TRASH TO TREASURE: SUSTAINABLE SOLUTIONS TO TEXTILE WASTE MANAGEMENT

Dissertation submitted to

ST. TERESA'S COLLEGE, ERNAKULAM

(Autonomous)

Affiliated to

MAHATMA GANDHI UNIVERSITY

In partial fulfilment of requirement for the

AWARD OF THE DEGREE OF MASTER OF SCIENCE IN

HOME SCIENCE (BRANCH B)

RESOURCE MANAGEMENT AND INTERIOR DESIGNING

By

ANN ALEENA JIMMY

Register No. AM23HRM001

DEPARTMENT OF HOMESCIENCE AND CENTRE FOR RESEARCH

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'Certified as bonafide research work'

Signature of the Examiner **Signature of the Guide**

Signature
of the Head of the department

Date

DEPARTMENT OF HOME SCIENCE

AND CENTRE FOR RESEARCH

ST. TERESA'S COLLEGE, ERNAKULAM

CERTIFICATE

This is to certify that the thesis entitled ***'Trash To Treasure: Sustainable Solutions To Textile Waste Management'*** Is an authentic record of the original research work carried out by Ms. Ann Aleena Jimmy with **Reg.No** –AM23HRM001 under my Supervision and guidance during the academic year 2023-25.

Place: Ernakulam

Date:

Smt Ansu Tom
Assistant Professor
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St Teresa's College, (Autonomous)
Ernakulam

DECLARATION

I hereby declare that the thesis entitled ***' Trash To Treasure: Sustainable Solutions To Textile Waste Management'*** is a Bonafide record work done by me during the course of the study, under the supervision and guidance of Ansu Tom, Assistant Professor, Department of Home Science and Centre for Research, St. Teresa's College, Ernakulam.

ANN ALEENA JIMMY

Place : Ernakulam

Date :

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I would like to begin by thanking God Almighty for his constant guidance and wisdom throughout every step of this research. My heartfelt gratitude to Dr. Vinitha CSST, Provincial Superior and Manager of the College, Sr. Emeline CSST, Director of the college, Dr. Alphonsa Vijaya Joseph, Principal of The college.

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I would also like to express my gratitude to the authorities of St. Teresa's College for providing me with the necessary resources and a conducive environment to carry out my research.

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ANN ALEENA JIMMY

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ABSTRACT

The research study, *"Trash to Treasure: Sustainable Solutions to Textile Waste Management,"* tackles the critical challenge of textile waste, particularly from tailoring units, by exploring sustainable methods to repurpose discarded fabric into useful products. The project emphasizes circular economy principles, aiming to minimize environmental harm while creating value from waste. Initial findings revealed a rising consumer interest in eco-friendly, multifunctional items crafted from upcycled materials. Fabric scraps were systematically gathered from tailoring units in Ernakulam, categorized by type, and assessed for durability and potential applications. The design phase focused on creating innovative, practical products such as fabric flowers, wrist cushions, and organizers, balancing sustainability with market appeal. Standardized production techniques were developed to ensure quality and scalability, while a fair pricing model made the products accessible without sacrificing environmental goals. Challenges such as material variability, consumer perceptions, and design constraints were encountered, yet the research identified promising opportunities for growth through community involvement, awareness campaigns, and strategic collaborations. The findings demonstrate that upcycling textile waste can play a vital role in conserving resources, reducing landfill burden, and supporting local economies. Additionally, the project highlights how upcycling can shift societal attitudes, encouraging people to view waste as a valuable resource. As sustainability gains traction, upcycling emerges as a key strategy in fostering a responsible and resilient circular economy within the textile sector.

INTRODUCTION

CHAPTER 1
INTRODUCTION

Whether we realize it or not, waste is an inevitable by-product of our daily lives. From the banana peel thrown into the trash to the outdated computers gathering dust in attics, waste generation is a constant occurrence. With the world's population growing rapidly and consumerism escalating, the volume of waste produced has become a significant global issue. Every purchase eventually leads to the disposal of a previous item, and every meal generates leftovers. Factories that manufacture the goods we use also contribute to this accumulation. For a long time, the common practice was to discard waste "out of sight"—in landfills, fields, or rivers. However, it is now evident that "away" does not exist; all waste remains on Earth, posing long-term environmental threats.

Waste can be broadly classified based on its origin, composition, and potential for degradation:

- **Solid Waste**: Includes household garbage, construction debris, and municipal waste, comprising plastics, paper, metals, glass, and organic materials. Improper disposal causes soil, air, and water pollution (UNEP, 2018).
- **Hazardous Waste**: Comprises industrial chemicals, medical waste, and toxic by-products that require specialized handling to prevent environmental and health risks.
- **E-Waste**: Refers to discarded electronic devices such as computers and mobile phones, which contain valuable yet hazardous materials like gold, copper, lead, and mercury (Baldé et al., 2017).
- **Biomedical Waste**: Generated from hospitals and clinics, including syringes, dressings, and contaminated materials that can spread infectious diseases if not managed properly.
- **Textile Waste**: Includes waste from the production, consumption, and disposal of textiles, such as fabric cuttings, defective materials, old clothing, and home textiles like curtains and upholstery.

Among these, **textile waste** presents unique challenges and opportunities due to its enormous volume, complex material composition, and significant potential for creative repurposing.

Background : Textile Waste and Its Environmental Impact

The global textile industry, while a major contributor to economic growth, is simultaneously one of the planet's largest polluters. According to the United Nations Environment Programme (UNEP, 2019), the fashion industry accounts for **10% of global carbon emissions** and is the **second-largest consumer of the world's water supply**. Annually, millions of tons of textiles are discarded into landfills, incinerated, or left to degrade ecosystems, causing severe environmental impacts. In India alone, over **1 million tons of textile waste** are produced every year, with much of it ending up in informal dumping grounds (Textile Ministry of India, 2020).

