DEVELOPING A TOOLKIT TO INCORPORATE ENVIRONMENTAL IMPROVEMENTS INTO THE FASHION DESIGN PROCESS

Prabod Dharshana Munasinghe

(178087A)

Doctor of Philosophy

Department of Textile and Apparel Engineering

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DECLARATION

I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature: *UOM Verified Signature* Date: 13/02/2023

The above candidate has carried out research for the PhD thesis under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of the supervisor: Dr. DGK Dissanayake

Signature of the supervisor: *UOM Verified Signature* Date:16/02/2023

Name of the supervisor: Prof. A Druckman

Signature of the supervisor: *UOM Verified Signature* Date:13/02/2023

DEDICATION

I would like to dedicate this thesis to my Parents Mrs Deyalage Dona Suneetha who was the class first until Grade 11 at the village school and had no financial support to continue the Advance Level examination in bio stream and later worked as a sewing operator to feed the family and Mr Ananda Ranjith Munasinghe, who was lost his entire education due to the eczema disease and later devoted his most of the life at the warm weather of Gulf countries to feed the family. Both of them knew the value of education, therefore they offered their entire spirit to build me to the current state.

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ABSTRACT

Developing a toolkit to incorporate environmental improvements into the fashion design process

The fashion industry plays a vital role in the development of the global economy while creating significant stress on the environment throughout its supply chains, due to high resource consumption, waste generation, and carbon emissions. The mass-market is the major market segment that creates sustainability concerns due to high volumes of production and low product prices that motivate consumers to buy more and throw away often. Consumer awareness and governmental concern regarding the sustainability of the fashion industry have increased and the industry is now being urged to take steps to mitigate environmental concerns. The literature reports many initiatives by various parties to address the environmental challenges in the fashion industry, but little success has been achieved to date. To address the sustainability issues of fashion products, environmental impacts need to be taken into consideration during the early stages of the product development process, and not once the product is being made. Most of the decisions of a fashion product are made in the product development stage, yet a comprehensive tool that supports making environmentally conscious decisions is lacking.

This study describes the development of a user-friendly toolkit for mass-market fashion designers, that facilitates environmentally responsible decision-making during the product development process. The toolkit is expected to provide a simple, time-efficient and inexpensive method that integrates sustainability into the design of apparel products. This study employed a mixed-method approach which used both quantitative and qualitative investigations. A systematic literature review was conducted with a meta-analysis to investigate the environmental impact of the life cycle of the fashion product to develop a database which comprises impact data across the clothing lifecycle Semi-structured interviews were conducted with mass-market fashion designers and sustainable design practitioners to investigate the key activities and decisions of the mass-market design process and to explore views concerning the impact of those decisions on the environment. Thematic analysis was used to analyse the qualitative data. Later the interconnections of both quantitative and qualitative aspects were made and those interconnections were composed into a comprehensive structure to develop the toolkit. The model is simulated as a simple web-based application that can be used as a toolkit to facilitate sustainable decision-making in the product development process. The toolkit structure includes data processing and visualisation methods, decision support protocols to improve the sustainability of the design, and a user interface of the toolkit: data inputs, decision making, presenting results and a bridge to link each interface. Finally, the simulated IT-based toolkit was validated by the fashion designers, during which the toolkit was proven to be successful in facilitating a user-friendly sustainable decision-making process.

Keywords: Sustainable fashion, Environmental sustainability, Design process, Toolkit, Sustainable development goal 12 (responsible consumption and production)

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LIST OF ABBREVIATIONS

Abbreviation	Description
BC	Before Christ
BHS	British Home Store
BRM	The Business and Retail Module
BSI	British Standards Institution
CBI	The Centre for the Promotion of Imports from developing countries
COVID19	2019 Novel Coronavirus
D4S	Design for Sustainability
DDM	Design and Development Module
E_d	Environmental impact data of dyeing
E_{gm}	Environmental impact data of garment construction methods
E_{ir}	Environmental impact data of ironing
E_{mm}	Environmental impact data of Material manufacturing
E_{me}	Environmental impact data for extraction of different materials
E_p	environmental impact per square meter of specific value addition
E_{rcy}	Environmental impact data of recycling
ES	Earth System
E_v	environmental impact per kilogramme of specific value addition
E_w	Environmental impact data of washing
F&F	Florence & Fred
FDS	Fashion Design for Sustainability
FEM	Facility environmental module
GFA	Global Fashion Agenda
GHG	Green House Gas
GRI	Global Reporting Initiative
GSM	Grammes per Square Meters
H&M	Hennes & Mauritz
IDMC	Internal Displacement Monitoring Centre
ISO	International Organization for Standardization
IT	Information Technology
IUCN	The International Union for the Conservation of Nature and Natural Resources

Abbreviation	Description
LCA	Life Cycle Analysis
Abbreviation	Description
LCI	Life-Cycle Inventory
MDG	Millenium Development Goals
MSI	Material Sustainability Index
PB	Planetary Boundary
PhD	Doctor of Philosophy
PM	Product Module
RILA	The Retail Industry Leaders Association
SAC	The Sustainable Fashion Academy
SCAP	Sustainable Clothing Action Plan
SDG	Sustainable Development Goals
SDS	Sustainable Design Strategies
SMT	Sustainable Material and Techniques
Tex	Unite weight of threads
USD	United States Dollars
WTO	World Trade Organization
WRAP	The Waste and Resources Action Programme
UNEP	United Nations Environment Programme
USA	Unites States of America
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
WCED	World Commission on Environment and Development
UNIDO	United Nations Industrial Development Organization
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNDESA	United Nations Department of Economic and Social Affairs
NIPO	National Intellectual Property Office of Sri Lanka

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