B. (2013). A moral basis for recycling: Extending the theory of planned behaviour. *Journal of Environmental Psychology, 36*, 96-102.

Chan, T. Y., & Wong, C. W. (2012). The consumption side of the sustainable fashion supply chain: Understanding fashion consumer eco-fashion consumption decision. *International Journal of Fashion Marketing and Management, 16*(2), 193-215.

Chang, H. J., & Watchravesringkan, K. (2018). Who are sustainably minded apparel shoppers? An investigation of the influencing factors of sustainable apparel consumption. *International Journal of Retail and Distribution Management, 46*(2), 148-162.

Cheng Ping, L. D. (2017). Effects of Brand Image, Perceived Price, Perceived Quality, and Perceived Value on The Purchase Intention Towards Sports and Tourism Products of The 2016 Taichung International Travel Fair. *Journal of International Management Studies, 12*(2), 97-107.

Cho, K. (2009). Cultural Practise as a Methodology for a Fashion Designer's Self-Expression and a New Design Possibility. *Family and Consumer Sciences Research Journal, 37*(4), 489-503.

Choi, M., & Yoh, E. (2013). Analysis of vegan fashion beauty products for the development of brand strategies. *Journal of Living Science Research, 39*(1), 103-120.

Clark, H. (2008). Slow Fashion, an Oxymoron or a Promise for the Future? *Journal of Fashion Theory, 12*(4), 427-446.

Cleveland, M., Kalamas, M., & Laroche, M. (2012). “It's not easy being green”: Exploring green creeds, green deeds, and internal environmental locus of control. *Journal of Psychology and Marketing, 29*(5), 293-305.

Cline, E. L. (2013). *Overdressed: The shockingly high cost of cheap fashion,* United State: Portfolio.

Cohen, J. (2013). *Statistical power analysis for the behavioural sciences,* United Kingdom: Routledge.

Collings, K. (2015). The capsule wardrobe: How to reduce your closet to 37 pieces. *Journal of Accessed, 25*(1)*, 145-155*.

Connell, K. Y. H. (2010). Internal and external barriers to eco-conscious apparel acquisition. *International Journal of Consumer Studies, 34*(3), 279-286.

Cowan, K., & Kinley, T. (2014). Green spirit: consumer empathies for green apparel. *International Journal of Consumer Studies, 38*(5), 493-499.

Crane, D. (2012). *Fashion and its social agendas: Class, gender, and identity in clothing*, United State: University of Chicago Press.

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*, United State: SAGE Publications Ltd.

Cross, N. (2003). *Engineering design methods: strategies for product design*, United Kingdom: John Wiley & Sons Ltd.

Cruz Cardenas, J., Arevalo Chavez, P., & Guadalupe, J. (2018). Consumer expenditures on clothing and footwear: a mixed-methods study. *International Journal of Fashion Marketing and Management, 22*(1), 99-113.

Cuc, S., & Vidovic, M. (2011). Environmental sustainability through clothing recycling. *Journal of Operations and Supply Chain Management, 4*(3), 108-115.

Cunha, J., & Broega, A. (2009). *Designing multifunctional textile fashion products.* In 2009 International Conference on AUTEX: 9th World Textile Conference, (pp. 862-868).

Curwen, L. G., Park, J., & Sarkar, A. K. (2013). Challenges and solutions of sustainable apparel product development: A case study of Eileen Fisher. *Clothing and Textiles Research Journal, 31*(1), 32-47.

Daboliņa, I., & Vilumsone, A. (2012). The Role of the Latest Clothing CAD/CAM System Applications in the Educational Process. *Journal of Material Science, Textile and Clothing Technology*, *1*(1)*,* 63–67.

Dahlbo, H., Aalto, K., Eskelinen, H., & Salmenpera, H. (2017). Increasing textile circulation consequences and requirements. *Journal of Sustainable Production and Consumption, 9*(1), 44-57.

Davaadorj, K., Tuvshinbayar, K., & Ehrmann, A. (2016). *Recycling of cashmere yarn and possible alternative fibres.* In *Proceedings of the* Proceedings of Aachen-Dresden-Denkendorf International Textile Conference, Dresden*,* (pp. 344-348).

De Macedo Guimaraes, L. B. (2012). Sociotechnical design for a sustainable world. *Journal of Theoretical Issues in Ergonomics Science, 13*(2), 240-269.

DeLong, M. R., Bang, H., & Gibson, L. (2019). Comparison of patterns of dressing for two generations within a local context. *Journal of Fashion, Style & Popular Culture, 6*(1), 99-117.

Delice, A. (2010). The sampling issues in Quantitative Research. *Journal of Theory Practice, 10*(4), 2001-2018.

Dervojeda, K., Verzijl, D., Rouwmaat, E., Probst, L., & Frideres, L. (2014). Clean Technologies, Circular Supply Chains. *Journal of Business Innovation Obervatory*, *1*(1), 94-100.

Diamantopoulos, A., Schlegelmilch, B. B., Sinkovics, R. R., & Bohlen, G. M. (2003). Can socio-demographics still play a role in profiling green consumers? A review of the evidence and an empirical investigation. *Journal of Business Research, 56*(6), 465-480.

Domina, T., & Koch, K. (1999). Consumer reuse and recycling of post-consumer textile waste. *International Journal of Fashion Marketing and Management, 3*(4), 346-359.

Durham, E., Hewitt, A., Bell, R., & Russell, S. (2016). Technical design for recycling of clothing. *Sustainable Apparel*, pp. 187-198. London: Woodhead Publications.

Durham, E., Hewitt, A., Rea, C., & Russell, S. (2014). Seam Separation Technology to Facilitate Re-use and Recycling of Textile Products. In *Proceedings of the International Conference on Sustainable Design and Manufacturing,* (pp. 124-128).

Eastman, C. M. (1970). On the analysis of intuitive design processes. *Journal of Emerging Methods in Environmental Design and Planning*, *1*(1), 21-37.

Eckman, M., Damhorst, M. L., & Kadolph, S. J. (1990). Toward a model of the in-store purchase decision process: Consumer use of criteria for evaluating women's apparel. *Clothing and Textiles Research Journal, 8*(2), 13-22.

Ekström, K. M., & Salomonson, N. (2014). Reuse and recycling of clothing and textiles: A network approach. *Journal of Macromarketing, 34*(3), 383-399.

Elkington, J. (1998). Partnerships from cannibals with forks: The triple bottom line of 21st-century business. *Journal of Environmental Quality Management, 8*(1), 37-51.

Elo, S., & Kyngas, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing, 62*(1), 107-115.

Eriksson, P., & Kovalainen, A. (2008). Qualitative methods in business research. *Introducing Qualitative Methods*, pp. 57-72. London: SAGE Publications Ltd.

Farrer, J. (2011). Remediation: Discussing fashion textiles sustainability. *Shaping sustainable fashion: Changing the way we make and use clothes*, pp. 19-33. London: Routledge.

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention and behaviour: An introduction to theory and research. *Journal of Experimental Social Psychology, 9*(1)*,* 148-153.

Fletcher, K. (2008). *Sustainable fashion and clothing*, United Kingdom: Basım Routledge.

Fletcher, K. (2013). *Sustainable fashion and textiles, design journeys*, United Kingdom: Basım Routledge.

Fletcher, K., & Grose, L. (2012). *Fashion and sustainability: a design for change*, United Kingdom: Laurence King.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50.

Forsman, L., & Madsen, D. (2017). Consumer's Attitudes towards Sustainability and Sustainable Labels in the Fashion Industry: A Qualitative Study. In *Master thesis, University of Boras, Sweden.*

Fraser, K. (2015). ReDress: Reducing Textile waste through Component Reuse. *Unmaking Waste 2015 Conference Proceedings,* (pp. 26-46).

French, M. J., Gravdahl, J., & French, M. (1985). *Conceptual design for engineers*, London: Design Council.

Friese, S. (2000). *Self-concept and identity in a consumer society*: *Aspects of symbolic product meaning*, Marburg: Tectum Verlag.

Gehin, A., Zwolinski, P., & Brissaud, D. (2008). A tool to implement a sustainable end of life strategies in the product development phase. *Journal of Cleaner Production, 16*(5), 566-576.

George, D. (2011). *SPSS for windows step by step: A simple study guide and reference,* India: Pearson Education.

George, D., & Mallery, M. (2003). *Using SPSS for Windows step by step: a simple guide and reference*, Boston, MA: Allyn & Bacon.

Ghalachyan, A. (2018). Evaluation of consumer perceptions and acceptance of sustainable fashion products made of bacterial cellulose. In *PhD Dissertation, Iowa State University, USA.*

Giorgi, A. (1999). A phenomenological perspective on some phenomenographic results on learning. *Journal of Phenomenological Psychology, 30*(2), 68-93.

Gleim, M. R., Smith, J. S., Andrews, D., & Cronin Jr, J. J. (2013). Against the green: A multi-method examination of the barriers to green consumption. *Journal of Retailing, 89*(1), 44-61.

Goan, M.J. K. (1996). *An integrated approach to environmentally conscious design and manufacturing,* United State: Virginia Tech.

Gobble, M. M. (2012). Innovation and strategy. *Journal of Research-Technology Management, 55*(3), 63-67.

Gould, H. (2017). Zara and H&M back in-store recycling to tackle throwaway culture. *The Guardian*, https://www.theguardian.com/sustainable-business/2017/may/26/zara-hm-step-up-instore-recycling-tackle-throwawayculture.

Govindan, K., Soleimani, H., & Kannan, D. (2015). Reverse logistics and closed-loop supply chain: A comprehensive review to explore the future. *European Journal of Operational Research, 240*(3), 603-626.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of Qualitative Research, 2*(163-194), 105-115.

Gupta, D. (2011). Design and engineering of functional clothing. *Journal of Indian Journal Fibre Textile, 36*(1)*,* 327-337.

Gwilt, A. (2015). Exploring a framework for fashion design for sustainability. *Handbook of Sustainable Apparel Production*, *439*(1)*,* 439-452.

Gwilt, A., & Rissanen, T. (2012). *Shaping sustainable fashion: Changing the way we make and use clothes*, United Kingdom: Routledge.

Gwozdz, W., Gupta, S., & Gentry, J. W. (2015). *"Fashion Sustainability" Investigated: Does Fashion or Style Generate More Life Satisfaction?,* In *Proceedings of the Annual Macromarketing Conference,* (pp. 128–132).

Ha Brookshire, J. E., & Norum, P. S. (2011). Willingness to pay for socially responsible products: a case of cotton apparel. *Journal of Consumer Marketing, 28*(5), 344-353.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modelling (PLS-SEM)*. United State: SAGE Publications Ltd.

Han, S., Tyler, D., & Apeagyei, P. (2015). Upcycling as a design strategy for product lifetime optimisation and societal change. In *the PLATE Conference Nottingham Trent University, (pp. 1-12).*

Hanks, K., Belliston, L., & Edwards, D. (1977). *Design yourself,* New York: MBI Publishing Company.

Hanks, K., Belliston, L., & Edwards, D. (1992). *Design yourself,* New York: MBI Publishing Company.

Harris, F., Roby, H., & Dibb, S. (2016). Sustainable clothing: challenges, barriers and interventions for encouraging more sustainable consumer behaviour. *International Journal of Consumer Studies, 40*(3), 309-318.

Hasling, K. M., & Raebild, U. (2017). Sustainability Cards: a design for longevity. In *the PLATE 2017: Product Lifetimes and the Environment, (pp. 1-10).*

Haug, A. (2017). Educating ethical designers. *International Journal of Technology and Design Education, 27*(4), 655-665.

Heger, G. (2016). The capsule closet phenomenon: A phenomenological study of lived experiences with capsule closets. In *Master's thesis, University of Boras, Sweden.*

Henninger, C. E., Alevizou, P. J., & Oates, C. J. (2016). What is sustainable fashion? *International Journal of Fashion Marketing and Management, 20*(4), 400-416.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modelling. *The Academy of Marketing Science Journal, 43*(1), 115-135.

Heron, J. (1977). Behaviour analysis in education and training: British Postgraduate Medical Federation. In *Master's thesis, University of London, United Kingdom.*

Hethorn, J., & Ulasewicz, C. (2008). *Sustainable fashion*, New York: Fairchild Books.

Heuer, M., & Becker Leifhold, C. (2018). *Eco-friendly and Fair: Fast Fashion and Consumer Behaviour*, United Kingdom: Routledge.

Hill, H., & Lynchehaun, F. (2002). Organic milk: attitudes and consumption patterns. *British Food Journal, 104*(7), 526-542.

Hill, J., & Lee, H.H. (2015). Sustainable brand extensions of fast fashion retailers. *Journal of Fashion Marketing and Management, 19*(2), 205-222.

Hines, J. D., & Swinker, M. E. (1996). Consumer's willingness to purchase apparel produced from recycled fibres. *Journal of Family and Consumer Sciences*, *1*(1)*,* 1-10.

Holdway, R., Walker, D., & Hilton, M. (2002). Eco-design and successful packaging. *Design Management Journal, 13*(4), 45-53.

Howarth, G., & Hadfield, M. (2006). A sustainable product design model. *Journal of Materials and Design, 27*(10), 1128-1133.

Hsiao, W. L., & Grauman, K. (2018). Creating a capsule wardrobe from fashion images. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition,* (pp. 391-394).

Hur, E., Beverley, K., & Cassidy, T. (2013). Development of an ideation toolkit supporting sustainable fashion design and consumption. *Research Journal of Textile and Apparel, 17*(2), 89-100.

Hur, E., & Cassidy, T. (2019). Perceptions and attitudes towards sustainable fashion design: challenges and opportunities for implementing sustainability in fashion. *International Journal of Fashion Design, Technology and Education, 12*(2), 208-217.

Hycner, R. H. (1985). Some guidelines for the phenomenological analysis of the interview data. *Journal of Human Studies, 8*(3), 279-303.

Irick, E. M. (2013). Examination of the Design Process of Repurposed Apparel and Accessories: An Application of Diffusion of Innovations Theory. In *PhD Dissertation, Oklahoma State University, USA.*

Jager, W., Janssen, M., De Vries, H., De Greef, J., & Vlek, C. (2000). Behaviour in commons dilemmas: Homo economicus and Homo psychologicus in an ecological-economic model. *Journal of Ecological Economics, 35*(3), 357-379.

Jaiswal, D., & Kant, R. (2018). Green purchasing behaviour: A conceptual framework and empirical investigation of Indian consumers. *Journal of Retailing and Consumer Services, 41*(1), 60-69.

Janigo, K. A., & Wu, J. (2015). Collaborative redesign of used clothes as a sustainable fashion solution and potential business opportunity. *Fashion Practise Journal, 7*(1), 75-97.

Jenkins, C. (2015). Extending the Life Cycle of Clothing and Revaluing Waste. *Journal of Metamorphosis*, *1*(1)*,* 1-22.

Jimenez, C. (2016). Price, Quality and Convenience as Predictors of Consumer Purchasing of Sustainable Products. In *PhD Dissertation, Texas University, USA.*

Jin Gam, H., & Banning, J. (2011). Addressing sustainable apparel design challenges with problem-based learning. *Clothing and Textiles Research Journal, 29*(3), 202-215.

Jin Gam, H., Cao, H., Farr, C., & Kang, M. (2010). Quest for the eco-apparel market: a study of mothers' willingness to purchase organic cotton clothing for their children. *International Journal of Consumer Studies, 34*(6), 648-656.

Jin Gam, H. (2011). Are fashion-conscious consumers more likely to adopt eco clothing? *International Journal of Fashion Marketing and Management, 15*(2), 178-193.

Jin Gam, H., Cao, H., Bennett, J., Helmkamp, C., & Farr, C. (2011). Application of design for disassembly in men's jacket: A study on sustainable apparel design. *International Journal of Clothing Science and Technology, 23*(3), 83-94.

Jin Gam, H., Cao, H., Farr, C., & Heine, L. (2009). C2CAD: sustainable apparel design and production model. *International Journal of Clothing Science and Technology, 21*(4), 166-179.

Joergens, C. (2006). Ethical fashion: myth or future trend. *International Journal of Fashion Marketing and Management, 10*(3), 360-371.

Joung, H. M., & Park Poaps, H. (2013). Factors motivating and influencing clothing disposal behaviours. *International Journal of Consumer Studies, 37*(1), 105-111.

Joy, A., Sherry Jr, J. F., Venkatesh, A., Wang, J., & Chan, R. (2012). Fast fashion, sustainability, and the ethical appeal of luxury brands. *Fashion Theory Journal, 16*(3), 273-295.

Kalkaja, R. (2016). Sustainable design strategies: Examination of aesthetics and function in zero waste and upcycling. In *Master's thesis, University of Lapland, Finland.*

Kennedy, J. M., & Vargus, B. (2001). Challenges in survey research and their implications for philanthropic studies research. *Journal of Nonprofit and Voluntary Sector Quarterly, 30*(3), 483-494.

Kim, H. S., & Damhorst, M. L. (1998). Environmental concern and apparel consumption. *Clothing and Textiles Research Journal, 16*(3), 126-133.

Kjaerheim, K. M. (2013). The exploration of a sustainable design method targeting the conceptual and creative design stage. In *Master's thesis, University of Iceland, Iceland.*

Kobayashi, S. (1987). *A book of colours: matching colours, combining colours, colour designing, colour decorating*, Japan: Kodansha international.

Koberg, D., & Bagnall, J. (1972). *The universal traveller: a companion for those on problem-solving journeys and a soft-systems guide book to the process of design,* Los Altos, CA: William Kaufmann.

Koberg, D., & Bagnall, J. (1981). *The universal traveller: a soft-systems approach to creativity, problem-solving and the process of reaching goals*. Los Altos, CA: William Kaufmann.

Köksal, D., Strahle, J., Müller, M., & Freise, M. (2017). Social sustainable supply chain management in the textile and apparel industry: A literature review. *Sustainability Journal, 9*(1), 100-123.

Koo, H. (2012). Design Functions in Transformable Garments for Sustainability. In *Master's thesis, University of Minnesota, USA.*

Koo, H. S., Dunne, L., & Bye, E. (2014). Design functions in transformable garments for sustainability. *International Journal of Fashion Design, Technology and Education, 7*(1), 10-20.

Kozlowski, A., Bardecki, M., & Searcy, C. (2012). Environmental impacts in the fashion industry: A life-cycle and stakeholder framework. *Journal of Corporate Citizenship, 1*(45), 17-27.

Kozlowski, A., Bardecki, M., & Searcy, C. (2019). Tools for Sustainable Fashion Design: An Analysis of Their Fitness for Purpose. *Sustainability Journal, 11*(13), 3581-3590.

Kozlowski, A., Searcy, C., & Bardecki, M. (2018). The reDesign canvas: Fashion design as a tool for sustainability. *Journal of Cleaner Production, 183*(1), 194-207.

Kroll, P., & Director, R. U. P. (2004). Transitioning from waterfall to iterative development. In *Master's Thesis, Regis University, USA.*

Kumar, B. (2012). Theory of planned behaviour approach to understanding the purchasing behaviour for environmentally sustainable products. *Journal of Indian Institute of Management, 1*(1)*,* 1-43.

Kumar, B., Manrai, A. K., & Manrai, L. A. (2017). Purchasing behaviour for environmentally sustainable products: A conceptual framework and empirical study. *Journal of Retailing and Consumer Services, 34*(1), 1-9.

LaBat, K. L., & Sokolowski, S. L. (1999). A three-stage design process applied to an industry and university textile product design project. *Clothing and Textiles Research Journal, 17*(1), 11-20.

Laitala, K. (2014). Consumer's clothing disposal behaviour: a synthesis of research results. *International Journal of Consumer Studies, 38*(5), 444-457.

Lamb, J. M., & Kallal, M. J. (1992). A conceptual framework for apparel design. *Clothing and Textiles Research Journal, 10*(2), 42-47.

Lang, C., Armstrong, C. M., & Brannon, L. A. (2013). Drivers of clothing disposal in the US: An exploration of the role of personal attributes and behaviours in frequent disposal. *International Journal of Consumer Studies, 37*(6), 706-714.

Lange, J. P. (2002). Sustainable development: efficiency and recycling in chemicals manufacturing. *Journal of Green Chemistry, 4*(6), 546-550.

Lawson, B. (1980). *How the designer thinks*, New York: Architectural Press.

Lawson, B. (2006). *How designers think: the design process demystified*, 3rd ed., Canada: Architectural Press, Burlington.

Lee, Y., Hwang, C., & Baytar, F. (2019). Exploring apparel design and fit for older women: a technology intervention. *International Journal of Fashion Design, Technology and Education, 12*(1), 86-95.

Leonas, K. K. (2017). The Use of Recycled Fibers in Fashion and Home Products. *Journal of Textiles and Clothing Sustainability*, *1*(1), 55-77.

Li, J., Tam, V. W., Zuo, J., & Zhu, J. (2015). Designer's attitude and behaviour towards construction waste minimisation by design: A study in Shenzhen, China. *Journal of Resources, Conservation and Recycling, 105*(1), 29-35.

Lindahl, M. (2006). Engineering designers' experience of design for environment methods and tools–Requirement definitions from an interview study. *Journal of cleaner production, 14*(5), 487-496.

Locker, S. (2008). A technology-enabled sustainable fashion system. *Journal of Sustainable Fashion*, *1*(1)*,* 95-126.

Ma, Y. J., Gam, H. J., & Banning, J. (2017). Perceived ease of use and usefulness of sustainability labels on apparel products: application of the technology acceptance model. *Journal of Fashion and Textiles, 4*(1), 3-13.

Maichum, K., Parichatnon, S., & Peng, K. C. (2016). Application of the extended theory of planned behaviour model to investigate the purchase intention of green products among Thai consumers. *Sustainability Journal, 8*(10), 1077-1087.

Maldini, I., & Stappers, P. J. (2019). The wardrobe as a system: exploring clothing consumption through design fiction. *Design Research Journal, 17*(1), 3-25.

Maloney, J., Lee, M.Y., Jackson, V., & Miller Spillman, K. A. (2014). Consumer willingness to purchase organic products: Application of the theory of planned behaviour. *Journal of Global Fashion Marketing, 5*(4), 308-321.

Manik, M. R. I. (2017). Economic Impact of Recycling and Reusing of Used Clothing in Global Market. *American Scientific Research Journal for Engineering, Technology, and Sciences, 35*(1), 309-318.

Manzini, E., & Vezzoli, C. (2002). O desenvolvimento de produtos sustentaveis. *Os requisitos ambientais dos produtos industriais*, Italy: Edusp.

Marshall, C., & Rossman, G. B. (1995). Data collection methods. *Journal of Designing Qualitative Research, 2*(8), 1-18.

Martindale, A., & Lee, Y.A. (2019). Students' perceptions of adopting minimal transformable wardrobes. *International Journal of Fashion Design, Technology and Education, 12*(1), 76-85.

MayPlumlee, T., & Little, T. J. (1998). No-interval coherently phased product development model for the apparel. *International Journal of Clothing Science and Technology, 10*(5), 342-364.

McCann, J. (2015). Consumer Behaviour and Its Importance in the Sustainability of the Clothing Field. *Handbook of Sustainable Apparel Production*, *231*(1), 231-270.

McDonough, W., & Braungart, M. (2002). Design for the triple top line: new tools for sustainable commerce. *Corporate Environmental Strategy Journal, 9*(3), 251-258.

McDonough, W., & Braungart, M. (2013). *The upcycle Beyond sustainability-designing for abundance*, New York: Macmillan.

McKelvey, K., & Munslow, J. (2011). *Fashion design: process, innovation and practice*, New Jersey: John Wiley & Sons.

McQuillan, H. (2011). Zero-waste design practises Strategies and risk-taking for garment design. *Shaping Sustainable Fashion Journal, 1*(1)*,* 83-97.

Mertens, D. M. (2003). Mixed methods and the politics of human research: The transformative emancipatory perspective. *Handbook of Mixed Methods in Social and Behavioural Research, 1*(1)*,* 135-164.

Mete, F. (2006). The creative role of sources of inspiration in clothing design. *International Journal of Clothing Science and Technology, 18*(4), 278-293.

Meyer, A. (2001). What's in it for the customers? Successfully marketing green clothes. *Business Strategy and the Environment, 10*(5), 317-330.

Moon, K. K.L., Lai, C. S.Y., Lam, E. Y.-N., & Chang, J. M. (2015). The popularization of sustainable fashion: barriers and solutions. *Journal of the Textile Institute, 106*(9), 939-952.

Morgan, L. R., & Birtwistle, G. (2009). An investigation of young fashion consumer's disposal habits. *International Journal of Consumer Studies, 33*(2), 190-198.

Moser, A. K. (2015). Thinking green, buying green? Drivers of pro-environmental purchasing behaviour. *Journal of Consumer Marketing, 32*(3), 167-175.

Mostafa, M. M. (2007). A hierarchical analysis of the green consciousness of the Egyptian consumer. *Psychology and Marketing Journal, 24*(5), 445-473.

Mowen, J. C., & Michael, S. (2000). *Consumer Behaviour (A Framework)*, New Jersey: Prentice-Hall.

Murtagh, N., Roberts, A., & Hind, R. (2016). The relationship between the motivations of architectural designers and environmentally sustainable construction design. *Construction Management and Economics Journal, 34*(1), 61-75.

Muthu, S. S. (2015). *Handbook of life cycle assessment (LCA) of textiles and clothing*, United Kingdom: Woodhead Publishing.

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball Sampling: A Purposeful Method of Sampling in Qualitative Research. *Journal of Strides in Development of Medical Education, 14*(3), 1-6.

Naz, F. (2019). Exploration of Sustainable Practises in Children's Wear Fabric Development. In *Master's Thesis, California State University, USA.*

Nederlof, M., & Frijns, J. (2010). Zero impact water use in the built environment: Towards zero-impact buildings and built environments. *Journal of Techne Press*, *1*(1)*,* 199-208.

Negishi, A., Armstrong, C. L., Kreplak, L., Rheinstadter, M. C., Lim, L.T., Gillis, T. E., & Fudge, D. S. (2012). The production of fibres and films from solubilized hagfish slime thread proteins. *Journal of Biomacromolecules, 13*(11), 3475-3482.

Nerurkar, O. (2016). Designing sustainable fashion: the role of psychosocial factors of fashion consumption and the challenges of design. *Indian Journal of Science and Technology, 9*(15), 1-10.

Niinimaki, K. (2006). Ecodesign and textiles. *Research Journal of Textile and Apparel, 10*(3), 67-75.

Niinimaki, K. (2009). Developing sustainable products by deepening consumer's product attachment through customizing. In *Proceedings of the World Conference on Mass Customization and Personalization MCPC2009,* (pp. 134-138).

Niinimaki, K. (2010). Eco-clothing, consumer identity and ideology. *Journal of Sustainable Development, 18*(3), 150-162.

Niinimaki, K. (2012). Proactive fashion design for sustainable consumption. *Nordic Textile Journal, 1*(1), 60-69.

Niinimaki, K. (2013). *Sustainable fashion: new approaches*, Finland: Aalto University.

Niinimaki, K., & Hassi, L. (2011). Emerging design strategies in sustainable production and consumption of textiles and clothing. *Journal of Cleaner Production, 19*(16), 1876-1883.

Ohtomo, S., & Hirose, Y. (2007). The dual process of reactive and intentional decision-making involved in eco-friendly behaviour. *Journal of Environmental Psychology, 27*(2), 117-125.

Orlando, J. (1979). *Objectifying apparel design.* In the Combined Proceedings, Association of College Professors of Textiles and Clothing, Eastern, Central and Western Regional Meetings, (pp. 1-10).

Pahl, G., & Beitz, W. (1984). *Engineering Design,* New York: Springer.

Pahl, G., & Beitz, W. (1996). *Engineering Design,* London: Springer-Verlag.

Pal, R. (2016). Sustainable value generation through post-retail initiatives: an exploratory study of slow and fast fashion businesses. *Green Fashion Journal, 1*(3)*,* 127-158.

Palmer, A., & Clark, H. (2005). *Old clothes, new looks: Second-hand fashion*, United Kingdom: Berg Publishers.

Papanek, V., & Fuller, R. B. (1972). *Design for the real world*, United Kingdom: the Thames and Hudson London.

Parsons, J. L., & Campbell, J. (2004). Digital apparel design process: Placing a new technology into a framework for the creative design process. *Clothing and Textiles Research Journal, 22*(2), 88-98.

Patton, M. Q. (2005). Qualitative research. *Encyclopedia of Statistics in Behavioural Science Journal*, *1*(1), 1-22.

Patton, M. Q. (2015). Qualitative research and methods: Integrating theory and practice. *Thousand Oaks,* Canada: SAGE Publications Ltd.

Paul, J., Modi, A., & Patel, J. (2016). Predicting green product consumption using the theory of planned behaviour and reasoned action. *Journal of Retailing and Consumer Services, 29*(1), 123-134.

Payne, A. (2011). The life-cycle of the fashion garment and the role of Australian mass market designers. *The International Journal of Environmental, Cultural, Economic and Social Sustainability, 7*(3), 237-246.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.Y., & Podsakoff, N. P. (2003). Common method biases in behavioural research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879-889.

Pol, V. G. (2010). Upcycling: converting waste plastics into paramagnetic, conducting, solid, pure carbon microspheres. *Environmental Science and Technology Journal, 44*(12), 4753-4759.

Pookulangara, S., & Shephard, A. (2013). Slow fashion movement: Understanding consumer perceptions: An exploratory study. *Journal of Retailing and Consumer Services, 20*(2), 200-206.

Poyner, J., & Simon, M. (1995). Integration of DFE tools with product development. In *Proceedings of the International Conference on Clean Electronics and Technology*, (pp. 54-59).

Radeloff, D. J. (1991). Psychological types, colour attributes, and colour preferences of clothing, textiles, and design students. *Clothing and Textiles Research Journal, 9*(3), 59-67.

Rahman, O., & Gong, M. (2016). Sustainable practises and transformable fashion design–Chinese professional and consumer perspectives. *International Journal of Fashion Design, Technology and Education, 9*(3), 233-247.

Rahman, S. U., Saleem, S., Akhtar, S., Ali, T., & Khan, M. A. (2014). Consumer's adoption of apparel fashion: The role of innovativeness, involvement, and social values. *International Journal of Marketing Studies, 6*(3), 49-58.

Ramirez, S. A. (2014). Slow Fashion: Developing a Conceptual Apparel Design Process. In *Master's thesis, Louisiana State University, USA.*

Ramsey, C. E., & Rickson, R. E. (1976). Environmental knowledge and attitudes. *Journal of Environmental Education, 8*(1), 10-18.

Regan, C. L., Kincade, D. H., & Sheldon, G. (1998). Applicability of the engineering design process theory in the apparel design process. *Clothing and Textiles Research Journal, 16*(1), 36-46.

Reiley, K., & DeLong, M. (2011). A consumer vision for sustainable fashion practise. *Journal of Fashion Practise, 3*(1), 63-83.

Reim, W., Parida, V., & Ortqvist, D. (2015). Product–Service Systems (PSS) business models and tactics–a systematic literature review. *Journal of Cleaner Production, 97*(1), 61-75.

Rhee, J., & Johnson, K. K. (2019). 'The wardrobe diet': teaching sustainable consumption through experience with undergraduates in the USA. *International Journal of Fashion Design, Technology and Education, 1*(1)*,* 1-10.

Ringle, C., Wende, S., & Will, A. (2005). *SmartPLS (2.0 beta)*, Hamburg, Germany: SmartPLS.

Rissanen, T. (2008). Creating fashion without the creation of fabric waste. In J. Hawley Hethorn & C. Ulasewicz (Eds.), *Sustainable fashion: Why now? A conversation about Issues, practises, and possibilities* (pp. 184–206). New York, NY: Fairchild Books.

Rissanen, T. (2013). Zero-waste fashion design: a study at the intersection of cloth, fashion design and pattern cutting. In *PhD dissertation, University of Technology Sydney, Australia.*

Rissanen, T., & McQuillan, H. (2016). *Zero waste fashion design*, United Kingdom: Bloomsbury Publishing.

Rodriguez, S. I., Roman, M. S., Sturhahn, S. C., & Terry, E. H. (2002). Sustainability assessment and reporting for the University of Michigan's Ann Arbor Campus. *Centre for Sustainable Systems, Report No. CSS02-04. University of Michigan, Ann Arbor, Michigan*.

Rumsey, R. (2009). Design for Disassembly an Implementation of C2CAD Framework. In *Master's thesis, Oklahoma State University, USA.*

Russell, S., Swan, P., Trebowicz, M., & Ireland, A. (2016). Review of wool recycling and reuse. *Journal of Natural Fibres: Advances in Science and Technology Towards Industrial Applications, 1*(1)*,* 415-428.

Saeidi, E., & Wimberley, V. S. (2018). Precious cut: exploring creative pattern cutting and draping for zero-waste design. *International Journal of Fashion Design, Technology and Education, 11*(2), 243-253.

Sandin, G., & Peters, G. M. (2018). Environmental impact of textile reuse and recycling: A review. *Journal of Cleaner Production, 1*(1), 1-24.

Saricam, C., & Okur, N. (2019). Analysing the Consumer Behaviour Regarding Sustainable Fashion Using Theory of Planned Behaviour. *Journal of Consumer Behaviour and Sustainable Fashion Consumption, 37*(1), 1-12.

Saunders, M., Lewis, P., Thornhill, A., & Wilson, J. (2009). *Business Research Methods: Financial Times,* London: Prentice-Hall.

Scaturro, S. (2008). Eco-tech fashion: sustainably rationalizing technology. *Fashion Theory Journal, 12*(4), 469-488.

Searcy, C., Karapetrovic, S., & McCartney, D. (2005). Designing sustainable development indicators: analysis for a case utility. *Measuring Business Excellence Journal, 9*(2), 33-41.

Shen, B. (2014). Sustainable fashion supply chain: Lessons from H&M. *Sustainability Journal, 6*(9), 6236-6249.

Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Research, 15*(3), 325-343.

Sinclair, R. (2014). *Textiles and fashion: materials, design and technology*, London: Elsevier.

Sisco, C., & Morris, J. (2012). The nice consumer toward a framework for sustainable fashion consumption in the EU. *Danish Fashion Institute Journal, 1*(1)*,* 27-37.

Solomon, M. R., & Rabolt, N. J. (2004). *Consumer behaviour: In fashion,* London: Prentice-Hall.

Stone, E., & Farnan, S. A. (2018). *The dynamics of fashion*, United State: Bloomsbury Publishing.

Thogersen, J., Jorgensen, A. K., & Sandager, S. (2012). Consumer decision making regarding a "green" everyday product. *Journal of Psychology and Marketing, 29*(4), 187-197.

Tu, J.C., & Hu, C.L. (2018). A Study on the Factors Affecting Consumer's Willingness to Accept Clothing Rentals. *Sustainability Journal, 10*(11), 4139-4152.

Unruh, G. (2010). *Earth, Inc.: Using nature's rules to build sustainable profits*, United State: Harvard Business Press.

Vadicherla, T., & Saravanan, D. (2014). Textiles and apparel development using recycled and reclaimed fibres. *Journal of Roadmap to Sustainable Textiles and Clothing, 1*(1), 139-160.

Valaei, N., & Nikhashemi, S. (2017). Generation Y consumer's buying behaviour in the fashion apparel industry: a moderation analysis. *International Journal of Fashion Marketing and Management, 21*(4), 523-543.

Van Nes, N., & Cramer, J. (2005). Influencing product lifetime through product design. *Journal of Business Strategy and the Environment, 14*(5), 286-299.

Vanderploeg, A., Lee, S.E., & Mamp, M. (2017). The application of 3D printing technology in the fashion industry. *International Journal of Fashion Design, Technology and Education, 10*(2), 170-179.

Vazquez, L. (2015). How to create a capsule wardrobe and simplify your life. *Journal of Accessed, 1*(1)*,* 1-25.

Vehmas, K., Raudaskoski, A., Heikkila, P., Harlin, A., & Mensonen, A. (2018). Consumer attitudes and communication in a circular fashion. *International Journal of Fashion Marketing and Management, 22*(3), 286-300.

Verhoef, E., Bliemer, M. C., Steg, L., & Van Wee, B. (2008). *Pricing in road transport: A multi-disciplinary perspective*. United Kingdom: Edward Elgar Publishing.

Volckner, F. (2008). The dual role of price: decomposing consumer's reactions to price. *Journal of the Academy of Marketing Science, 36*(3), 359-377.

Wagner, M., Chen, Y., Curteza, A., Thomassey, S., Perwuelz, A., & Zeng, X. (2018). Fashion Product Solutions and Challenges for Environmental and Trend Conscious Consumers. *Journal of Fashion Technology and Textile Engineering, 1*(1)*,* 147-153.

Wagner, M., & Curteza, A. (2018). Design evaluation of sustainable fashion. In *International Conference the Actual Problems Succeeding Design*, (pp.157-161).

Wagner, M., Curteza, A., Thomassey, S., & Zeng, X. (2018). The Appearance of Sustainable Fashion Products. *Journal of Current Trends Fashion Technology, 2*(1), 1-10.

Wai Yee, L., Hassan, S. H., & Ramayah, T. (2016). Sustainability and philanthropic awareness in clothing disposal behaviour among young Malaysian consumers. *Journal of Sage Open, 6*(1), 145-155.

Wang, H. F., & Hsu, H. W. (2010). A closed-loop logistic model with a spanning-tree based genetic algorithm. *Journal of Computers and Operations Research, 37*(2), 376-389.

Warde, W. D. (1990). *Sampling methods*, USA: Department of Statistics, Oklahoma State University.

Watkins, S. M. (1988). Using the design process to teach functional apparel design. *Clothing and Textiles Research Journal, 7*(1), 10-14.

Wiriyapinit, M. (2007). Is thai culture the right culture for knowledge management?: An exploratory case study research. *Journal of Chulalongkorn Review, 74*(1), 80-90.

Woodruffe Burton, H., Eccles, S., & Elliott, R. (2002). Towards a theory of shopping: a holistic framework. *Journal of Consumer Behaviour: An International Research Review, 1*(3), 256-266.

Woolridge, A. C., Ward, G. D., Phillips, P. S., Collins, M., & Gandy, S. (2006). Life cycle assessment for reuse/recycling of donated waste textiles compared to the use of virgin material: An UK energy-saving perspective. *Journal of Resources, Conservation and Recycling, 46*(1), 94-103.

Workman, J. E., Caldwell, L. F., & Kallal, M. J. (1999). Development of a test to measure spatial abilities associated with apparel design and product development. *Clothing and Textiles Research Journal, 17*(3), 128-133.

Xu, Y., Chen, Y., Burman, R., & Zhao, H. (2014). Second-hand clothing consumption: a cross-cultural comparison between American and Chinese young consumers. *International Journal of Consumer Studies, 38*(6), 670-677.

Yin, R. K. (2015). *Qualitative research from start to finish*, New York: Guilford Publications.

Young, C., Jirousek, C., & Ashdown, S. (2004). Undesigned: A study in sustainable design of apparel using post-consumer recycled clothing. *Clothing and Textiles Research Journal, 22*(2), 61-68.

Young Lee, J., Halter, H., Johnson, K. K., & Ju, H. (2013). Investigating fashion disposition with young consumers. *Journal of Young Consumers, 14*(1), 67-78.

Yuksekkaya, M. E., Celep, G., Dogan, G., Tercan, M., & Urhan, B. (2016). A comparative study of physical properties of yarns and fabrics produced from virgin and recycled fibres. *Journal of Engineered Fibers and Fabrics, 11*(2), 155-166.

Zaichkowsky, J. L. (1994). The personal involvement inventory: Reduction, revision, and advertising application. *Journal of Advertising, 23*(4), 59-70.

Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence. *Journal of Marketing*, *1*(1)*,* 2-22.

Zhang, L., Chen, L., Wu, Z., Zhang, S., & Song, H. (2018). Investigating young consumer's purchasing intention of green housing in China. *Sustainability Journal, 10*(4), 1044-1054.

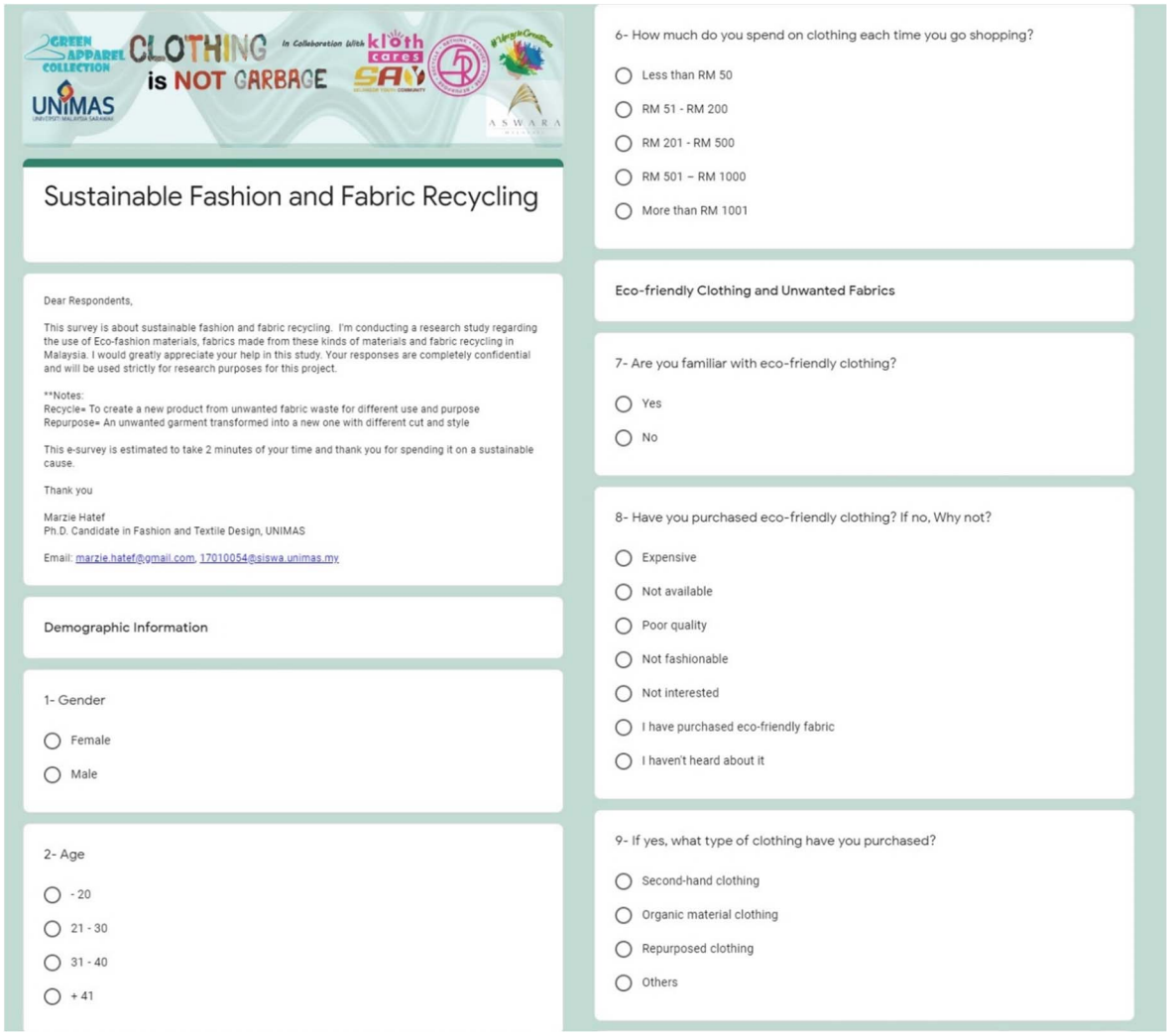
Zheng, Y., & Chi, T. (2015). Factors influencing purchase intention towards environmentally friendly apparel: an empirical study of US consumers. *International Journal of Fashion Design, Technology and Education, 8*(2), 68-77.

# APPENDICES

**Appendix 1 -** Publications

1. **HatefJalil, M.,** & Shaharuddin, S. S. (2019). Consumer Purchase Behaviour of Eco-Fashion Clothes as a Trend to Reduce Clothing Waste. *International Journal of Innovative Technology and Exploring Engineering*, *8*(12), 4224-4233. (Scopus-Indexed)
2. **HatefJalil, M.,** & Shaharuddin, S. S. (2019). Adopting C2CAD Model to Eco Capsule Wardrobe Design. *International Journal of Scientific & Technology Research*, *8*(12), 1224-1233. (Scopus-Indexed)
3. **HatefJalil, M.,** & Shaharuddin, S. S. (2020). Fashion Designers Behaviour Toward Eco-Fashion Design. *Journal of Visual Art and Design*, *12*(1), 1-22. (Web of Science-Emerging Sources Citation Index).
4. **HatefJalil, M.,** & Shaharuddin, S. S. (2020). A Strategy for Eco-Fashion Design Based on the Clothing Life Cycle. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, *11*(12), 1-13. (Web of Science-Emerging Sources Citation Index).

**Appendix 2 -** Survey Questionnaire Consumer's Behaviour



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ASWARA

Sustainable Fashion and Fabric Recycling

Dear Respondents,

This survey is about sustainable fashion and fabric recycling. I'm conducting a research study regarding the use of Eco-fashion materials, fabrics made from these kinds of materials and fabric recycling in Malaysia. I would greatly appreciate your help in this study. Your responses are completely confidential and will be used strictly for research purposes for this project.

**Notes:
Recycle= To create a new product from unwanted fabric waste for different use and purpose
Repurpose= An unwanted garment transformed into a new one with different cut and style

This e-survey is estimated to take 2 minutes of your time and thank you for spending it on a sustainable cause.

Thank you

Marzie Hatef
Ph.D. Candidate in Fashion and Textile Design, UNIMAS

Email: marzie.hatef@gmail.com, 17010054@siswa.unimas.my

Demographic Information

1- Gender

- Female
- Male

2- Age

- - 20
- 21 - 30
- 31 - 40
- + 41

6- How much do you spend on clothing each time you go shopping?

- Less than RM 50
- RM 51 - RM 200
- RM 201 - RM 500
- RM 501 – RM 1000
- More than RM 1001

Eco-friendly Clothing and Unwanted Fabrics

7- Are you familiar with eco-friendly clothing?

- Yes
- No

8- Have you purchased eco-friendly clothing? If no, Why not?

- Expensive
- Not available
- Poor quality
- Not fashionable
- Not interested
- I have purchased eco-friendly fabric
- I haven't heard about it

9- If yes, what type of clothing have you purchased?

- Second-hand clothing
- Organic material clothing
- Repurposed clothing
- Others



2- Age

- 20
- 21 - 30
- 31 - 40
- + 41

3- Employment status

- Student
- Salaried employee/contract worker
- Government servant
- Homemaker/Housewife
- Self employed
- Retired
- Currently unemployed

Personal Information

4- Monthly income

- RM 500 - RM 2, 000
- RM 2, 001 – RM5, 000
- RM 5, 001 – RM10, 000
- RM 10, 001 – RM20, 000

5- How often did you purchase new clothing?

- Once a week
- Once a month
- Once every 3-4 months
- Once every 6-7 months
- Once or twice a year

9- If yes, what type of clothing have you purchased?

- Second-hand clothing
- Organic material clothing
- Repurposed clothing
- Others

10- What is the main reason that you dispose your clothes?

- Ripped out
- Out of fashion
- Lost/gain weight
- Purchased for only one event
- To make space for new clothing since wardrobe is full capacity
- Others

11- How do you dispose of your unwanted clothes?

- Donation to the charity organizations
- Give away to the family/friends
- Reuse for a new purpose
- Put in the fabric recycling bin (example: Kloth Cares fabric bin)
- Selling for online auction
- Throw away into any garbage bins available
- Others

12-If you are willing to purchase clothes made from the recycled materials, which one of these items matters most?

- Price
- Fashionable
- Uniqueness
- Easy to use
- Quality
- Others

Next




# Sustainable Fashion and Fabric Recycling

## Behaviour in regards to Eco-Fashion Clothes

Please CHOOSE the number which best describes your opinion. 1 means that you strongly disagree with the statement AND 5 means you strongly agree with the statement. To me " having a women's capsule wardrobe"

**Attitude**

1-I believe that Eco-fashion clothes have similar price with the other products.

1 2 3 4 5

2-I believe that Eco-fashion clothes have been made of materials with good quality.

1 2 3 4 5

3-I believe that Eco-fashion clothes can help to protect the environment.

1 2 3 4 5

4-I believe that Eco-fashion clothes are easy to use, nice and chic.

1 2 3 4 5

**Perceived behavioural Control**

5-I have the resources, time, and willingness to purchase Eco-fashion clothes.

1 2 3 4 5

6-Purchasing Eco-fashion clothes is a decision that is only up to me.

1 2 3 4 5

7-I am confident that I can purchase Eco-fashion clothes for other clothes when I want.

1 2 3 4 5

8-To me, purchasing Eco-fashion clothes is easy.

1 2 3 4 5

**Subjective Norms**

9-My family expect me to engage in Eco-fashion clothes when buying clothes.

1 2 3 4 5

10-People who influence my behaviour might think that I should use Eco-fashion clothes.

1 2 3 4 5

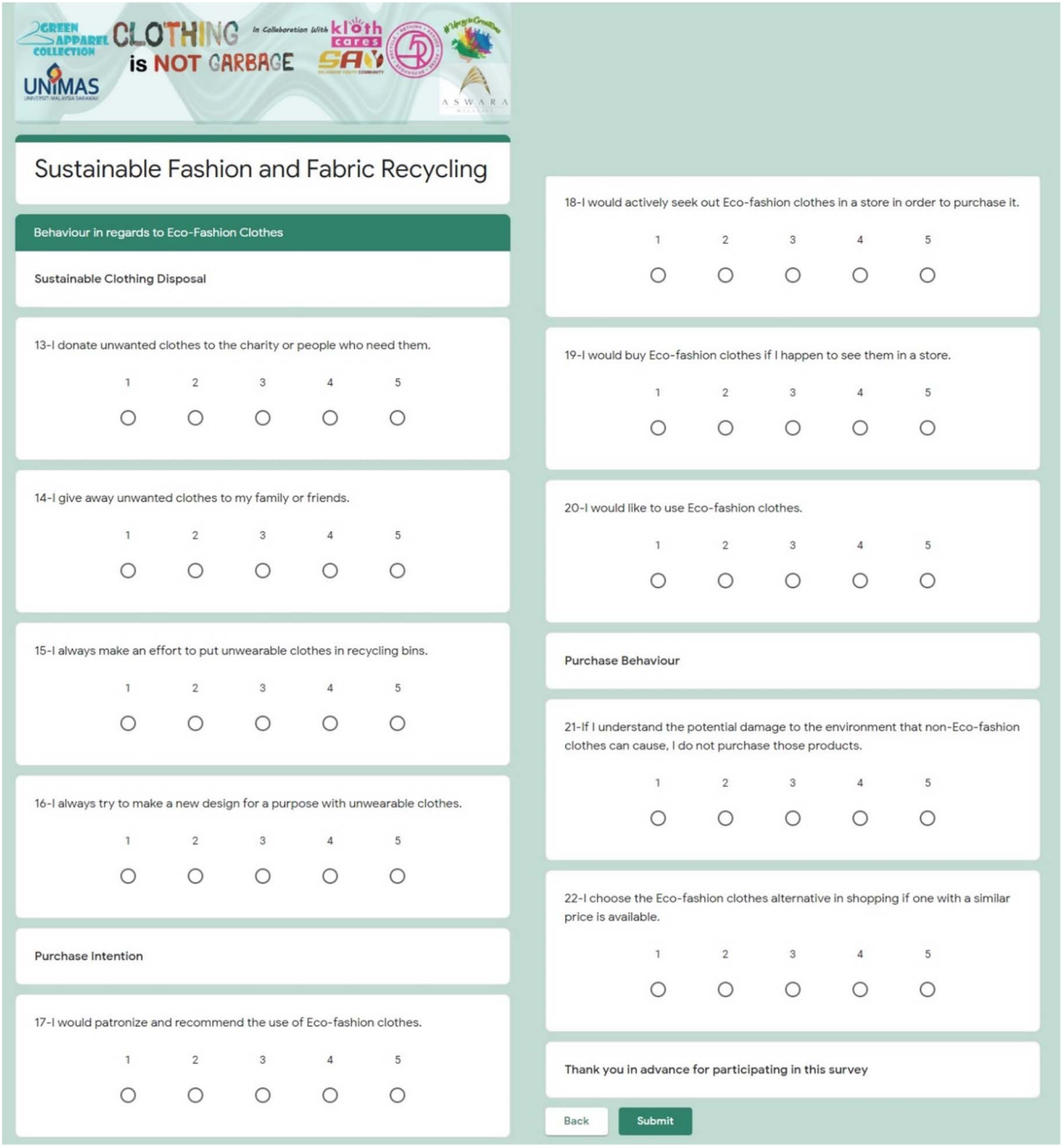
11-My society expects me to engage in Eco-fashion clothes when buying clothes.

1 2 3 4 5

12-Most of the people who are important to me think that purchasing Eco-fashion clothes in my shopping is a good thing.

1 2 3 4 5

Back Next


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Sustainable Fashion and Fabric Recycling
Behaviour in regards to Eco-Fashion Clothes
Sustainable Clothing Disposal
13-I donate unwanted clothes to the charity or people who need them.
14-I give away unwanted clothes to my family or friends.
15-I always make an effort to put unwearable clothes in recycling bins.
16-I always try to make a new design for a purpose with unwearable clothes.
Purchase Intention
17-I would patronize and recommend the use of Eco-fashion clothes.
18-I would actively seek out Eco-fashion clothes in a store in order to purchase it.
19-I would buy Eco-fashion clothes if I happen to see them in a store.
20-I would like to use Eco-fashion clothes.
Purchase Behaviour
21-If I understand the potential damage to the environment that non-Eco-fashion clothes can cause, I do not purchase those products.
22-I choose the Eco-fashion clothes alternative in shopping if one with a similar price is available.
1 2 3 4 5
Thank you in advance for participating in this survey
Back
Submit

**Appendix 3 -** Invitation Letter for Consumer

## Invitation Letter

**Dear Responder,**

Hello! I am Marzie Hatef, as a Ph.D. candidate at the University of Malaysia Sarawak, studying under supervision Dr Siti Shukhaila Shaharuddin. I understand that you are interested to purchase Eco-fashion clothing made of recycled contents, as you were a participant of my last study about Eco-fashion clothing in Malaysia. I am writing my dissertation about the Eco/sustainable clothing design, and I would like to invite you to participate in a research interview.

The interview will be conducted on 10th to 17th January 2019 in Kuala Lumpur (which time is most convenient for you). The interview can last an average of 30 minutes. It will consist of 6 main questions regarding your experiences and suggestions about Eco-fashion clothing made of recycled contents.

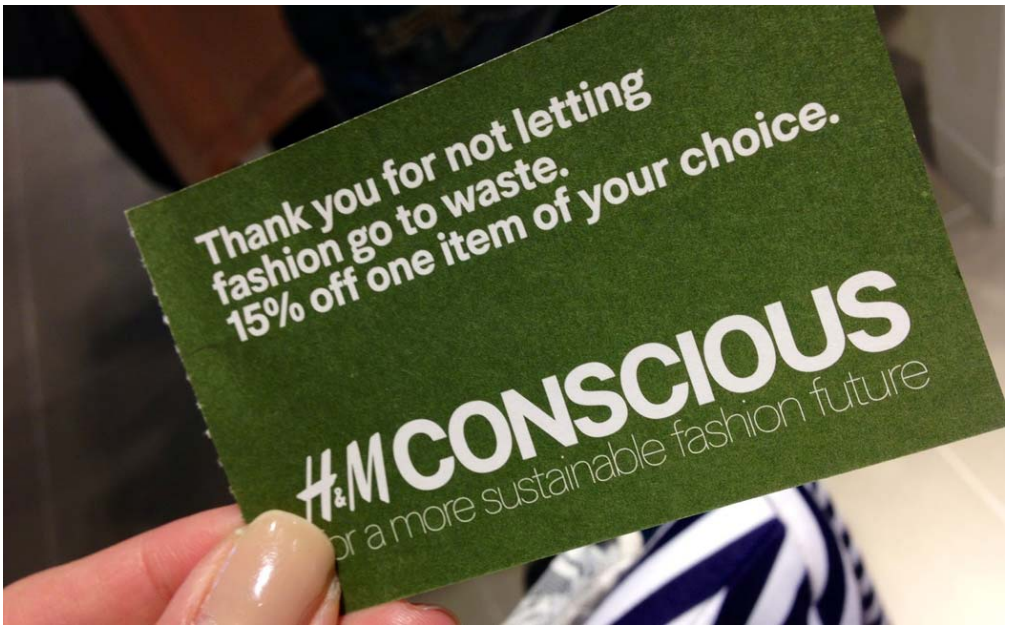
I will record voices and write memos to gather accurate information. It will not be used for any purpose other than this research. Everything is confidential and your identity will remain anonymous. Your decision to participate will not affect your current or future relationships with the University of Malaysia Sarawak. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships. Please send me email at marzie.hatef@gmail.com or 17010054@siswa.unimas.my if this interview will be possible for you. If you are interested in participating, please let me know a few times that would work with your schedule.

**Thank you very much for your time.**

Marzie Hatef

Items of Interview Questions about Eco-Fashion Clothes:

1. Can you introduce yourself, name, age, occupation, and monthly family income?
2. Where did you buy your sustainable clothes made of Eco-fashion materials, especially recycled contents which you chose in the survey “Eco-fashion Clothes”.
3. What factors do you think influenced your attitude of purchasing these Eco clothes?
4. What features would you like to see added/changed in Eco clothes made of Eco-fashion materials in next purchasing?



**Appendix 4 -** Invitation Letter for Sustainable Designers

## Invitation Letter

**Dear Responder,**

Hello! I am Marzie Hatef, as a Ph.D. candidate at the University of Malaysia Sarawak, studying under supervision Dr Siti Shukhaila Shaharuddin. I understand that you are working on sustainability design field and this issue. I am writing my dissertation about the Eco/sustainable apparel design process, and I would like to invite you to participate in a research interview. Our study is about Eco-fashion clothing design on the clothing life cycle. The purpose of our research is to development an Eco-fashion collection design process model.

The interview will be conducted via Skype or over the phone (whichever is most convenient for you). Each interview can last an average of 1 hour. The interview will consist of 20 total questions regarding your professional knowledge regarding sustainable apparel design and the factors that can be affect in sustainable design base on the clothing life cycle. I will record voices and write memos to gather accurate information. It will not be used for any purpose other than this research. Everything is confidential and your identity will remain anonymous. Your decision to participate will not affect your current or future relationships with the University of Malaysia Sarawak. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships. Please send me email at 17010054@siswa.unimas.my if this interview will be possible for you. If you are interested in participating, please let me know a few times that would work with your schedule.

**Thank you very much for your time.**

Marzie Hatef

Items of Interview Questions about Eco-Fashion Design Process:

Part One – Discovery of the fashion designer's behaviour

1. Can you introduce yourself, name, occupation, expertise, and organisation type?
2. As a designer, what factors do you think influenced your attitude to think about Eco-fashion design?
3. What are the fundamental criteria (specific design criteria) that you consider for the foundation of the Eco-fashion design?
4. What sustainable practises do you feel are related in Eco-fashion design?
5. What factors do you think encouraged you interested in Eco-fashion design and intent to minimise the waste?

Part Two – Discovery related factors on the Eco-fashion design process

1. Can you please explain about your Eco-fashion design process? (General with specific steps)
2. As a sustainable designer, during the discover the problems of Eco clothing, what criteria and factors affect your working conditions and decision?
3. As a sustainable designer, during selection the best idea of Eco clothing, what criteria and factors affect your working conditions and decision?
4. As a sustainable designer, what criteria and factors affect your working conditions to issue and set up an Eco-fashion design after settle style and idea?
5. As a sustainable designer, what factors affect your working conditions, while turning ideas from your mind, paper, or 3D software into real prototypes??

6. Before the final design outcome, what factors do you think should be considered and evaluate?
7. What do you think about development and technique of design procedure in the Eco-fashion design?

**Appendix 5 -** Survey Questionnaire for Sustainable Designer's Behaviour



## Eco-Fashion Clothing Design: Make Art without Waste

Dear Respondents,

This survey is about sustainable clothing design. I'm conducting a research study regarding the use of Eco-fashion materials in the design of apparel and fashion. I would greatly appreciate your help in this study. Your responses are completely confidential and will be used strictly for research purposes for this project.

Please note that Eco-fashion materials in this survey refer to these three categories;
1-Recycled fabrics; such as fabrics made of waste plastics bottle,
2-Reused/upcycled fabrics and materials,
3-Organic materials and natural fabrics.

Thank you in advance for your participation in this study. it is greatly appreciated!

Marzie Hatef
Ph.D. Candidate in Fashion and Textile Design, UNIMAS
Email: marzie.hatef@gmail.com, 17010054@siswa.unimas.my

Gender?

- ◯ Female
- ◯ Male

What is the highest level of education you have completed?

- ◯ Technical school graduate
- ◯ College graduate (bachelor's degree, BA, BS)
- ◯ Post graduate or professional degree (master, doctorate)

Age?

- ◯ - 20
- ◯ 21 - 25
- ◯ 25 - 35
- ◯ + 35

where is your location of the business?

- ◯ Europe
- ◯ Southeast Asia
- ◯ Middle East
- ◯ Other

Are you interested in sustainable issues in fashion and textile design?

- ◯ Yes
- ◯ No

Next



# Eco-Fashion Clothing Design: Make Art without Waste

Instructions: choose ONE number that most closely corresponds to how strongly you agree or disagree with each statement. Remember: choosing 1 means that you strongly disagree with the statement: choosing 5 means you strongly agree with the statement: choosing 3 would indicate that you are neutral and neither agree nor disagree.

**Using Eco-fashion materials in design is a primary way to**

1-conserve natural resources.

1 2 3 4 5

2-reduce clothing waste.

1 2 3 4 5

3-reduce the carbon impact.

1 2 3 4 5

4-reduce water consumption.

1 2 3 4 5

**In design with Eco-fashion material**

5-I perceive the price of Eco-fashion clothing as a positive thing.

1 2 3 4 5

6-I am interested in using these materials, they seem inexpensive.

1 2 3 4 5

7-It is important for me to know the quality of the materials I buy.

1 2 3 4 5

8-It is important for me to buy materials that have high quality.

1 2 3 4 5

**In design with Eco-fashion material**

9-I am interested in using them with nice colours and high attractiveness.

1 2 3 4 5

10-I perceive the simple style is a positive thing.

1 2 3 4 5

11-It is important to assess the quality and price base on aesthetic features.

1 2 3 4 5

12-I search for as much functional feature information before I design.

1 2 3 4 5

**In design with Eco-fashion material**

13-I would find it easy to use technology to make a design decision.

1 2 3 4 5

14-It would be easy for me to become an expert in utilizing technology.

1 2 3 4 5

15-New-fashioned technology makes me a smarter designer.

1 2 3 4 5

16-Utilizing technology reduces the time and saves money.

1 2 3 4 5

Back Next



# Eco-Fashion Clothing Design: Make Art without Waste

## Emotional Factors in Eco-Fashion Design

### Subjective Norm

17-Most of my friends are using Eco-fashion materials in their process design.

1 2 3 4 5

18-My friends and social environment emphasize to use of Eco-fashion materials.

1 2 3 4 5

19-I think most people who are important to me supporting my Eco-clothes collections.

1 2 3 4 5

20-Most designers who are important to me think that using Eco-fashion products is a good idea.

1 2 3 4 5

### Attitude

21-According to me, the idea of using Eco-fashion materials in my profession is wisely.

1 2 3 4 5

22-Using Eco-fashion material is an excellent idea.

1 2 3 4 5

23-Using Eco-fashion materials into apparel design would be very pleasant.

1 2 3 4 5

24-I feel that Eco-fashion materials are a necessary instrument in fashion design.

1 2 3 4 5

### Behavioural Intention

25-After that, I will make an effort to use Eco-fashion materials in my profession.

1 2 3 4 5

26-As regards to my profession, I intend to use Eco-fashion products.

1 2 3 4 5

27-I believe that Eco-fashion materials usage will become widespread in the future.

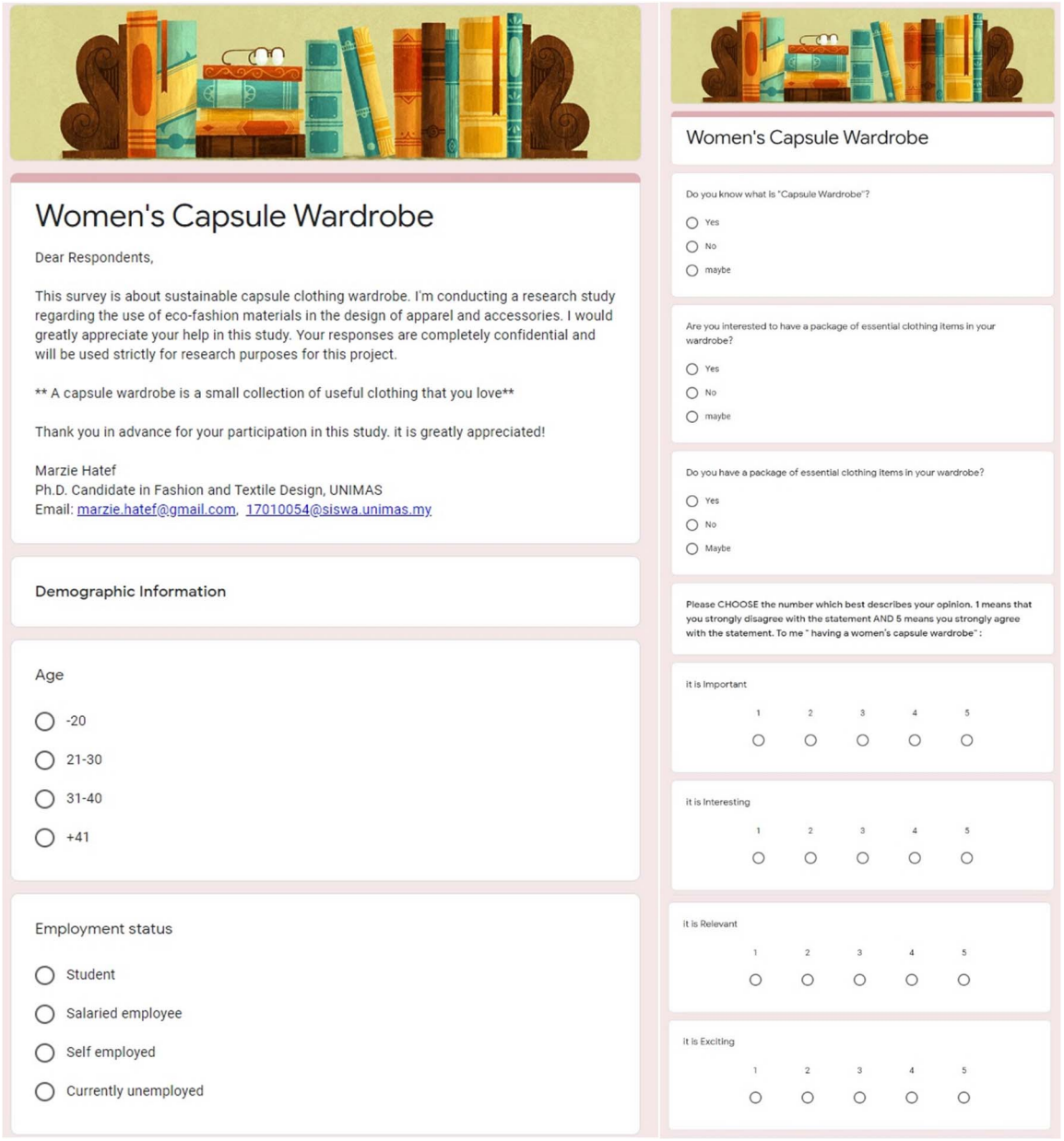
1 2 3 4 5

28-I think I will use the information of Eco-fashion products regularly in the near future.

1 2 3 4 5

Back Submit

**Appendix 6 -** Survey Questionnaire for Consumer's Willingness of Capsule Wardrobe



Women's Capsule Wardrobe

Dear Respondents,

This survey is about sustainable capsule clothing wardrobe. I'm conducting a research study regarding the use of eco-fashion materials in the design of apparel and accessories. I would greatly appreciate your help in this study. Your responses are completely confidential and will be used strictly for research purposes for this project.

** A capsule wardrobe is a small collection of useful clothing that you love**

Thank you in advance for your participation in this study. it is greatly appreciated!

Marzie Hatef
Ph.D. Candidate in Fashion and Textile Design, UNIMAS
Email: marzie.hatef@gmail.com, 17010054@siswa.unimas.my

Demographic Information

Age

- -20
- 21-30
- 31-40
- +41

Employment status

- Student
- Salaried employee
- Self employed
- Currently unemployed

Women's Capsule Wardrobe

Do you know what is "Capsule Wardrobe"?

- Yes
- No
- maybe

Are you interested to have a package of essential clothing items in your wardrobe?

- Yes
- No
- maybe

Do you have a package of essential clothing items in your wardrobe?

- Yes
- No
- Maybe

Please CHOOSE the number which best describes your opinion. 1 means that you strongly disagree with the statement AND 5 means you strongly agree with the statement. To me " having a women's capsule wardrobe" :

it is Important

1 2 3 4 5

it is Interesting

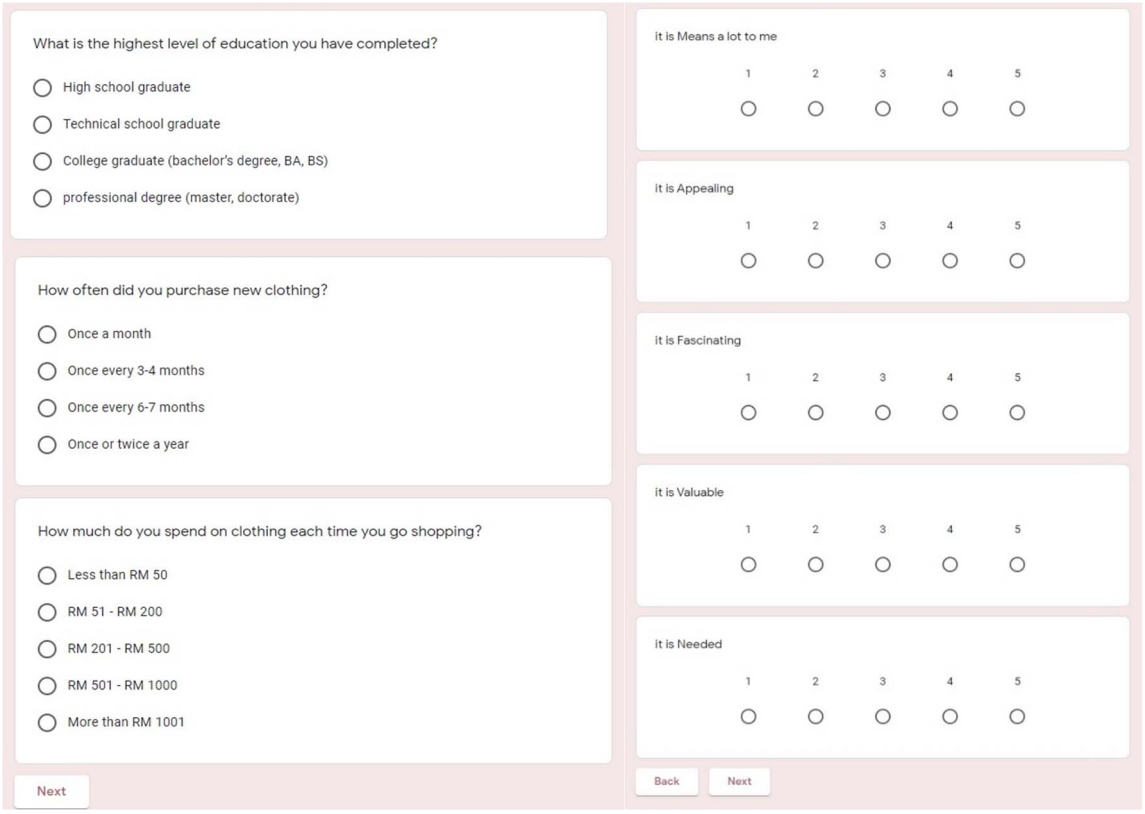
1 2 3 4 5

it is Relevant

1 2 3 4 5

it is Exciting

1 2 3 4 5


What is the highest level of education you have completed?
High school graduate
Technical school graduate
College graduate (bachelor's degree, BA, BS)
professional degree (master, doctorate)
How often did you purchase new clothing?
Once a month
Once every 3-4 months
Once every 6-7 months
Once or twice a year
How much do you spend on clothing each time you go shopping?
Less than RM 50
RM 51 - RM 200
RM 201 - RM 500
RM 501 - RM 1000
More than RM 1001
Next
it is Means a lot to me
1 2 3 4 5
it is Appealing
1 2 3 4 5
it is Fascinating
1 2 3 4 5
it is Valuable
1 2 3 4 5
it is Needed
1 2 3 4 5
Back
Next



## Women's Capsule Wardrobe

Making Capsule Wardrobe

If you are interested in making a capsule wardrobe, which of the following items would you like to have in your wardrobe? Please show your interest in choosing numbers from 1 to 5.




1
1 2 3 4 5

2
1 2 3 4 5

3
1 2 3 4 5

3
1 2 3 4 5

4
1 2 3 4 5

5
1 2 3 4 5

6
1 2 3 4 5

7
1 2 3 4 5

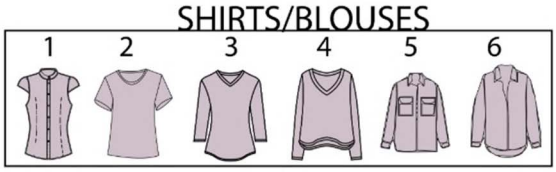
8
1 2 3 4 5

Back Next



## Women's Capsule Wardrobe

Making Capsule Wardrobe




1
1 2 3 4 5

2
1 2 3 4 5

3
1 2 3 4 5

4
1 2 3 4 5

5
1 2 3 4 5

6
1 2 3 4 5

Back Next



## Women's Capsule Wardrobe

Making Capsule Wardrobe




1

1 2 3 4 5

2

1 2 3 4 5

3

1 2 3 4 5

4

1 2 3 4 5

5

1 2 3 4 5

6

1 2 3 4 5

7

1 2 3 4 5

8

1 2 3 4 5

Back Next



## Women's Capsule Wardrobe

Making Capsule Wardrobe




1

1 2 3 4 5

2

1 2 3 4 5

3

1 2 3 4 5

4

1 2 3 4 5

5

1 2 3 4 5

6

1 2 3 4 5

7

1 2 3 4 5

8

1 2 3 4 5

9

1 2 3 4 5

10

1 2 3 4 5

Back Next



Women's Capsule Wardrobe

Making Capsule Wardrobe




1

1 2 3 4 5

2

1 2 3 4 5

3

1 2 3 4 5

4

1 2 3 4 5

5

1 2 3 4 5

6

1 2 3 4 5

7

1 2 3 4 5

8

1 2 3 4 5

9

1 2 3 4 5

10

1 2 3 4 5

Back Next



Women's Capsule Wardrobe

Making Capsule Wardrobe




1

1 2 3 4 5

2

1 2 3 4 5

3

1 2 3 4 5

4

1 2 3 4 5

5

1 2 3 4 5

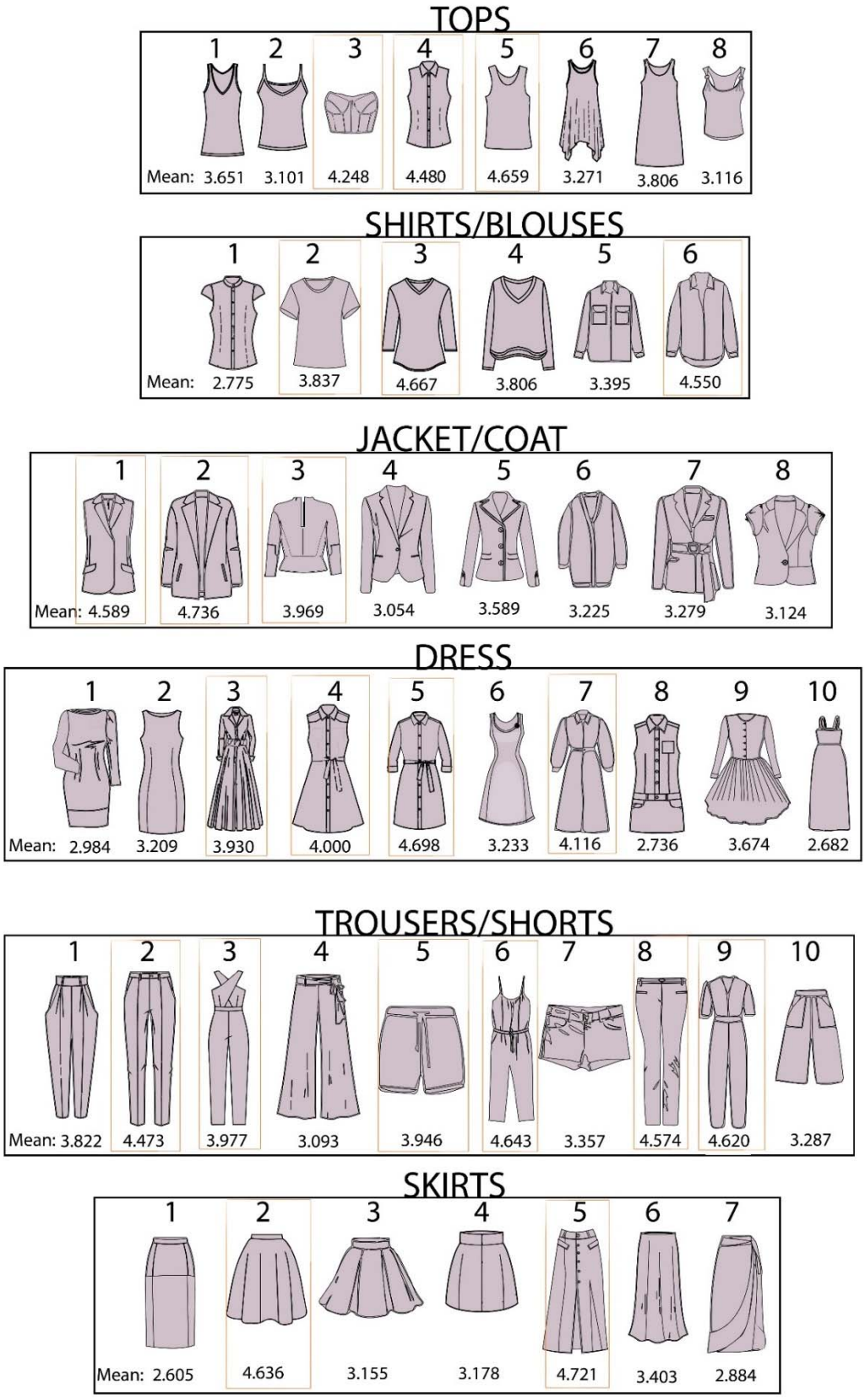
6

1 2 3 4 5

7

1 2 3 4 5

Back Submit




**Clothes Items Used in Capsule Wardrobe Survey**

**Appendix 7 -** Invitation Letter for Consumer's Evolution of the Capsule Wardrobe

## Invitation Letter

**Dear Responder,**

**Hello! I am Marzie Hatef, as a Ph.D. candidate at the University of Malaysia Sarawak, studying under supervision Dr Siti Shukhaila Shaharuddin. I understand that you are interested to possess a capsule wardrobe, as you were a participant of my last study about the casual capsule wardrobe. I am writing my dissertation about the sustainable apparel design process, and I would like to invite you to participate in a research interview. Our study is about evaluation of Eco/sustainable capsule wardrobe.**

**The interview will be conducted at Shahrtash Fashion Design Institute on 28th Jun 2019 in Tehran. The interview can last an average of 1 hour. The interview will consist of 6 main questions regarding your willingness and your evaluation of possess an Eco casual capsule design. I will record voices, take photographs, and write memos to gather accurate information. It will not be used for any purpose other than this research. Everything is confidential and your identity will remain anonymous. Your decision to participate will not affect your current or future relationships with the University of Malaysia Sarawak. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships. Please send me email at marzie.hatef@gmail.com or 17010054@siswa.unimas.my if this interview will be possible for you. If you are interested in participating, please let me know a few times that would work with your schedule.**

**Thank you very much for your time.**

**Marzie Hatef**

Items of Interview Questions about Eco Capsule Wardrobe:

1. Can you introduce yourself; name, age, occupation, education level and work experience (if you have).
2. What design features do you like/dislike in Eco-fashion clothes in the capsule wardrobe?
3. How do you feel and evaluate the quality of the materials in Eco-fashion clothes in the capsule wardrobe?
4. In order to purchase environmentally friendly clothing such as Eco-fashion clothes in a capsule wardrobe, what do you think to switch from your favourite brands or stores to purchase Eco-friendly clothes?
5. Do you have any suggestion about the added/changed that designer can know to improve the design features and quality of the materials such as clothes in the future?

**Appendix 8 -** Summary of Eco-Fashion Designers and Eco-Fashion Brands

| No | Name | Career | Brand | Summary of Design Process | Properties | Factors mentioned in social media |
|---|---|---|---|---|---|---|
| 1 | JASON ROSS | Accessories label www.artmas-quibble.com | Artemas Quibble and The Creatures of Mme Du Barry | -with a reclaimed piece: leather books cover and vintage finials | -the mix of antiquity and rough-hewn sophistication | -consumer's needs<br>-design based on the history and tradition items |
| 2 | DAVID GRAZIOLI | Menswear label www.banuq.com | Atelier Awash | -recycled carded wool, reclaimed, organic material: cotton, linen, all vegetable-dyed process is labour intensive<br>-collection wool fabric offcut, sorting base quality & colour, cleaning and removing attachments, then shredded, re-spun, re-woven. | -journeys from japan to Africa | -classical design<br>-timeless design |
| 3 | CRISTOPHER | Fashion designer www.cristopherr | Cristopher Raeburn | -re-appropriated military fabrics<br>-redesign parachutes and rolls up<br>-taped seams that overlap and intersect patterns | -collaborate with British cotton mills | -functional clothing design<br>-intelligent and meticulously art |
| 4 | CLARE BARE | lingerie & swimwear designer www.clarebare.bigcartel.com | Clare Bare | -Eco-friendly lingerie made from vintage fabrics, mesh, organic cotton, bamboo jersey.<br>-unused fabrics are bought, then dyes or print with natural colours. | -collaborate with charity shops to buy vintage linen, curtains, pillowcases<br>-the nice and comfortable items | -reduction in fabric and clothing waste in good condition<br>-customization design<br>- functionality and aesthetic attributes |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | JASON DENHAM | men's and women's luxury denim www.dehnamthejeanmaker.com | Denham | -the process starts with inspiration based on the team go to the location for finding enough fabrics & clothes for reconstruction and recut clothes then bounding with detail seams | -deep knowledge and the big source of denim jeans, apparel for military, workwear<br>-each item has the Barcode in the data library | -design based on the functionality and good appearance<br>-using technology at the data bank to check the life cycle of items |
| 6 | JEFFREY WANG | Conceptual creative designers | Jeffrey Wang | -redesign recycled customer-donated Levi jeans into wearable art<br>-create some pieces without re-cutting and sew, only use again in a new style like sculptures | -collaboration with jeans producer Levi Strauss<br>-re-design jeans based on the consumer's needs | -reduction of clothing waste without making a piece of waste during new design |
| 7 | JULIA BARBEE | Theatrical costume designer www.juliabarbee.org | Julia Barbee | -deconstructs tactile ephemera, woollen fibre, and gossamer (a kind of fabric)<br>-fabrics are taken from garage sales or donated<br>never use sketches, only plunders her treasure trove of goodies | -inspired by Stella McCartney reconstructed<br>-her material is her inspiration | -collaboration with other designers.<br>-consideration consumer's belief to make wearable clothes from the waste |
| 8 | ANIKA SANDERS | Fashion designer www.junkystyling.co.uk | Junky Styling | -inspired by observations - deconstruct and re-cut toward sustainable zero waste fashion recycled from the best quality second-hand clothing, deconstructed, re-cut and completely transformed into a new product t-shirt, trench coats and denim | -redesign men's wear to women's wear<br>-offer a service "wardrobe surgery": bring items to be transformed into a new look | -fashion education programme<br>-new idea based on the consumer 'needs - knowledge and experience in the conceptual design process<br>-timeless design |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | KARTHA | Creative designer www.kmamode.co | Km/A | -tiny scraps of cotton jersey crazy-stitched onto a single jersey (mechanical recycling) | -based on the colour, the collection gives a name: black-white | -classical & beautiful & functional & wearable clothes |
| 10 | KONDAKIS | Fashion brand www.kondakis.biz | Kondakis | -reconstructed nylon parachute<br>-all designs are lined with cotton fabrics for comfortable parameter | -environmentally and socially responsible<br>-using Eco-fashion materials | -using the education system to promote up-cycling as re-construction fabrics |
| 11 | LU FLUX | Women's wear collection www.luflux.com | Lu Flux | -with salvage and vintage material rescued from textile recycling plants combine unfashionable clothing and interior textile (curtain, sofa.) | -traditional pattern combined for modern design unique<br>smile to design if u cannot wear it | -memorable and cultural design based on the young consumer needs<br>-clothing design for disassembly without seams |
| 12 | CHRISTINE MAYER | Women's wear collection www.mayer-berlin.com | Myer Peace Collection | -inspired by global patterns and embroideries -upcycled and patchworked denim, linen and hep vintage garment<br>-working directly on the mannequin | -cut jackets feature sleeves elaborate embroideries on redesign clothes<br>-save time and money during the design process | -historically, design<br>-zero-waste design<br>-economic attributes with a fair price |
| 13 | CLOED PRISCILLA | Fashion designer milch.mur.at | Milch | -upcycled classic menswear trousers and shirts to women's collection<br>-also bags and hats from details of men's trousers.<br>-after collection second-hand organic garments, they will be ready for green-cleaning, then cut and make a new design | -fair-trade<br>an environmental and social consideration | -design based on the end of clothing lifespan<br>-economic features |

| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | NUDIE JEANS | Fashion brand www.nudiejeans.com | Nudie Jeans | -they repairs, reuse and finally recycles jeans that sold to the customer with warranty<br>-unwanted jeans + leftover denim recycle to new yarns then new fabrics.<br>-new programme for textile students to invite and create new conceptual fashion design from old Nudie jeans | -environmental responsibility<br>-repair free jeans purchased from this company<br>-guarantee after purchasing | -consideration consumer needs<br>-designer's perception and education them<br>-economic attributes<br>-market's demand |
| 15 | HAYLEY TRESIZE | Fashion brand www.raggedyrags.co.uk | Raggedy | -tiny scars and combining of knitwear, tweeds, linens, and cotton to new couture.<br>old man tweed coat transformed to funky dress's woman<br>-using scribble stitch on top of fabrics, a spider's web will be created | -raises awareness of recycling through her design run workshops at colleges | -easy to wear<br>-express individuality<br>-consideration aesthetic features in the redesign<br>-giving awareness to the consumer |
| 16 | EUGENIE SCHMIDT | Men's and women's luxury denim collection www.schmidttakahashi.de | Schmidt Takahashi | -upcycled, restyled and redesigned clothing<br>care about quality so each piece is lined with the highest quality pure silk to improve comfort & appearance<br>-each piece collected is registered in a digital database. all donated items are carefully washed and ironed. after designing based on material, colours, and style they are catalogued, and archival photographs were taken. | -all data is saved as a Quick Response Code. QR acts like a label and a history recorder that with QR code reader that is available in the smartphone. Each piece of the finished collection is numbered and registered in the database of SCHMIDTTAKAHASHI. | -Avant-guard outlook<br>-consideration good quality based on the consumer's demand<br>-comfortable & aesthetic features<br>-technology attributes<br>-economic features |

| | | | | | | |
|---|---|---|---|---|---|---|
| 17 | SYLVIA ROCHALA | Fashion designer www.sylviarochala.com | Sylvia Rochala | -rip men's old silk shirts then than-knotting them to form a dress<br>-unravelled yarn (bias-cut) from second-hand sweaters to hand-knit a lace<br>-bleach second-hand denim and t-shirt then "SHIBORI" techniques | -use tie-dyed silk technique<br>-cut-out peephole and asymmetrical layers<br>-always a message for each collection | -aesthetic attributes<br>-cultural & traditional design<br>-sustainable design techniques |
| 18 | TAMARA FOGEL | Accessories label www.tamarafogel.com | Tamara Fogel | -upcycled German flour sacks, grain sacks, French mattress ticking, canvas military tents and hand-stitched quilts from Pakistan | -inspired by heritage, quality, and authenticity | -combination of cultures and countries consideration<br>-economic attributes with low price |
| 19 | KATRINA BEA | Avant-garde designer www.thebeaproject.com | The Bea Project | -clothing collections include hand-sewn, dyed, painted, reclaimed, and reworked vintage fabric and clothes, where textiles are sourced from stripped and destroyed vintage and unwanted clothing | -inspired by nomadic gipsy cultures<br>chaos design<br>grunge-rock style | -cultural and musical design<br>-using Eco-fashion materials<br>-aesthetic attributes |
| 20 | SARA LI-CHOU HAN | Creative fashion designer www.trash-couture.com | Trashed Couture | -second-hand denim is sourced from vintage markets, charity shops and upcycled into unique couture<br>-creations directly on the mannequin | -inspired by the punk brand high quality in fabric and design<br>-run workshops ethical and sustainable development | -aesthetic attributes<br>-zero-fabric-waste design<br>-economic attributes |
| 21 | EVA ZINGONI | Fashion designer www.evazingoni.com | Eva Zingoni | -fabrics come from leftover couture production (it is valuable).<br>-making selection and connection between them.<br>-skill in combination with different fabrics. | -identify which fabrics suit which styles, which changes are needed<br>-inspired by haute-couture designers | -economic attributes<br>-functional and aesthetic features |

| | | | | | | |
|---|---|---|---|---|---|---|
| 22 | CLARCK SABBAT | Trained fashion designer www.freindswithbenefitslifestyle.co | Friends with Benefits | -hand-dyed recycled T-shirt fabric re-cut (only bamboo and jersey fabrics)<br>-creations directly on the mannequin<br>-surprising textile combination | -inspired by the fashion greats: Madame Gres & Vionnet<br>-her sense of style & natural elegance unique asymmetrical | -emotionally design<br>-wearable art<br>-consumer's need<br>-environmental knowledge<br>-zero-waste design |
| 23 | ORSOLA DE CASTRO | Fashion brand www.fromsomewhere.co.uk | From Somewhere | -reimagining and refashioning cutting-room scarps, damaged goods to produce well-designed dresses<br>-wasted materials in production scale to recycle and redesign | -collaboration with other manufacturers & producers (Speedo)<br>-using strips & brilliant colour insertions | -using Eco-fashion materials<br>-stylish design<br>-timeless design<br>-high-fashion features |
| 24 | NIN CASTLE | Fashion label www.goodone.co.uk | Good One | -designing with offcut and excess fabric from the fashion industry<br>-sources are pre-and post-consumer waste, hand-picking unwanted garments from recycling factories, sample fabric yardage, end rolls from textile mills | -the unusual and imbalanced colour combination casual style with vintage looks<br>-collaboration with other brands,<br>-offers a recycled collection to other brands (puma) | -easy to wear<br>-aesthetic and functional design<br>-desirable feminine pieces to wear<br>-high quality |
| 25 | HIBRIDA | Accessories label www.hibrida.cl | Hibrida | -the concept is a hybrid design<br>-combine past and fusing with updated material<br>label: conceptual designs with mix fabrics to create a visual language<br>-this label is the pilot project material is categorised by type, size, and colour | -hybrid care about values and workmanship in creation rather than choosing the material<br>-hybrid opens a dialogue between consumers and the environment | -connection between cultural & aesthetic features<br>-technology attributes |

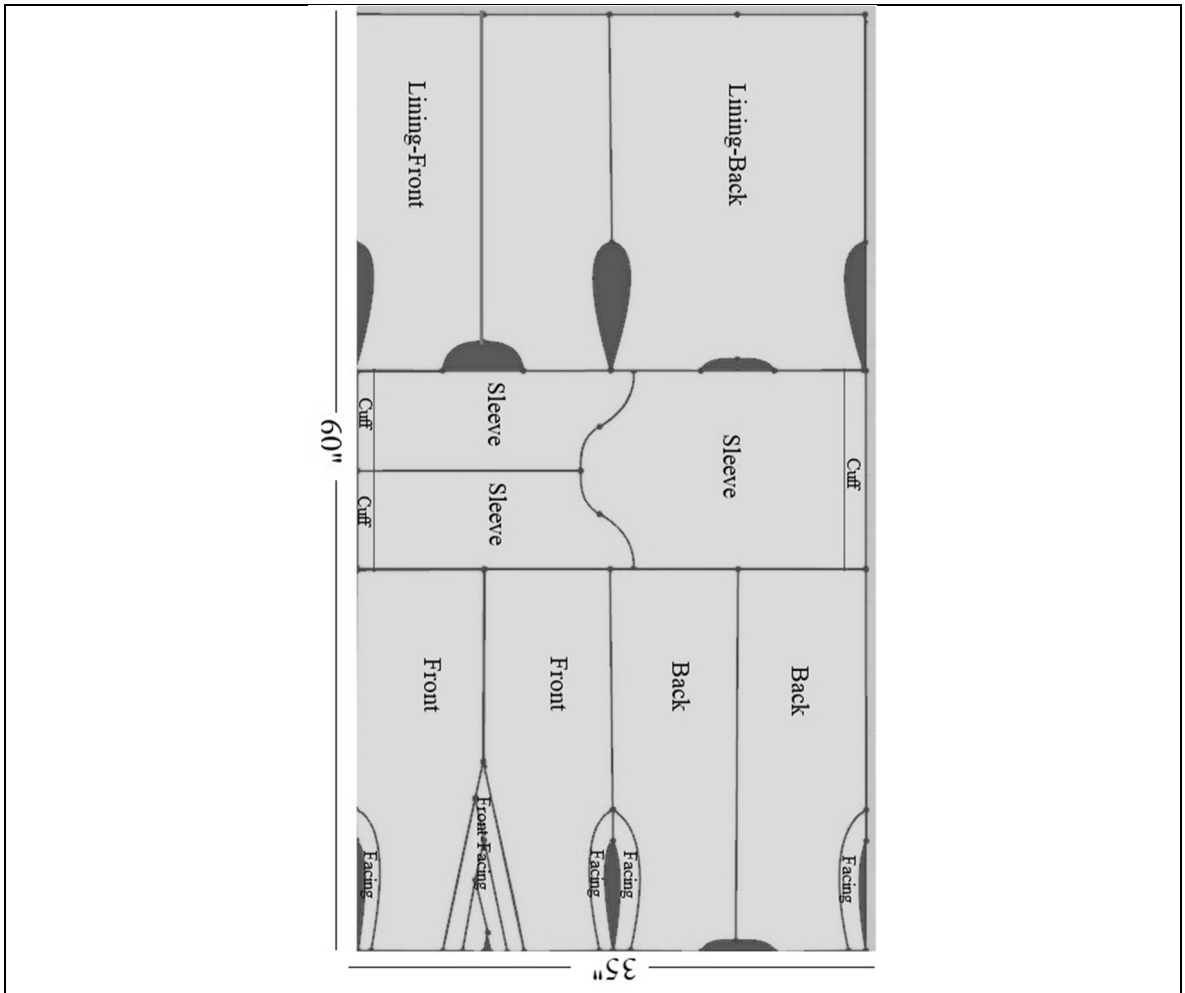
| | | | | | | |
|---|---|---|---|---|---|---|
| 26 | MICHELE LOWE- | Accessories label www.lowe-holder.com | Michele Lowe-Holder | -using laser cut combine the use of end-of-line textiles and handcrafted ribbon art upcycling textile waste | -using origami folds<br>-inspiration from Victorian flowers | -using technology features<br>-zero-waste design |
| 27 | PAULINA PLIZGA | Fashion brand www.paulinaplizga.com | Paulina Plizga | -snippets from the flea market, second-hand garments, factory offcut, end of line couture fabrics.<br>-they are sorted through fabrics and colours, then shredded into small strips and pin. So, over-stitching the strips<br>and work directly on the mannequin | -unique design<br>-individual design<br>-inspired by Japanese culture | -cultural & aesthetic features<br>-a sustainable design technique<br>-zero-waste design<br>-upcycling and recycling design |
| 28 | ELIZABETH | High-fashion brand www.pxp-sf.com | Piece X Piece | -categorise fabric based on the colour, texture and shape<br>-a combination of new material and recycled fabrics (only pre-consumer waste) | -easy to wear<br>-casual clothes<br>-high quality | -promotion sustainability in education for designers<br>-economic attributes |
| 29 | RACHEL FREIRE | Unique Womenswear label www.rachelfreire.com | Rachel Freire | -drawing inspiration from the past<br>-the concept all the design is that cow nipple with leather (because it is a part of the cow that anybody does not care about it during meat processing) | -avant-garde sense<br>-unique design | -visual creative cerebral beauty and response<br>-economic features |
| 30 | STINE CHRISTA BUSK | Unisex brand www.royalbuddha.DK | R. Ds (Recycling Dead Stock) | -using 100% organic fabrics (wool and cotton deadstock fabric) from some of the best brands recycling deadstock patchwork fabrics (made from small squares)<br>military-style trousers | -easy going to make clothing<br>-timeless design - genderless styles | -using Eco-fashion materials<br>-consumer's needs |

| | | | | | | |
|---|---|---|---|---|---|---|
| 31 | REET AUS | Fashion-costume designer<br>www.reetaus.com | Reet Aus | -the concept is trash to trend.<br>-design with pre- and post-consumer waste<br>-fabrics based on the colour and textural combination<br>-promoting sustainability through the education system | -simple, clean, and wearable design<br>-share upcycling idea and experience designing on the website for helping individuals, independent designers, and mass producers. | -social & environmental & aesthetic features<br>-giving awareness about the environmental hazards<br>-using Eco-fashion materials<br>-co-design with client |
| 32 | ANITA STEINWIDDER | Unique womenswear label<br>www.steinwidder.com | Steinwidder | -damaged pre-consumer factory-made socks.<br>-socks are interlocked together like a jigsaw puzzle discreet colour diversity they are bought, washed, ironed, sorted based on the colours (also uses from second-hand garments that cannot be resold), then directly on the mannequin designs will be created. | -give value to items that reject because cannot be resold | -zero-waste design<br>-aesthetic features<br>-using Eco-fashion materials |
| 33 | ANN WIBERG & NANNA LOWE | Couture fashion brand<br>www.trash-couture.com | Trash-Couture | -inspiration for art<br>-using recycled couture fabrics and vintage lace using left-over fabric from European couture house.<br>-they are chiffon and silk, tulle, lace, feathers, fine embroidery, and opulent beading. | -a pioneer in sustainable high-end fashion respect to the tradition and craft evening wear and bridal gowns design can be customized | -economic features<br>-aesthetic attributes<br>-consumer's need<br>-design based on the latest clothes in the market (market needs) |

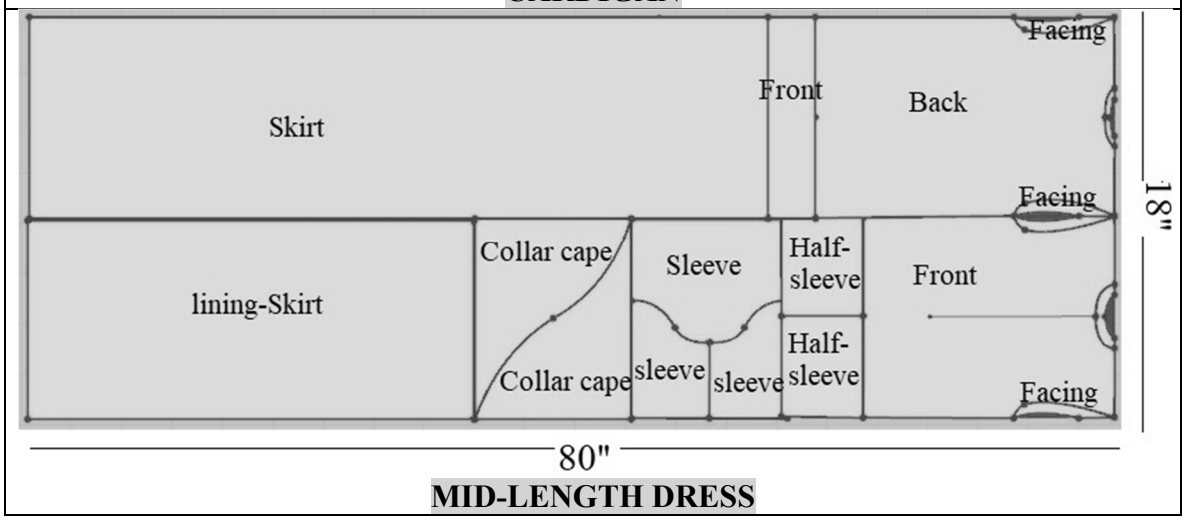
**Appendix 9 -** Summer Casual Eco Capsule Wardrobe for Four-Week



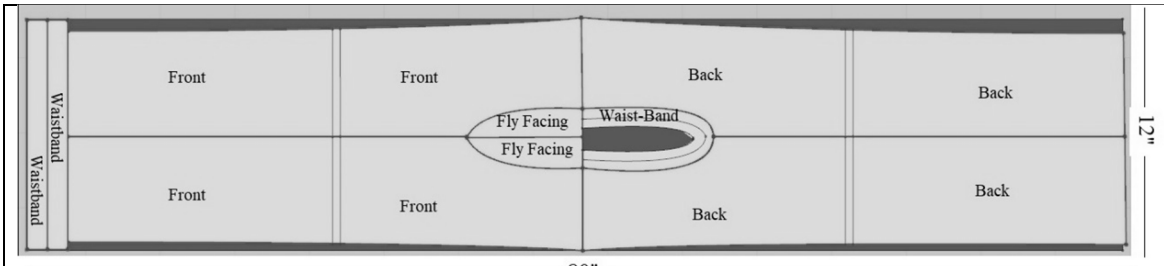
**Appendix 10 -** Pattern Layout of Ten Pieces in the Capsule Wardrobe



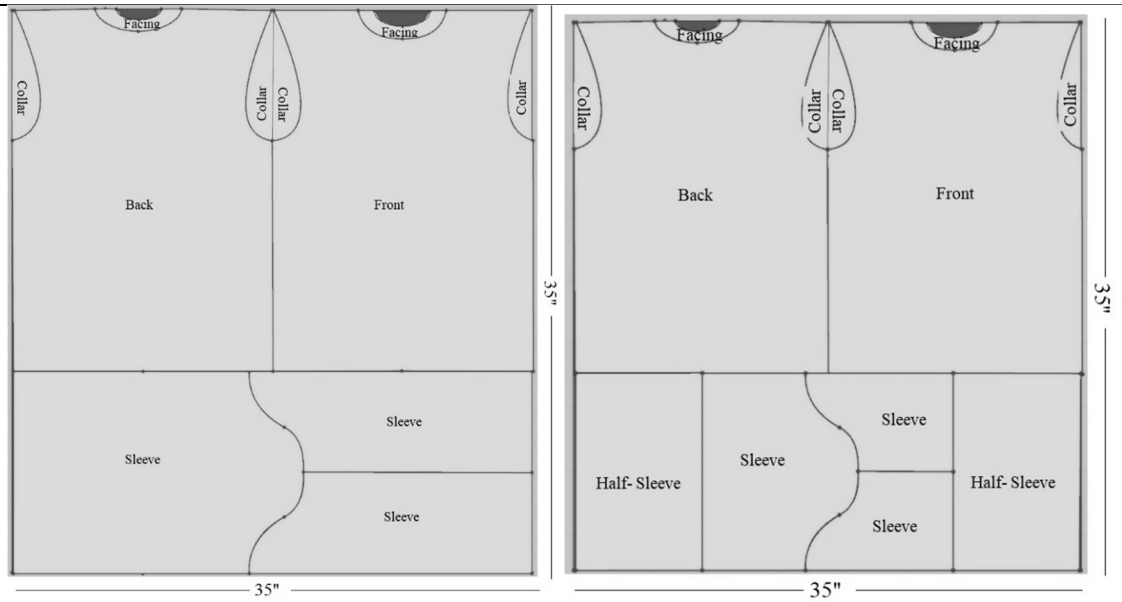

**CARDIGAN**



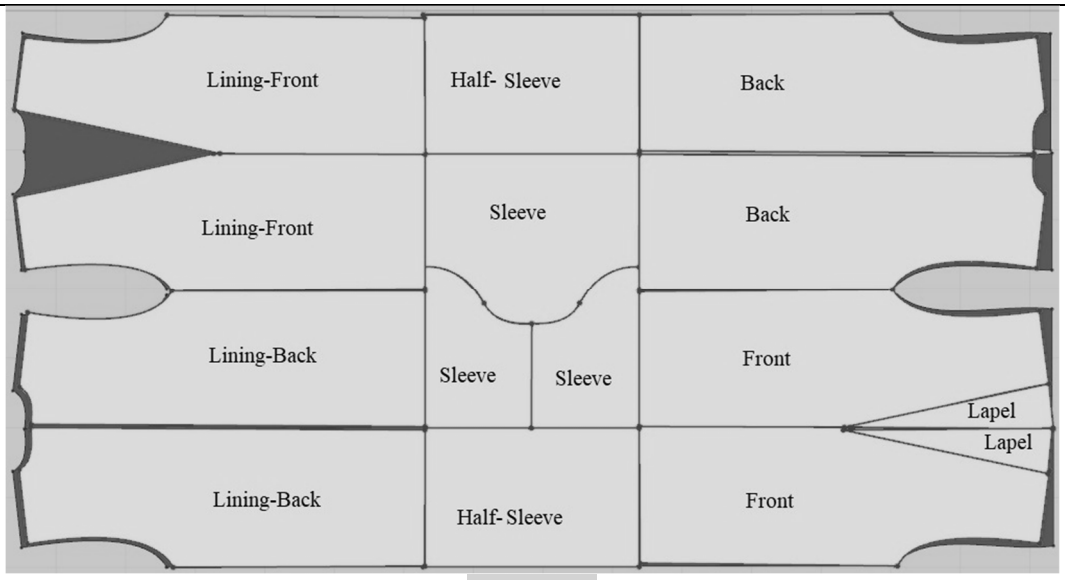

**MID-LENGTH DRESS**



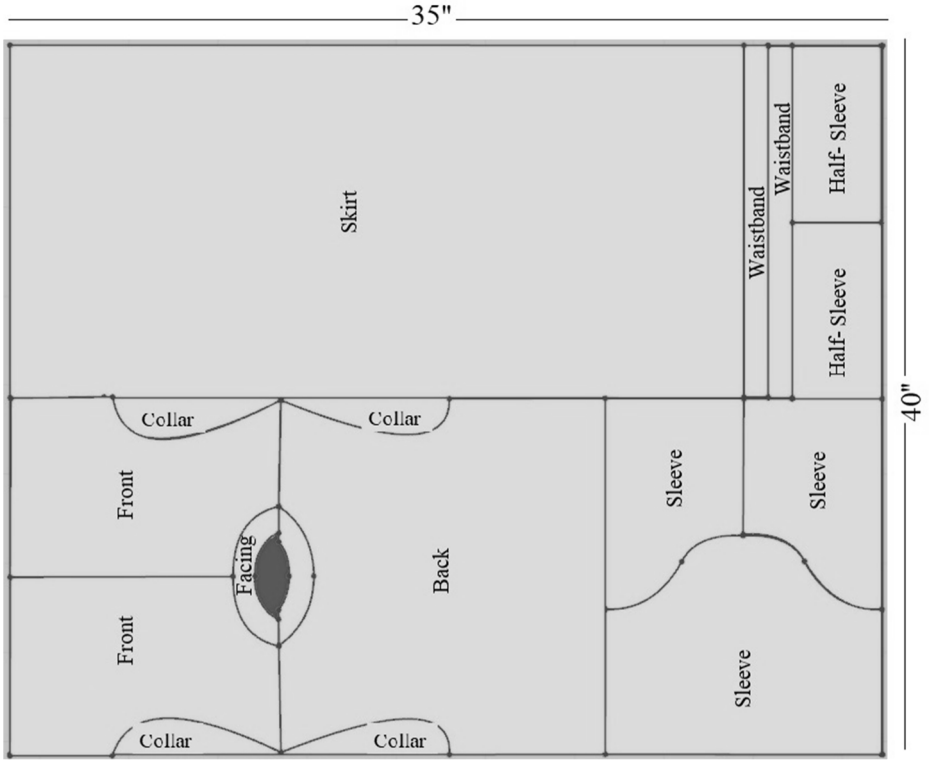

**TROUSER**



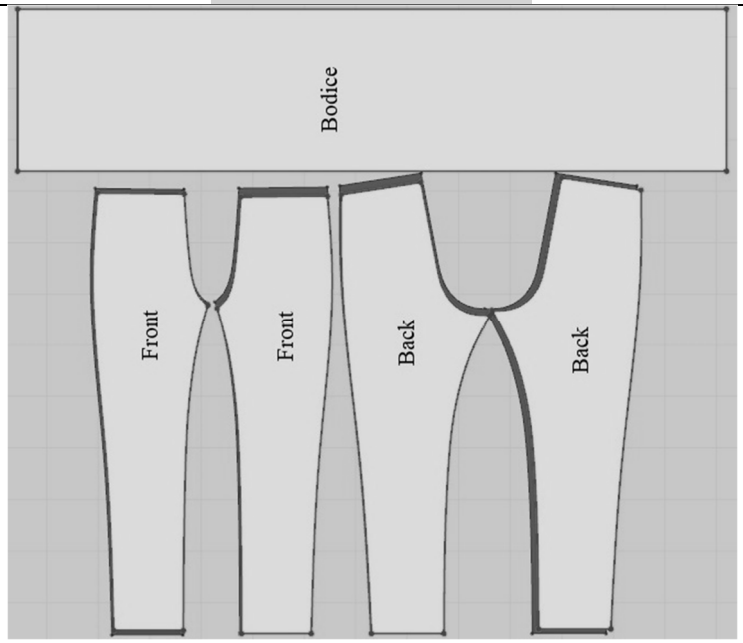

**SHIRT**




**JACKET**




**MINI COAT & SKIRT**



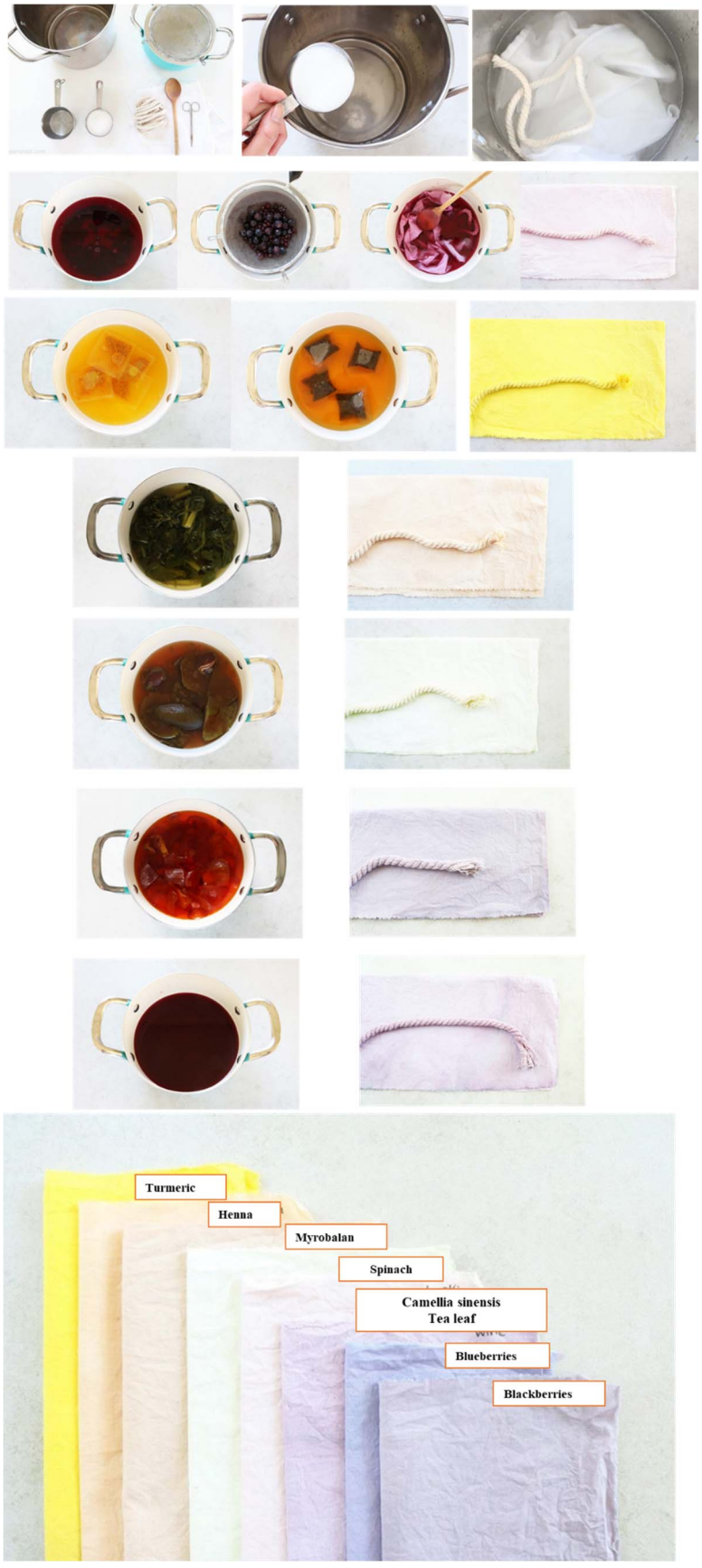

**JUMPSUIT**

Note. ■ fabric wasted ☐ Pattern layout utilising jigsaw puzzle practise

**Appendix 11 -** Workshop for Design of Prototypes




**Raw Fabrics and Materials**




**Dyeing of Cotton Fabrics**



**Pattern Making of Prototypes**



**Pattern Making of Prototypes**



**Sewing Process of Prototypes**

**Description of Multifunctional Clothes**

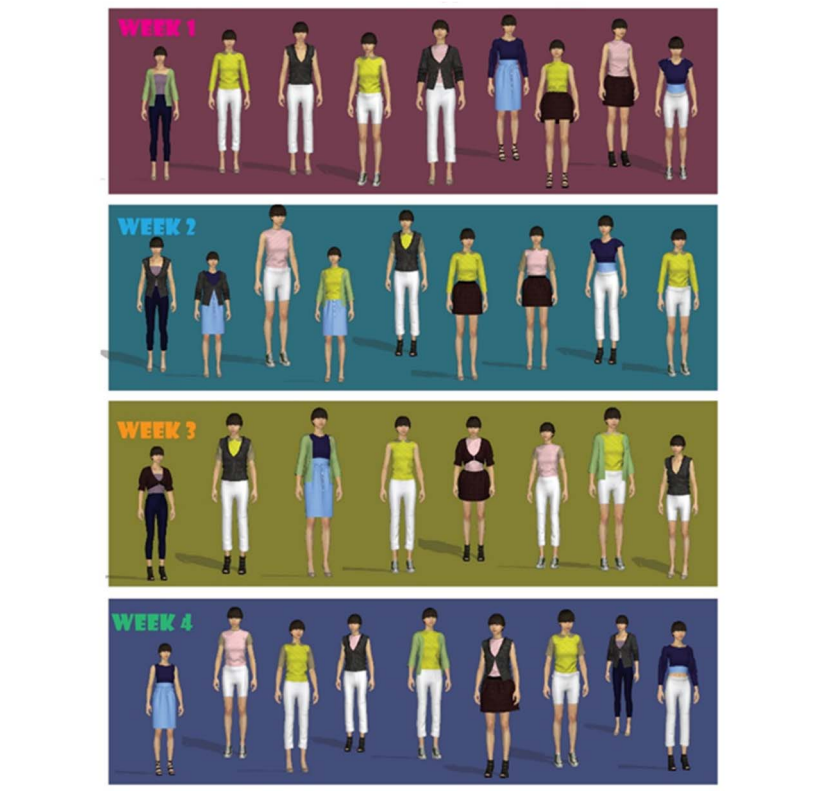
| Items | Description |
|---|---|
| **Shawl-Collar Jacket / Blazer Jacket** | The shawl-collar jacket was designed which utilised unsold grey striped PES trouser. The company announced the trouser was not attractive enough to make consumers buy it. Interestingly, men's suit was transformed into a women's blazer coat. Jigsaw puzzle methodology was applied to make a blazer coat. Besides, the lining of the coat was made of unsold grey satin knee-length women's dress. The purpose of choosing this type of fabric was that a satin lining has a good weight which can give comfortable sense. The internal layer of blazer coat has a hidden pocket for convenient storage of small items .Furthermore, on the two side armholes, there are *railroad* buttons to help the sleeves for being detached and making the vest style for different wearing occasions. The vest can be worn for freestyles while the coat is suitable to be worn for the formal office look. So, one multifunction jacket piece can support two different items: (1) vest and (2) shawl-collar jacket.   |

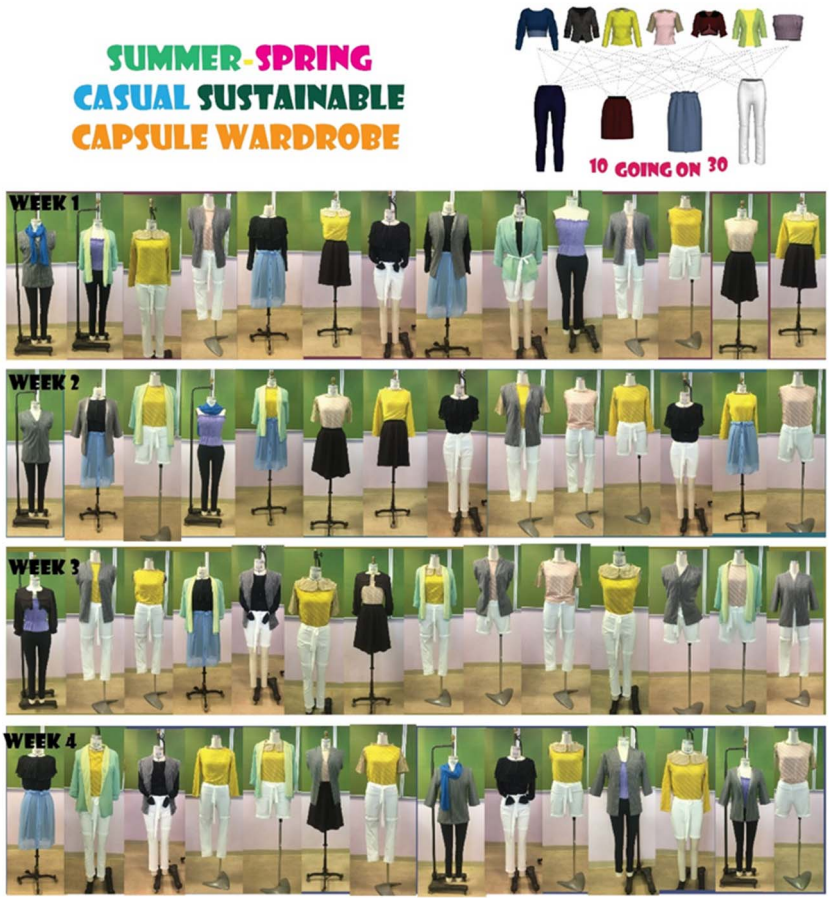
| | |
|---|---|
| **Straight Trouser** | The straight trouser was designed which utilised white *r-PES* fabric. The pattern was planned to be detached trouser in the leg thigh area and become short with detachable hidden zipper. So, one multifunction trouser piece can support two different items: (1) straight trouser and (2) short. |
| **Bolero and A-line Skirt** | The set of bolero coat and the A-line round skirt was designed which used brown r-PES crepe with a rough surface due to the medium weight of polyester or cotton crepe, it is relatively easy to use. |
| **Jumpsuit** | The denim jumpsuit was developed using an entire pair of women's navy cotton jean with the original waistline and a piece of taupe *r-PES* fabric for the bodice. It can be detached by *railroad* button through the waistline and use on the separate occasion. So, one multifunction jumpsuit piece can support three different items: (1) strapless top, (2) jean trouser and (3) jumpsuit. |
| **Cardigan** | The cardigan was designed which employed light olive *r-PES* fabric and the internal lining layer derived from a soft and light cotton *Batiste* fabric in ivory colour. With accordance to the style of this study, the lightweight cotton fabrics are great for summer dresses or any garment where you want a breathable, easy-to-wash fabric. |

| | |
|---|---|
| **Mantua / Sport Mid-Length Dress** | The mantua dress was made of marine *r-PES* chiffon and navy *r-PES* crepe fabrics designed with a multifunctional purpose. It can be detached through sleeves and waistline. Therefore, this dress may wear in five different looks, like a sundress/military dress, blouse, princess top and mid-length pleat skirt. The skirt can be attached to the dress at the waistline with *railroad* button or be worn separately. So, one multifunction mantua piece can support four different items: (1) sundress/military dress, (2) mantua, (3) blouse, (4) sport mid-length dress and (5) princess top. Additionally, the navy PES satin fabric was used to make the internal lining. Furthermore, chiffon is light and translucent, very well draping, and flowing fabric. The thinner the chiffon, the harder is to manoeuvre. Hence, *r-PES* crepe fabric was used in some parts for a more elegant and durable result. |
| **Shirts** | The t-shirts were developed using beige, nude and light olive cotton *Batiste* fabrics which dyed utilising natural dyes as previously discussed. This fabric is a very fine weave fabric mostly used in casual shirts and skirts. The two shirts feature lightweight for ease of wearing under a jacket or coat. In addition, they have multifunction usage with detaching the sleeves and collar. So, one multifunction shirt piece can support three different items: (1) T-shirt, (2) shirt and (3) tank tops. Therefore, all ten multifunctional pieces can support all twenty-two clothes which were chosen through surveying young women to possess a wardrobe of favourite summer-casual clothes. |



**Wearing Prototypes on Dummy**




**Causal Capsule Wardrobe**










**Designed Labels for the Three Different Types of Clothes in the Capsule Wardrobe**



**Focus Group One for Evaluation of Eco Capsule Wardrobe**



**Focus Group Two for Evaluation of Eco Capsule Wardrobe**

**Appendix 12 -** Statistical Reports by SPSS - Consumer's and Designer's Behaviour

**Case Processing Summary for Consumer's Behaviour**

| | | N | Per Cent (%) |
|---|---|---|---|
| Cases | Valid | 583 | 100.0 |
| | Excluded | 0 | .0 |
| | Total | 583 | 100.0 |

**Descriptive Statistics for Consumer's Behaviour**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| Perceived Behavioural Control | 4.5510 | .54390 | 583 |
| Perceived Behaviour to Dispose of Clothing | 4.6059 | .53731 | 583 |
| Purchase Intention | 4.7161 | .40459 | 583 |
| Purchase Behaviour | 4.5497 | .67803 | 583 |
| Attitude | 4.7098 | .38415 | 583 |
| Subjective Norms | 4.8735 | .27294 | 583 |

**Inter-Item Correlation Matrix for Consumer's Behaviour**

| | Perceived Behavioural Control | Perceived Behaviour | Purchase Intention | Purchase Behaviour | Attitude | Subjective Norms |
|---|---|---|---|---|---|---|
| Perceived Behavioural Control | 1.000 | .696 | .587 | .508 | .652 | .265 |
| Perceived Behaviour to Dispose of Clothing | .596 | 1.000 | .601 | .625 | .593 | .239 |
| Purchase Intention | .487 | .601 | 1.000 | .463 | .578 | .337 |
| Purchase Behaviour | | | | 1.000 | .530 | .116 |
| Attitude | | | | | 1.000 | .587 |
| Subjective Norms | | | | | | 1.000 |

**Total Effects of Consumer's Behaviour**

| | O | M | STD | O/STD | P-value |
|---|---|---|---|---|---|
| attitude -> intention to purchase eco-fashion clothes | 0.459 | 0.446 | 0.092 | 4.981 | 0.000 |
| perceived behavioural control -> intention to purchase eco-fashion clothes | 0.272 | 0.287 | 0.090 | 3.021 | 0.003 |
| subjective norm -> intention to purchase eco-fashion clothes | -0.106 | -0.096 | 0.046 | 2.293 | 0.022 |
| intention to purchase eco-fashion clothes -> purchasing | 0.595 | 0.610 | 0.155 | 3.854 | 0.000 |
| sustainable disposal behaviour -> intention to purchase eco-fashion clothes | 0.381 | 0.373 | 0.048 | 7.933 | 0.000 |
| sustainable disposal behaviour -> purchasing | 0.393 | 0.378 | 0.151 | 2.611 | 0.000 |

Note. (O) = Original Sample, (M) = Sample Mean, (STDEV) = Standard Deviation, (|O/STDEV|) = T Statistics

**Outer Loading for Consumer's Behaviour**

| | (O) | (M) | (STDEV) |
|---|---|---|---|
| Fair price <- Attitude | 0.615 | 0.584 | 0.127 |
| Behaviour influenceable<- Subjective Norms | 0.966 | 0.960 | 0.082 |
| Good quality <- Attitude | 0.715 | 0.683 | 0.128 |
| Follow in a store <- Intention purchase eco-fashion clothes | 0.910 | 0.908 | 0.021 |
| Family expectation<- Subjective Norms | 0.977 | 0.971 | 0.085 |
| Individual confidence <- Perceived behavioural control | 0.522 | 0.511 | 0.081 |
| Society thinking<- Subjective Norms | 0.866 | 0.854 | 0.088 |
| Recycling bin <- Sustainable disposal clothing behaviour | 0.365 | 0.359 | 0.090 |
| Individual thinking<- Perceived behavioural control | 0.544 | 0.535 | 0.087 |

**Outer loading continued**

| | (O) | (M) | (STDEV) |
|---|---|---|---|
| Society expectation<- Subjective Norms | -0.030 | -0.019 | 0.068 |
| Individual willingness<- Perceived behavioural control | 0.890 | 0.891 | 0.018 |
| Donation <- Sustainable disposal clothing behaviour | 0.918 | 0.917 | 0.013 |
| Environmental knowledge <- Purchase behaviour | 0.942 | 0.941 | 0.010 |
| Individual decision <- Perceived behavioural control | 0.900 | 0.900 | 0.016 |
| Easy to use <- Attitude | 0.732 | 0.746 | 0.083 |
| Recommend <- Intention purchase eco-fashion clothes | 0.907 | 0.905 | 0.023 |
| Conscious choice<- Purchase behaviour | 0.940 | 0.939 | 0.011 |
| Give away <- Sustainable disposal clothing behaviour | 0.885 | 0.883 | 0.023 |
| Reuse or redesign <- Sustainable disposal clothing behaviour | 0.959 | 0.959 | 0.006 |
| Seek out <- Intention purchase eco-fashion clothes | 0.353 | 0.346 | 0.100 |
| Use eco-fashion clothes <- Intention purchase eco-fashion clothes | 0.379 | 0.372 | 0.100 |
| Protect environment <- Attitude | 0.741 | 0.708 | 0.128 |

Note. (O) = Original Sample, (M) = Sample Mean, (STDEV) = Standard Deviation, (|O/STDEV|) = T Statistics

**Descriptive Statistics for Designer's Behaviour (N=98)**

| | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|
| Environmental knowledge | 3.00 | 5.00 | 4.3878 | .61039 |
| Quality & Price | 3.00 | 5.00 | 4.3444 | .58384 |
| Functionality & Aesthetic | 2.25 | 5.00 | 3.9923 | .71657 |
| Technology | 2.00 | 5.00 | 3.8801 | .80208 |
| Attitude | 3.00 | 5.00 | 4.2474 | .58822 |
| Subjective Norms | 3.00 | 5.00 | 4.3240 | .59984 |
| Behavioural Intention | 2.75 | 5.00 | 4.1250 | .67374 |
| Behavioural Design | 3.00 | 5.00 | 4.2296 | .57288 |

**Correlations for Designer's Behaviour (N=98)**

| | | EC | QPV | FAV | T | A | SN | BI | BD |
|---|---|---|---|---|---|---|---|---|---|
| Environmental knowledge | Pearson Correlation | 1 | .553** | .580** | .449** | .652** | .722** | .603** | .642** |
| Quality &Price | Pearson Correlation | | 1 | .545** | .392** | .693** | .660** | .477** | .611** |
| Functionality & Aesthetic | Pearson Correlation | | | 1 | .698** | .569** | .655** | .612** | .582** |
| Technology | Pearson Correlation | | | | 1 | .626** | .340** | .747** | .708** |
| Attitude | Pearson Correlation | | | | | 1 | .859** | .661** | .780** |
| Subjective Norms | Pearson Correlation | | | | | | 1 | .490** | .747** |
| Behavioural Intention | Pearson Correlation | | | | | | | 1 | .856** |
| Behavioural Design | Pearson Correlation | | | | | | | | 1 |

**. Correlation is significant at the 0.00 level (2-tailed).

**Model Summary [b] for Designer's Behaviour**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|---|---|---|---|---|---|
| 1 | .935[a] | .874 | .869 | .21310 | 1.994 |

a. Predictors: (Constant), Environmental knowledge, Quality &Price, Functionality & Aesthetic, Technology

b. Dependent Variable: Attitude

**ANOVA [a] for Designer's Behaviour**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 29.339 | 4 | 7.335 | 161.516 | .000[b] |
| | Residual | 4.223 | 93 | .045 | | |
| | Total | 33.562 | 97 | | | |

a. Dependent Variable: Attitude

b. Predictors: (Constant), Environmental knowledge, Quality &Price, Functionality & Aesthetic, Technology

**Coefficients [a] for Designer's Behaviour**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -.115 | .182 | | -.633 | .528 |
| | Environmental knowledge | .509 | .047 | .528 | 10.949 | .000 |
| | Quality &Price | .211 | .047 | .210 | 4.487 | .000 |
| | Functionality & Aesthetic | .214 | .048 | .261 | 4.439 | .000 |
| | Technology | .092 | .038 | .125 | 2.424 | .017 |

a. Dependent Variable: Attitude

**Model Summary [b] for Designer's Behaviour**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|---|---|---|---|---|---|
| 1 | .735[a] | .640 | .649 | .20320 | 2.002 |

a. Predictors: (Constant), Subjective Norms, Attitude

b. Dependent Variable: Behavioural Intention

**ANOVA [a] for Designer's Behaviour**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 20.236 | 2 | 10.118 | 40.396 | .000[b] |
| | Residual | 23.795 | 95 | .250 | | |
| | Total | 44.031 | 97 | | | |

a. Dependent Variable: Behavioural Intention

b. Predictors: (Constant), Subjective Norms, Attitude

**Model Summary [b] for Designer's Behaviour**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|---|---|---|---|---|---|
| 1 | .856[a] | .733 | .731 | .19733 | 1.810 |

a. Predictors: (Constant), Behavioural Intention

b. Dependent Variable: Behavioural Design

**Coefficients [a] for Designer's Behaviour**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.226 | .187 | | 6.546 | .000 |
| | Behavioural Intention | .728 | .045 | .856 | 16.251 | .000 |

a. Dependent Variable: Behavioural Design

**Path Coefficients for Designer's Behaviour**

| | O | M | STD | O/STD | P-value |
|---|---|---|---|---|---|
| Attitude -> Behavioural intention | 1.01 | 1.00 | 0.19 | 5.37 | 0.00 |
| Behavioural intention -> Design behaviour | 0.82 | 0.83 | 0.02 | 23.97 | 0.00 |
| Environmental knowledge -> Attitude | 0.52 | 0.52 | 0.04 | 13.34 | 0.00 |
| Environmental knowledge -> Quality & Price | 0.70 | 0.71 | 0.05 | 14.77 | 0.00 |
| Functionality & aesthetic -> Attitude | 0.18 | 0.18 | 0.06 | 3.87 | 0.00 |
| Functionality & aesthetic -> Technology | 0.84 | 0.84 | 0.02 | 4.75 | 0.00 |
| Quality & Price -> Attitude | 0.30 | 0.31 | 0.04 | 7.60 | 0.00 |
| Quality & Price -> Functionality & aesthetic | 0.52 | 0.52 | 0.08 | 6.37 | 0.00 |
| Subjective norms -> Behavioural intention | -0.38 | -0.36 | 0.20 | 2.20 | 0.04 |
| Technology -> Attitude | 0.13 | 0.12 | 0.05 | 2.72 | 0.01 |

Note. (O) = Original Sample, (M) = Sample Mean, (STDEV) = Standard Deviation, (|O/STDEV|) = T Statistics

**Total Effect for Designer's Behaviour**

| | O | M | STD | O/STD | P-value |
|---|---|---|---|---|---|
| Attitude -> Behavioural intention | 1.01 | 1.00 | 0.19 | 5.37 | 0.00 |
| Attitude -> Design behaviour | 0.84 | 0.83 | 0.16 | 5.36 | 0.00 |
| Behavioural intention -> Design behaviour | 0.82 | 0.83 | 0.02 | 23.97 | 0.00 |
| Environmental knowledge -> Attitude | 0.84 | 0.84 | 0.04 | 13.34 | 0.00 |
| Environmental knowledge -> Behavioural intention | 0.85 | 0.85 | 0.18 | 4.85 | 0.00 |
| Environmental knowledge -> Design behaviour | 0.70 | 0.70 | 0.15 | 4.83 | 0.00 |
| Environmental knowledge -> Functionality & aesthetic | 0.37 | 0.37 | 0.07 | 5.44 | 0.00 |
| Environmental knowledge -> Quality & Price | 0.70 | 0.71 | 0.05 | 14.77 | 0.00 |
| Environmental knowledge -> Technology | 0.31 | 0.31 | 0.06 | 5.37 | 0.00 |
| Functionality & aesthetic -> Attitude | 0.28 | 0.28 | 0.06 | 3.87 | 0.00 |
| Functionality & aesthetic -> Behavioural intention | 0.29 | 0.28 | 0.07 | 4.25 | 0.00 |
| Functionality & aesthetic -> Design behaviour | 0.24 | 0.23 | 0.06 | 4.24 | 0.00 |
| Functionality & aesthetic -> Technology | 0.84 | 0.84 | 0.02 | 45.75 | 0.00 |
| Quality & Price -> Attitude | 0.45 | 0.45 | 0.04 | 7.60 | 0.00 |
| Quality & Price -> Behavioural intention | 0.46 | 0.45 | 0.09 | 4.86 | 0.00 |
| Quality & Price -> Design behaviour | 0.38 | 0.38 | 0.08 | 4.88 | 0.00 |
| Quality & Price -> Functionality & aesthetic | 0.52 | 0.52 | 0.08 | 6.37 | 0.00 |
| Quality & Price -> Technology | 0.44 | 0.44 | 0.07 | 6.33 | 0.00 |
| Subjective norms -> Behavioural intention | -0.38 | -0.36 | 0.20 | 1.95 | 0.04 |
| Subjective norms -> Design behaviour | -0.32 | -0.30 | 0.20 | 2.20 | 0.04 |
| Technology -> Attitude | 0.13 | 0.12 | 0.05 | 2.72 | 0.01 |
| Technology -> Behavioural intention | 0.13 | 0.12 | 0.05 | 2.38 | 0.01 |
| Technology -> Design behaviour | 0.11 | 0.10 | 0.04 | 2.40 | 0.01 |

Note. (O) = Original Sample, (M) = Sample Mean, (STDEV) = Standard Deviation, (|O/STDEV|) = T Statistics

**Outer Loading for Designer's Behaviour**

| | O | M | STD | O/STD | P-value |
|---|---|---|---|---|---|
| Colour and beauty <- Functionality & aesthetic | 0.76 | 0.75 | 0.07 | 10.98 | 0.00 |
| Multifunctional design<- Functionality & aesthetic | 0.73 | 0.73 | 0.08 | 9.79 | 0.00 |
| Friend expectation<- Subjective norms | 0.67 | 0.67 | 0.06 | 10.86 | 0.00 |
| Quality based on the aesthetic features <- Functionality & aesthetic | 0.86 | 0.86 | 0.02 | 36.07 | 0.00 |
| Personal effort <- Behavioural intention | 0.81 | 0.81 | 0.04 | 20.14 | 0.00 |
| Personal intention to use eco-material <- Behavioural intention | 0.78 | 0.78 | 0.06 | 13.75 | 0.00 |
| Simple style <- Functionality & aesthetic | 0.89 | 0.90 | 0.02 | 53.64 | 0.00 |
| To conserve natural resources <- Environmental knowledge | 0.73 | 0.73 | 0.06 | 11.93 | 0.00 |
| New-fashioned technology <- Technology | 0.71 | 0.70 | 0.07 | 9.90 | 0.00 |
| Future anticipation <- Behavioural intention | 0.68 | 0.68 | 0.06 | 10.88 | 0.00 |
| Friends' activities <- Subjective norms | 0.93 | 0.93 | 0.02 | 8.66 | 0.00 |
| A necessary instrument<- Attitude | 0.66 | 0.65 | 0.07 | 9.62 | 0.00 |
| Environmental hazards <- Design behaviour | 0.80 | 0.80 | 0.04 | 18.79 | 0.00 |
| Reducing the time and save money <- Technology | 0.93 | 0.93 | 0.01 | 33.30 | 0.00 |
| Conscious choice <- Design behaviour | 0.78 | 0.78 | 0.03 | 23.24 | 0.00 |
| Easy to use<- Technology | 0.93 | 0.94 | 0.01 | 36.12 | 0.00 |
| Designer's thinking<- Subjective norms | 0.88 | 0.88 | 0.03 | 26.30 | 0.00 |
| Material properties <- Quality & Price | 0.91 | 0.91 | 0.03 | 34.40 | 0.00 |
| Positive thinking<- Attitude | 0.85 | 0.85 | 0.04 | 21.97 | 0.00 |
| Society's Supporting from me <- Subjective norms | 0.93 | 0.93 | 0.02 | 12.20 | 0.00 |
| Excellent idea <- Attitude | 0.81 | 0.81 | 0.04 | 17.98 | 0.00 |

**Outer Loading continued**

| | | | | | |
|---|---|---|---|---|---|
| Environmentally irresponsible <- Design behaviour | 0.82 | 0.82 | 0.04 | 20.42 | 0.00 |
| Spontaneous activities <- Design behaviour | 0.76 | 0.75 | 0.06 | 13.56 | 0.00 |
| Fair price <- Quality & Price | 0.92 | 0.93 | 0.02 | 23.60 | 0.00 |
| Good quality <- Quality & Price | 0.66 | 0.65 | 0.10 | 6.36 | 0.00 |
| Knowledge and awareness <- Quality & Price | 0.65 | 0.64 | 0.11 | 6.16 | 0.00 |
| To reduce clothing and textile waste <- Environmental knowledge | 0.82 | 0.83 | 0.03 | 31.88 | 0.00 |
| To reduce the carbon impact <- Environmental knowledge | 0.81 | 0.81 | 0.05 | 14.71 | 0.00 |
| Personal Idea<- Attitude | 0.77 | 0.77 | 0.05 | 14.19 | 0.00 |
| Improvement knowledge <- Behavioural intention | 0.69 | 0.69 | 0.07 | 9.76 | 0.00 |
| Reduction of water consumption<- Environmental knowledge | 0.80 | 0.80 | 0.05 | 15.68 | 0.00 |
| Personal ability <- Technology | 0.70 | 0.69 | 0.07 | 9.76 | 0.00 |

Note. (O) = Original Sample, (M) = Sample Mean, (STDEV) = Standard Deviation, (|O/STDEV|) = T Statistics

**Appendix 12 -** Statistical Reports by Nvivo - Consumer's and Designer's Behaviour

**NVivo Coding Comparison among Consumers for Objective One**

| Node | Source | Kappa | Agreement | A and B | Not A and Not B | Disagreement | and Not B | B and Not A |
|---|---|---|---|---|---|---|---|---|
| Quality and Price Value | Orked | 0.94 | 90.61 | 6.3 | 84.31 | 9.39 | 9.39 | 0 |
| Quality and Price Value | Aisyah | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Quality and Price Value | Suzila | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Quality and Price Value | Maria | 0.71 | 88.71 | 0 | 88.71 | 11.29 | 11.29 | 0 |
| Quality and Price Value | Hisyam | 0.77 | 92.16 | 10.85 | 81.31 | 7.84 | 7.84 | 0 |
| Quality and Price Value | Mawar | 0.73 | 91.22 | 0 | 91.22 | 8.78 | 8.78 | 0 |
| Quality and Price Value | Fatima | 0.9 | 80.18 | 5.47 | 74.71 | 19.82 | 19.82 | 0 |
| Quality and Price Value | Denise | 0.98 | 98.3 | 7.12 | 91.18 | 1.7 | 1.7 | 0 |
| Quality and Price Value | Noria | 0.57 | 84.47 | 4.16 | 90.31 | 15.53 | 5.04 | 5.04 |
| Quality and Price Value | Soraya | 0.75 | 85.9 | 0 | 85.9 | 14.1 | 9.4 | 4.7 |
| Quality and Price Value | Amin | 0.84 | 90.61 | 14.3 | 76.31 | 9.39 | 9.39 | 0 |
| Quality and Price Value | Linda | 0.75 | 84.65 | 12.6 | 72.05 | 15.35 | 8 | 7.35 |
| Quality and Price Value | Asliza | 0.61 | 74.53 | 9.49 | 65.04 | 25.47 | 13.59 | 11.88 |
| Quality and Price Value | Grace | 0.72 | 82.5 | 18.13 | 64.37 | 17.5 | 12.54 | 4.96 |
| Quality and Price Value | Lina | 0.87 | 86.42 | 14.92 | 71.5 | 12.58 | 8.18 | 4.4 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Quality and Price Value | Sharifa | 0.75 | 87.09 | 5.46 | 81.63 | 19.91 | 14.71 | 5.2 |
| Total | | 0.80 | 88.58 | 6.80 | 82.40 | 11.79 | 8.72 | 2.72 |
| Design Features | Orked | 0.74 | 84.08 | 2.45 | 81.63 | 15.92 | 13.32 | 2.6 |
| Design Features | Aisyah | 0.81 | 87.31 | 11.98 | 75.33 | 12.69 | 10.05 | 2.64 |
| Design Features | Suzila | 0.75 | 89.85 | 19.4 | 70.45 | 10.15 | 9.25 | 0.9 |
| Design Features | Maria | 0.86 | 90.98 | 0 | 90.98 | 9.02 | 8.22 | 0.8 |
| Design Features | Hisyam | 0.84 | 85.81 | 6.55 | 79.26 | 14.19 | 11.19 | 3 |
| Design Features | Mawar | 0.89 | 88.23 | 9.87 | 78.36 | 11.77 | 0 | 11.77 |
| Design Features | Fatima | 0.92 | 89.15 | 11.4 | 77.75 | 10.85 | 10.85 | 0 |
| Design Features | Denise | 0.79 | 83.71 | 14.4 | 69.31 | 16.29 | 11.29 | 5 |
| Design Features | Noria | 0.61 | 82.53 | 16.49 | 66.04 | 17.47 | 15.88 | 1.59 |
| Design Features | Soraya | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Design Features | Amin | 0.98 | 98.18 | 98.18 | 0 | 1.82 | 1.82 | 0 |
| Design Features | Linda | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Design Features | Asliza | 0.91 | 90.61 | 4.31 | 86.3 | 9.39 | 6.09 | 3.3 |
| Design Features | Grace | 0.76 | 88 | 16.4 | 71.6 | 12 | 10.3 | 1.7 |
| Design Features | Lina | 0.91 | 98.43 | 24.66 | 73.77 | 1.57 | 0.04 | 1.53 |
| Design Features | Sharifa | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Total | | 0.86 | 91.05 | 14.75 | 76.29 | 8.94 | 6.76 | 2.17 |
| Environmental Knowledge and Concern | Orked | 1 | 100 | 0 | 100 | 0 | 0 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Environmental Knowledge and Concern | Aisyah | 0.87 | 85.23 | 9.87 | 75.36 | 14.77 | 10.37 | 4.4 |
| Environmental Knowledge and Concern | Suzila | 0.96 | 89.15 | 7.9 | 81.25 | 10.85 | 10.25 | 0.6 |
| Environmental Knowledge and Concern | Maria | 0.71 | 88.71 | 0 | 88.71 | 11.29 | 11.29 | 0 |
| Environmental Knowledge and Concern | Hisyam | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Environmental Knowledge and Concern | Mawar | 0.83 | 91.22 | 8.76 | 82.46 | 8.78 | 7.65 | 1.13 |
| Environmental Knowledge and Concern | Fatima | 0.9 | 80.18 | 0.2 | 79.98 | 19.82 | 6.92 | 12.9 |
| Environmental Knowledge and Concern | Denise | 0.88 | 91.3 | 2.98 | 88.32 | 8.7 | 4.56 | 4.14 |
| Environmental Knowledge and Concern | Noria | 0.94 | 90.61 | 10.3 | 80.31 | 9.39 | 9.39 | 0 |
| Environmental Knowledge and Concern | Soraya | 0.95 | 87.6 | 0 | 87.6 | 12.4 | 11.15 | 1.25 |
| Environmental Knowledge and Concern | Amin | 0.95 | 98.43 | 11.61 | 86.82 | 1.57 | 0.04 | 1.53 |
| Environmental Knowledge and Concern | Linda | 0.87 | 91.31 | 7.53 | 83.78 | 8.69 | 6.05 | 2.64 |
| Environmental Knowledge and Concern | Asliza | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Environmental Knowledge and Concern | Grace | 0.76 | 83.98 | 0 | 83.98 | 16.02 | 16.02 | 0 |
| Environmental Knowledge and Concern | Lina | 0.74 | 86.81 | 14.55 | 72.26 | 13.19 | 9.65 | 3.54 |
| Environmental Knowledge and Concern | Sharifa | 0.89 | 81.23 | 20.87 | 60.36 | 18.77 | 8.77 | 10 |
| Total | | 0.89 | 90.36 | 5.91 | 84.44 | 9.64 | 7.00 | 2.63 |

**NVivo Coding Comparison among Designers for Objective One**

| Node | Source | Kappa | Agreement | A and B | Not A and Not B | Disagreement | And Not B | B and Not A |
|---|---|---|---|---|---|---|---|---|
| Environmental Knowledge | Janet | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Environmental Knowledge | Jane | 0.83 | 80.1 | 3.24 | 76.86 | 19.9 | 10.03 | 9.87 |
| Environmental Knowledge | Suzy | 0.81 | 80.18 | 6.76 | 73.42 | 19.82 | 9.98 | 9.84 |
| Environmental Knowledge | Julie | 0.88 | 81.3 | 12 | 69.3 | 18.7 | 18.7 | 0 |
| Environmental Knowledge | Sina | 0.88 | 80.61 | 4.31 | 76.3 | 19.39 | 16.09 | 3.3 |
| Environmental Knowledge | Nur | 0.86 | 88 | 6.4 | 81.6 | 22 | 20.3 | 1.7 |
| Environmental Knowledge | Nazla | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Environmental Knowledge | Dana | 0.78 | 96.31 | 10.53 | 85.78 | 3.69 | 1.05 | 2.64 |
| Total | | 0.88 | 88.31 | 5.40 | 82.90 | 12.93 | 9.51 | 3.41 |
| Perceived Quality and Price | Janet | 0.85 | 78.43 | 11.61 | 66.82 | 21.57 | 20.04 | 1.53 |
| Perceived Quality and Price | Jane | 0.91 | 96.31 | 6.43 | 89.88 | 3.69 | 0 | 3.69 |
| Perceived Quality and Price | Suzy | 0.88 | 77.85 | 8.9 | 68.95 | 22.15 | 21.15 | 1 |
| Perceived Quality and Price | Julie | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Perceived Quality and Price | Sina | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Perceived Quality and Price | Nur | 0.75 | 88.71 | 0 | 88.71 | 11.29 | 11.29 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Perceived Quality and Price | Nazla | 0.97 | 98.16 | 17.85 | 80.31 | 1.84 | 1.84 | 0 |
| Perceived Quality and Price | Dana | 0.84 | 90.61 | 4.3 | 86.31 | 9.39 | 5.41 | 3.98 |
| Total | | 0.9 | 91.25 | 6.13 | 85.12 | 8.74 | 7.46 | 1.27 |
| Perceived Functional and Aesthetic | Janet | 0.82 | 89.15 | 15.43 | 73.72 | 10.85 | 10.85 | 0 |
| Perceived Functional and Aesthetic | Jane | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Perceived Functional and Aesthetic | Suzy | 0.91 | 90.53 | 9.8 | 80.73 | 9.47 | 9.47 | 0 |
| Perceived Functional and Aesthetic | Julie | 0.83 | 80.1 | 10 | 70.1 | 19.9 | 15.6 | 4.3 |
| Perceived Functional and Aesthetic | Sina | 0.98 | 98.8 | 0 | 98.8 | 1.2 | 1.2 | 0 |
| Perceived Functional and Aesthetic | Nur | 0.68 | 71.3 | 3.67 | 67.63 | 28.7 | 24.56 | 4.14 |
| Perceived Functional and Aesthetic | Nazla | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Perceived Functional and Aesthetic | Dana | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Total | | 0.90 | 91.23 | 4.86 | 86.37 | 8.76 | 7.71 | 1.05 |
| Perceived Ease to Use Technology | Janet | 0.88 | 97.85 | 11.1 | 86.75 | 2.15 | 2.15 | 0 |
| Perceived Ease to Use Technology | Jane | 0.77 | 85.23 | 9.87 | 75.36 | 14.77 | 10.37 | 4.4 |
| Perceived Ease to Use Technology | Suzy | 0.76 | 89.15 | 7.9 | 81.25 | 10.85 | 10.25 | 0.6 |
| Perceived Ease to Use Technology | Julie | 0.73 | 78.71 | 0 | 78.71 | 21.29 | 14 | 7.29 |
| Perceived Ease to Use Technology | Sina | 0.69 | 82.16 | 7.56 | 74.6 | 17.84 | 16.01 | 1.83 |
| Perceived Ease to Use Technology | Nur | 0.73 | 71.22 | 9.8 | 61.42 | 28.78 | 27.65 | 1.13 |
| Perceived Ease to Use Technology | Nazla | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Perceived Ease to Use Technology | Dana | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Total | | 0.82 | 88.04 | 5.77 | 82.26 | 11.96 | 10.05 | 1.90 |
| Attitude of Eco-Fashion Design | Janet | 0.9 | 90.98 | 0 | 90.98 | 9.02 | 8.22 | 0.8 |
| Attitude of Eco-Fashion Design | Jane | 0.84 | 85.81 | 6.55 | 79.26 | 14.19 | 11.19 | 3 |
| Attitude of Eco-Fashion Design | Suzy | 0.89 | 88.23 | 9.87 | 78.36 | 11.77 | 11.77 | 0 |
| Attitude of Eco-Fashion Design | Julie | 1 | 100 | 0 | 100 | 0 | 0 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Attitude of Eco-Fashion Design | Sina | 0.79 | 83.71 | 14.4 | 69.31 | 16.29 | 11.29 | 5 |
| Attitude of Eco-Fashion Design | Nur | 0.91 | 82.53 | 18.2 | 64.33 | 17.47 | 11.59 | 5.88 |
| Attitude of Eco-Fashion Design | Nazla | 0.93 | 80.1 | 11.09 | 69.01 | 19.9 | 14.94 | 4.96 |
| Attitude of Eco-Fashion Design | Dana | 0.81 | 80.18 | 16.76 | 63.42 | 19.82 | 9.98 | 9.84 |
| Total | | 0.88 | 86.44 | 9.60 | 76.83 | 13.55 | 9.87 | 3.68 |
| Subjective Norm of Eco-Fashion Design | Janet | 0.75 | 84.65 | 12.6 | 72.05 | 15.35 | 8.4 | 6.95 |
| Subjective Norm of Eco-Fashion Design | Jane | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Subjective Norm of Eco-Fashion Design | Suzy | 0.72 | 82.5 | 18.17 | 64.33 | 17.5 | 12.54 | 4.96 |
| Subjective Norm of Eco-Fashion Design | Julie | 0.87 | 86.42 | 14.92 | 71.5 | 13.58 | 9.18 | 4.4 |
| Subjective Norm of Eco-Fashion Design | Sina | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Subjective Norm of Eco-Fashion Design | Nur | 0.74 | 74.08 | 2.45 | 71.63 | 25.92 | 23.32 | 2.6 |
| Subjective Norm of Eco-Fashion Design | Nazla | 0.81 | 87.31 | 11.98 | 75.33 | 12.69 | 10.05 | 2.64 |
| Subjective Norm of Eco-Fashion Design | Dana | 0.75 | 79.85 | 19.4 | 60.45 | 20.15 | 19.25 | 0.9 |
| Total | | 0.83 | 86.85 | 9.94 | 76.91 | 13.14 | 10.34 | 2.80 |
| Behavioural Intention of Eco-Fashion Design | Janet | 0.88 | 90.3 | 23.2 | 67.1 | 9.7 | 6.56 | 3.14 |
| Behavioural Intention of Eco-Fashion Design | Jane | 0.92 | 88.61 | 4.31 | 84.3 | 11.39 | 8.09 | 3.3 |
| Behavioural Intention of Eco-Fashion Design | Suzy | 0.76 | 81.8 | 4.54 | 77.26 | 18.2 | 11.5 | 6.7 |
| Behavioural Intention of Eco-Fashion Design | Julie | 0.91 | 98.43 | 14.66 | 83.77 | 1.57 | 1.53 | 0.04 |
| Behavioural Intention of Eco-Fashion Design | Sina | 0.78 | 76.31 | 11.53 | 64.78 | 23.69 | 21.05 | 2.64 |
| Behavioural Intention of Eco-Fashion Design | Nur | 0.98 | 98 | 0 | 98 | 2 | 2 | 0 |
| Behavioural Intention of Eco-Fashion Design | Nazla | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Behavioural Intention of Eco-Fashion Design | Dana | 0.96 | 89.15 | 9.8 | 79.35 | 10.85 | 7.58 | 3.27 |
| Total | | 0.89 | 90.32 | 8.50 | 81.82 | 9.67 | 7.28 | 2.38 |

**NVivo Coding and Comparison Results from the Interviews for Objective Two**

| Steps | Coding Terms | Kappa | Agreement | A and B | Not A and Not B | Disagreement | A and Not B | B and Not A |
|---|---|---|---|---|---|---|---|---|
| Define Problem and Idea | Needs of the market (Price/Quality/Design) | 0.92 | 92.39 | 2.93 | 89.46 | 7.60 | 6.06 | 1.53 |
| | Needs of consumers (Price and Quality) | 0.95 | 95.35 | 2.89 | 92.46 | 4.64 | 3.61 | 1.03 |
| | Needs of consumers (Design) | 0.87 | 88.20 | 3.84 | 84.36 | 11.79 | 10.69 | 1.10 |
| | Personal belief (Environmental knowledge) | 0.93 | 92.31 | 7.57 | 84.74 | 7.68 | 6.33 | 1.35 |
| Product Design | Personal belief (Environmental knowledge) | 0.91 | 92.44 | 4.35 | 88.08 | 7.55 | 5.80 | 1.75 |
| | Designer's needs (Price and Quality) | 0.95 | 97.11 | 6.26 | 90.84 | 2.89 | 2.08 | 0.80 |
| | Designer's needs (Design) | 0.95 | 95.68 | 1.75 | 93.92 | 4.31 | 3.60 | 0.71 |
| Evaluation | Needs of the market (Price/Quality/Design) | 0.87 | 92.29 | 3.64 | 88.65 | 7.70 | 6.9 | 0.80 |
| | Needs of consumers (Price and Quality) | 0.93 | 93.59 | 3.69 | 89.89 | 6.41 | 5.46 | 0.94 |
| | Needs of consumers (Design) | 0.86 | 91.21 | 8.51 | 82.70 | 10.03 | 7.08 | 2.94 |
| | Personal belief (Environmental knowledge) | 0.93 | 93.84 | 4.99 | 88.85 | 6.15 | 5.59 | 0.56 |

**NVivo Coding Comparison among Designers for Objective Two**

| Node | Source | Kappa | Agreement | A and B | Not A and Not B | Disagreement | A and Not B | B and Not A |
|---|---|---|---|---|---|---|---|---|
| Define Problem and Idea – market needs | Janet | 0.78 | 74.53 | 5.67 | 68.86 | 25.47 | 25.47 | 0 |
| Define Problem and Idea – market needs | Jane | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Define Problem and Idea – market needs | Suzy | 0.86 | 85.42 | 4.92 | 80.5 | 14.58 | 10.18 | 4.4 |
| Define Problem and Idea – market needs | Julie | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Define Problem and Idea – market needs | Sina | 0.94 | 94.08 | 0 | 94.08 | 5.92 | 4.32 | 1.6 |
| Define Problem and Idea – market needs | Nur | 0.98 | 98.31 | 0 | 98.31 | 1.69 | 1.69 | 0 |
| Define Problem and Idea – market needs | Nazla | 0.88 | 89.85 | 9.4 | 80.45 | 10.15 | 4.85 | 5.3 |
| Define Problem and Idea – market needs | Dana | 0.96 | 96.98 | 3.45 | 93.53 | 3.02 | 2.02 | 1 |
| Total | | 0.92 | 92.39 | 2.93 | 89.46 | 7.60 | 6.06 | 1.53 |
| Define Idea – consumer needs (price-quality) | Janet | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Define Idea – consumer needs (price-quality) | Jane | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Define Idea – consumer needs (price-quality) | Suzy | 0.92 | 89.15 | 1.23 | 87.92 | 10.85 | 6.85 | 4 |
| Define Idea – consumer needs (price-quality) | Julie | 0.89 | 88.71 | 4.4 | 84.31 | 11.29 | 10.29 | 1 |
| Define Idea – consumer needs (price-quality) | Sina | 0.98 | 98.53 | 6.49 | 92.04 | 1.47 | 1.47 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Define Idea – consumer needs (price-quality) | Nur | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Define Idea – consumer needs (price-quality) | Nazla | 0.98 | 98.18 | 0 | 98.18 | 1.82 | 1.82 | 0 |
| Define Idea – consumer needs (price-quality) | Dana | 0.88 | 88.3 | 11 | 77.3 | 11.7 | 8.46 | 3.24 |
| Total | | 0.95 | 95.35 | 2.89 | 92.46 | 4.64 | 3.61 | 1.03 |
| Define Idea – consumer needs (design) | Janet | 0.87 | 85.23 | 9.87 | 75.36 | 14.77 | 10.37 | 4.4 |
| Define Idea – consumer needs (design) | Jane | 0.93 | 89.15 | 7.9 | 81.25 | 10.85 | 10.25 | 0.6 |
| Define Idea – consumer needs (design) | Suzy | 0.71 | 88.71 | 0 | 88.71 | 11.29 | 11.29 | 0 |
| Define Idea – consumer needs (design) | Julie | 0.76 | 82.16 | 7.56 | 74.6 | 17.84 | 16.01 | 1.83 |
| Define Idea – consumer needs (design) | Sina | 0.83 | 81.22 | 0 | 81.22 | 18.78 | 17.65 | 1.13 |
| Define Idea – consumer needs (design) | Nur | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Define Idea – consumer needs (design) | Nazla | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Define Idea – consumer needs (design) | Dana | 0.92 | 79.15 | 5.4 | 73.75 | 20.85 | 20 | 0.85 |
| Total | | 0.87 | 88.20 | 3.84 | 84.36 | 11.79 | 10.69 | 1.10 |
| Define Problem and Idea – knowledge | Janet | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Define Problem and Idea – knowledge | Jane | 0.88 | 80.53 | 19.49 | 61.04 | 19.47 | 13.59 | 5.88 |
| Define Problem and Idea – knowledge | Suzy | 0.95 | 95.43 | 14.66 | 80.77 | 4.57 | 3.2 | 1.37 |
| Define Problem and Idea – knowledge | Julie | 0.96 | 96.31 | 10.53 | 85.78 | 3.69 | 2.64 | 1.05 |
| Define Problem and Idea – knowledge | Sina | 0.88 | 77.85 | 8 | 69.85 | 22.15 | 20.4 | 1.75 |
| Define Problem and Idea – knowledge | Nur | 0.97 | 97.23 | 0 | 97.23 | 2.77 | 2 | 0.77 |
| Define Problem and Idea – knowledge | Nazla | 0.84 | 91.15 | 7.9 | 83.25 | 8.85 | 8.85 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Define Problem and Idea – knowledge | Dana | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Total | | 0.93 | 92.31 | 7.57 | 84.74 | 7.68 | 6.33 | 1.35 |
| Product Design – knowledge | Janet | 0.87 | 91.16 | 7.56 | 83.6 | 8.84 | 7.01 | 1.83 |
| Product Design – knowledge | Jane | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Product Design – knowledge | Suzy | 0.84 | 85.91 | 6.55 | 79.36 | 14.09 | 11.19 | 2.9 |
| Product Design – knowledge | Julie | 0.89 | 88.23 | 9.87 | 78.36 | 11.77 | 11.77 | 0 |
| Product Design – knowledge | Sina | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Product Design – knowledge | Nur | 0.79 | 83.71 | 8.4 | 75.31 | 16.29 | 8.6 | 7.69 |
| Product Design – knowledge | Nazla | 0.89 | 90.53 | 2.49 | 88.04 | 9.47 | 7.88 | 1.59 |
| Product Design – knowledge | Dana | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Total | | 0.91 | 92.44 | 4.35 | 88.08 | 7.55 | 5.80 | 1.75 |
| Product Design – designer needs (price-quality) | Janet | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Product Design – designer needs (price-quality) | Jane | 0.98 | 98.3 | 14.12 | 84.18 | 1.7 | 1.7 | 0 |
| Product Design – designer needs (price-quality) | Suzy | 0.84 | 90.61 | 8.3 | 82.31 | 9.39 | 6.09 | 3.3 |
| Product Design – designer needs (price-quality) | Julie | 0.95 | 98 | 4.4 | 93.6 | 2 | 1.7 | 0.3 |
| Product Design – designer needs (price-quality) | Sina | 0.95 | 98.43 | 21.61 | 76.82 | 1.57 | 0 | 1.57 |
| Product Design – designer needs (price-quality) | Nur | 0.91 | 96.31 | 0 | 96.31 | 3.69 | 2.64 | 1.05 |
| Product Design – designer needs (price-quality) | Nazla | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Product Design – designer needs (price-quality) | Dana | 0.97 | 95.23 | 1.7 | 93.53 | 4.77 | 4.56 | 0.21 |
| Total | | 0.95 | 97.11 | 6.26 | 90.84 | 2.89 | 2.08 | 0.80 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Product Design – designer needs (design) | Janet | 0.86 | 89.15 | 7.9 | 81.25 | 10.85 | 7.56 | 3.29 |
| Product Design – designer needs (design) | Jane | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Product Design – designer needs (design) | Suzy | 0.97 | 97.16 | 1.85 | 95.31 | 2.84 | 2.84 | 0 |
| Product Design – designer needs (design) | Julie | 0.94 | 94.61 | 4.3 | 90.31 | 5.39 | 4.35 | 1.04 |
| Product Design – designer needs (design) | Sina | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Product Design – designer needs (design) | Nur | 0.94 | 94.53 | 0 | 94.53 | 5.47 | 5.47 | 0 |
| Product Design – designer needs (design) | Nazla | 0.9 | 90 | 0 | 90 | 10 | 8.6 | 1.4 |
| Product Design – designer needs (design) | Dana | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Total | | 0.95 | 95.68 | 1.75 | 93.92 | 4.31 | 3.60 | 0.71 |
| Evaluation and Implementation - market needs | Janet | 0.75 | 87.09 | 7.46 | 79.63 | 12.91 | 7.71 | 5.2 |
| Evaluation and Implementation - market needs | Jane | 0.74 | 84.08 | 2.45 | 81.63 | 15.92 | 15.92 | 0 |
| Evaluation and Implementation - market needs | Suzy | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Evaluation and Implementation - market needs | Julie | 0.75 | 89.85 | 9.4 | 80.45 | 10.15 | 10.15 | 0 |
| Evaluation and Implementation - market needs | Sina | 0.86 | 90.98 | 0 | 90.98 | 9.02 | 8.22 | 0.8 |
| Evaluation and Implementation - market needs | Nur | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Evaluation and Implementation - market needs | Nazla | 0.88 | 88.23 | 9.87 | 78.36 | 11.77 | 11.77 | 0 |
| Evaluation and Implementation - market needs | Dana | 0.98 | 98.15 | 0 | 98.15 | 1.85 | 1.43 | 0.42 |
| Total | | 0.87 | 92.29 | 3.64 | 88.65 | 7.70 | 6.9 | 0.80 |
| Evaluation – consumer needs (price-quality) | Janet | 1 | 100 | 0 | 100 | 0 | 0 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Evaluation – consumer needs (price-quality) | Jane | 0.82 | 82.53 | 6.49 | 76.04 | 17.47 | 11.59 | 5.88 |
| Evaluation – consumer needs (price-quality) | Suzy | 0.96 | 96.1 | 0 | 96.1 | 3.9 | 3.9 | 0 |
| Evaluation – consumer needs (price-quality) | Julie | 0.81 | 80.18 | 16.76 | 63.42 | 19.82 | 19.82 | 0 |
| Evaluation – consumer needs (price-quality) | Sina | 0.98 | 98.3 | 0 | 98.3 | 1.7 | 1.7 | 0 |
| Evaluation – consumer needs (price-quality) | Nur | 0.95 | 95.61 | 6.31 | 89.3 | 4.39 | 3.39 | 1 |
| Evaluation – consumer needs (price-quality) | Nazla | 0.95 | 96 | 0 | 96 | 4 | 3.3 | 0.7 |
| Evaluation – consumer needs (price-quality) | Dana | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Total | | 0.93 | 93.59 | 3.69 | 89.89 | 6.41 | 5.46 | 0.94 |
| Evaluation – consumer needs (design) | Janet | 0.78 | 96.31 | 10.53 | 85.78 | 3.69 | 2.64 | 1.05 |
| Evaluation – consumer needs (design) | Jane | 0.88 | 97.85 | 9.76 | 88.09 | 2.15 | 0 | 2.15 |
| Evaluation – consumer needs (design) | Suzy | 0.87 | 85.23 | 9.87 | 75.36 | 14.77 | 10.37 | 4.4 |
| Evaluation – consumer needs (design) | Julie | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Evaluation – consumer needs (design) | Sina | 0.84 | 90.61 | 14.3 | 76.31 | 9.39 | 9.39 | 0 |
| Evaluation – consumer needs (design) | Nur | 0.85 | 84.65 | 12.6 | 72.05 | 15.35 | 10.2 | 5.15 |
| Evaluation – consumer needs (design) | Nazla | 0.81 | 84.53 | 9.89 | 74.64 | 25.47 | 16.59 | 8.88 |
| Evaluation – consumer needs (design) | Dana | 0.89 | 90.55 | 1.13 | 89.42 | 9.45 | 7.49 | 1.96 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total | | 0.86 | 91.21 | 8.51 | 82.70 | 10.03 | 7.08 | 2.94 |
| Evaluation – consumer needs (technology) | Janet | 0.87 | 86.42 | 14.92 | 71.5 | 13.58 | 9.18 | 4.4 |
| Evaluation – consumer needs (technology) | Jane | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Evaluation – consumer needs (technology) | Suzy | 0.74 | 84.78 | 2.45 | 82.33 | 15.22 | 15.22 | 0 |
| Evaluation – consumer needs (technology) | Julie | 0.98 | 97.31 | 1.98 | 95.33 | 2.69 | 2.05 | 0.64 |
| Evaluation – consumer needs (technology) | Sina | 0.97 | 97.85 | 0 | 97.85 | 2.15 | 2.15 | 0 |
| Evaluation – consumer needs (technology) | Nur | 0.66 | 77.98 | 0 | 77.98 | 22.02 | 22.02 | 0 |
| Evaluation – consumer needs (technology) | Nazla | 0.94 | 95.81 | 1.2 | 94.61 | 4.19 | 3.09 | 1.1 |
| Evaluation – consumer needs (technology) | Dana | 0.89 | 88.23 | 0 | 88.23 | 11.77 | 11.5 | 0.27 |
| Total | | 0.88 | 91.04 | 2.56 | 88.47 | 8.95 | 8.15 | 0.80 |
| Evaluation and Implementation – knowledge | Janet | 0.98 | 98.15 | 0 | 98.15 | 1.85 | 1.75 | 0.1 |
| Evaluation and Implementation – knowledge | Jane | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Evaluation and Implementation – knowledge | Suzy | 0.81 | 82.53 | 16.49 | 66.04 | 17.47 | 15.88 | 1.59 |
| Evaluation and Implementation – knowledge | Julie | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Evaluation and Implementation – knowledge | Sina | 0.81 | 81.18 | 6.76 | 74.42 | 18.82 | 17.84 | 0.98 |
| Evaluation and Implementation – knowledge | Nur | 0.98 | 98.3 | 12.4 | 85.9 | 1.7 | 1.7 | 0 |
| Evaluation and Implementation – knowledge | Nazla | 0.91 | 90.61 | 4.31 | 86.3 | 9.39 | 7.56 | 1.83 |
| Evaluation and Implementation – knowledge | Dana | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Total | | 0.93 | 93.84 | 4.99 | 88.85 | 6.15 | 5.59 | 0.56 |

**NVivo Coding Comparison among Young Women Consumers Group One for Objective Three**

| Node | Source | KAppa | Agreement | A and B | Not A and Not B | Disagreement | A and Not B | B and Not A |
|---|---|---|---|---|---|---|---|---|
| Product Functionality and Design Features | Azar | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Product Functionality and Design Features | Safa | 0.75 | 82.5 | 18.13 | 64.37 | 17.5 | 12.54 | 4.96 |
| Product Functionality and Design Features | Nooshin | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Product Functionality and Design Features | Saba | 0.75 | 80.09 | 15.46 | 64.63 | 19.91 | 14.71 | 5.2 |
| Product Functionality and Design Features | Amene | 0.74 | 84.08 | 3.44 | 80.64 | 15.92 | 13.32 | 2.6 |
| Product Functionality and Design Features | Fateme | 0.81 | 87.31 | 0.53 | 86.78 | 12.69 | 10.05 | 2.64 |
| Product Functionality and Design Features | Behnaz | 0.85 | 89.85 | 3.4 | 86.45 | 10.15 | 9.25 | 0.9 |
| Product Functionality and Design Features | Sahar | 0.86 | 90.98 | 2.34 | 88.64 | 9.02 | 8.22 | 0.8 |
| Product Functionality and Design Features | Hana | 0.84 | 85.81 | 6.55 | 79.26 | 14.19 | 11.19 | 3 |
| Product Functionality and Design Features | Shokoofe | 0.98 | 98.23 | 9.87 | 88.36 | 1.77 | 1.77 | 0 |
| Product Functionality and Design Features | Mahya | 0.92 | 89.15 | 5.4 | 83.75 | 10.85 | 10.85 | 0 |
| Product Functionality and Design Features | Farnoosh | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Total | | 0.87 | 90.66 | 5.42 | 85.24 | 9.33 | 7.65 | 1.67 |
| Quality of Materials | Azar | 0.61 | 80.53 | 19.49 | 61.04 | 19.47 | 15.88 | 3.59 |
| Quality of Materials | Safa | 0.63 | 80.1 | 10.09 | 70.01 | 19.9 | 14.96 | 4.94 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Quality of Materials | Nooshin | 0.9 | 80.18 | 0 | 80.18 | 19.82 | 17.84 | 1.98 |
| Quality of Materials | Saba | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Quality of Materials | Amene | 0.94 | 90.61 | 4.3 | 86.31 | 9.39 | 6.69 | 2.7 |
| Quality of Materials | Fateme | 0.95 | 98 | 4.4 | 93.6 | 2 | 1.7 | 0.3 |
| Quality of Materials | Behnaz | 0.95 | 98.43 | 21.61 | 76.82 | 1.57 | 1.53 | 0.04 |
| Quality of Materials | Sahar | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Quality of Materials | Hana | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Quality of Materials | Shokoofe | 0.87 | 85.23 | 9.87 | 75.36 | 14.77 | 10.37 | 4.4 |
| Quality of Materials | Mahya | 0.96 | 89.15 | 7.9 | 81.25 | 10.85 | 10.25 | 0.6 |
| Quality of Materials | Farnoosh | 0.75 | 88.71 | 0.01 | 88.7 | 11.29 | 11.29 | 0 |
| Total | | 0.88 | 90.91 | 6.47 | 84.43 | 9.08 | 7.54 | 1.54 |
| Environmental Knowledge and Concern | Azar | 0.77 | 92.16 | 17.85 | 74.31 | 7.84 | 6.01 | 1.83 |
| Environmental Knowledge and Concern | Safa | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Environmental Knowledge and Concern | Nooshin | 0.9 | 80.18 | 0.2 | 79.98 | 19.82 | 6.92 | 12.9 |
| Environmental Knowledge and Concern | Saba | 0.88 | 91.3 | 2.12 | 89.18 | 8.7 | 4.56 | 4.14 |
| Environmental Knowledge and Concern | Amene | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Environmental Knowledge and Concern | Fateme | 0.95 | 95 | 3.4 | 91.6 | 5 | 1.25 | 3.75 |
| Environmental Knowledge and Concern | Behnaz | 0.95 | 98.43 | 21.61 | 76.82 | 1.57 | 1.53 | 0.04 |
| Environmental Knowledge and Concern | Sahar | 0.91 | 96.31 | 0.53 | 95.78 | 3.69 | 2.64 | 1.05 |
| Environmental Knowledge and Concern | Hana | 0.88 | 97.85 | 7.84 | 90.01 | 2.15 | 1.11 | 1.04 |
| Environmental Knowledge and Concern | Shokoofe | 0.9 | 83.98 | 10 | 73.98 | 16.02 | 0 | 16.02 |
| Environmental Knowledge and Concern | Mahya | 0.94 | 86.81 | 6.55 | 80.26 | 13.19 | 9.56 | 3.63 |
| Environmental Knowledge and Concern | Farnoosh | 0.89 | 89.23 | 9.87 | 79.36 | 10.77 | 10.4 | 0.37 |
| Total | | 0.91 | 92.60 | 6.66 | 85.94 | 7.39 | 3.66 | 3.73 |

**NVivo Coding Comparison among Young Women Consumers Group Two for Objective Three**

| Node | Source | KAppa | Agreement | A and B | Not A and Not B | Disagreement | A and Not B | B and Not A |
|---|---|---|---|---|---|---|---|---|
| Product Functionality and Design Features | Mahna | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Product Functionality and Design Features | Mahsa | 0.63 | 88.5 | 1.13 | 87.37 | 11.5 | 4.96 | 6.54 |
| Product Functionality and Design Features | Elham | 0.87 | 95.42 | 0 | 95.42 | 4.58 | 4.58 | 0 |
| Product Functionality and Design Features | Pardis | 0.75 | 90.09 | 5.46 | 84.63 | 9.91 | 5.2 | 4.71 |
| Product Functionality and Design Features | Afsoon | 0.74 | 94.08 | 3.44 | 90.64 | 5.92 | 2.6 | 3.32 |
| Product Functionality and Design Features | Farzane | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Product Functionality and Design Features | Maryam | 0.85 | 94.85 | 0 | 94.85 | 5.15 | 5.15 | 0 |
| Product Functionality and Design Features | Parisa | 0.75 | 93.98 | 0 | 93.98 | 6.02 | 6 | 0.02 |
| Total | | 0.82 | 94.61 | 1.25 | 93.36 | 5.38 | 3.56 | 1.82 |
| Quality of Materials | Mahna | 0.84 | 86.81 | 6.55 | 80.26 | 13.19 | 13.19 | 0 |
| Quality of Materials | Mahsa | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Quality of Materials | Elham | 0.89 | 89.15 | 0 | 89.15 | 10.85 | 10.85 | 0 |
| Quality of Materials | Pardis | 0.75 | 88.71 | 0 | 88.71 | 11.29 | 10.19 | 1.1 |
| Quality of Materials | Afsoon | 0.77 | 92.16 | 7.85 | 84.31 | 7.84 | 7.84 | 0 |
| Quality of Materials | Farzane | 0.9 | 93.1 | 0 | 93.1 | 6.9 | 6.9 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Quality of Materials | Maryam | 0.9 | 80.18 | 0 | 80.18 | 19.82 | 19.82 | 0 |
| Quality of Materials | Parisa | 0.88 | 91.3 | 2.12 | 89.18 | 8.7 | 5.14 | 3.56 |
| Total | | 0.86 | 90.17 | 2.06 | 88.11 | 9.82 | 9.24 | 0.58 |
| Environmental Knowledge and Concern | Mahna | 0.94 | 90.61 | 4.3 | 86.31 | 9.39 | 9.39 | 0 |
| Environmental Knowledge and Concern | Mahsa | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Environmental Knowledge and Concern | Elham | 0.95 | 98.43 | 4.61 | 93.82 | 1.57 | 1.53 | 0.04 |
| Environmental Knowledge and Concern | Pardis | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Environmental Knowledge and Concern | Afsoon | 0.95 | 95 | 0 | 95 | 5 | 5 | 0 |
| Environmental Knowledge and Concern | Farzane | 1 | 100 | 0 | 100 | 0 | 0 | 0 |
| Environmental Knowledge and Concern | Maryam | 0.94 | 86.81 | 6.55 | 80.26 | 13.19 | 13.19 | 0 |
| Environmental Knowledge and Concern | Parisa | 0.89 | 89.23 | 4.87 | 84.36 | 10.77 | 10.77 | 0 |
| Total | | 0.95 | 95.01 | 2.54 | 92.46 | 4.99 | 4.98 | 0.005 |