Textile waste can be divided into two types:

- **Pre-consumer Waste**: By-products such as fabric scraps and damaged goods generated during manufacturing.
- **Post-consumer Waste**: Clothing and household textiles discarded after consumer use.

Alarmingly, only **15% of post-consumer textile waste** is recycled globally, with the remainder landfilled or incinerated (EPA, 2021).

Textile waste impacts the environment in various ways:

- **Landfill Overload**: Large volumes of discarded textiles rapidly fill landfills.
- **Water Pollution**: Dyeing and finishing processes contaminate water bodies.
- **Carbon Emissions**: Textile production and decomposition contribute to greenhouse gas emissions.
- **Microplastic Pollution**: Washing synthetic textiles releases microplastics into aquatic ecosystems.

Contributing factors to the textile waste crisis include:

- **Fast Fashion**: Rapid production cycles drive overconsumption and quick disposal.
- **Low Recycling Rates**: Complex, mixed-material garments are difficult to recycle.
- **Underdeveloped Infrastructure**: Especially in developing countries, formal systems for textile waste management are lacking.
- **Consumer Behaviour**: Lack of awareness and limited access to recycling programs lead to casual disposal of textiles.

Only **15%** of textiles are currently recycled, while the rest are landfilled or incinerated (EPA, 2021). Traditional methods like landfilling and incineration are no longer sustainable given the increasing environmental pressures. Hence, sustainable solutions for textile waste management are urgently needed.

The Concept of Sustainable Textile Waste Management

The concept of "**Trash to Treasure**" reimagines waste as a resource rather than refuse. It aligns with the principles of the **circular economy**, which emphasizes minimizing waste through reuse, recycling, and sustainable design (Geissdoerfer et al., 2017).

In textile waste management, sustainable approaches include:

- **Recycling**: Breaking down used textiles into fibres to manufacture new products, through mechanical (shredding) or chemical (fibre molecule breakdown) processes (Shirvanimoghaddam et al., 2020).
- **Upcycling**: Creatively repurposing textiles into new, often higher-value products without breaking them down.
- **Repair and Reuse**: Extending the life of garments through mending and repurposing.
- **Circular Fashion**: Designing garments for longevity, repairability, and recyclability (Ellen MacArthur Foundation, 2017).
- **Community-Based Initiatives**: Clothing swaps, repair cafes, donation drives, and upcycling workshops empower local communities and promote environmental awareness.
- **Technological Innovations**: Fibre-to-fibre recycling, biodegradable fabrics, and AI-based textile sorting systems are enhancing textile waste management capabilities (Fashion for Good, 2022).

These sustainable practices significantly reduce environmental degradation, conserve natural resources, and open new economic opportunities.

Relevance of the Study

Addressing textile waste is not merely an environmental necessity—it represents a profound social and economic opportunity. Textile waste management contributes to:

- **Innovation**: Encouraging new practices in recycling, upcycling, and sustainable design.
- **Employment**: Creating jobs in recycling and creative industries.
- **Resource Conservation**: Reducing carbon footprints and conserving water, land, and energy.

In particular, recycling fabric scraps from tailoring units holds immense potential. Although India stands as one of the largest textile producers, it continues to face significant waste management challenges. Kerala, with its rich tradition of craftsmanship and high population density, represents an ideal context for implementing innovative textile waste solutions.

This project focuses on **repurposing fabric scraps from tailoring units** to create a sustainable, circular model. It aims to generate insights and solutions that contribute to a more **resilient, environmentally conscious** textile industry and community. Shifting from a linear "take-make-dispose" model to a circular one is not only critical for environmental health but also offers economic and social benefits for present and future generations.

Aim of the Study

The aim of this study is to develop sustainable solutions for managing textile waste by repurposing fabric scraps, promoting circular economy practices, and reducing environmental impact.

Objectives

- To identify the types and sources of textile waste, especially fabric scraps from tailoring units.
- To analyze the environmental impacts caused by improper textile waste disposal.
- To explore sustainable practices such as recycling, upcycling, and reuse in textile waste management.
- To design and implement creative methods for repurposing textile waste into valuable products.
- To contribute to the development of a circular economy model in the textile sector through innovative waste management strategies.

LITERATURE REVIEW

CHAPTER 2
LITERATURE REVIEW

According to Creswell (2005), "A review of literature is a written summary of journal articles, books, and other documents that describes the past and current state of information, organizes the literature into topics, and documents a need for a proposed study." It involves the presentation, classification, and evaluation of what other researchers have written on a particular subject. The literature pertaining to the study titled "Trash to Treasure: Sustainable Solutions to Textile Waste Management" is presented in this chapter under the following subheadings:

2.1) Apparel Industry – Textile Waste Production
2.3) Textile Waste and Its Environmental Impact
2.4) Fast Fashion and Consumer Behaviour
2.5) Sustainable Practices in the Fashion Industry
2.6) Upcycling and Innovation
2.7) Consumer Awareness and Education
2.8) Government and NGO Initiatives

2.1) Textile Waste and Its Environmental Impacts

The article *Environmental Impact of Textile Reuse and Recycling – A Review* examines the environmental benefits and challenges associated with textile reuse and recycling. It highlights the substantial environmental impact reductions when textiles are reused, particularly when compared to producing new garments. However, the study points out that recycling methods, especially for blended fabrics, face technical challenges that reduce the efficiency of recycling processes. Mechanical recycling often results in downcycling, while chemical recycling has higher energy demands but can produce materials close to virgin fibre quality. Efficient collection and sorting are crucial to maximizing the benefits of textile recycling (Sandin et al., 2019).

In the study *Circular Economy for Textile Waste Management*, the authors emphasize the concept of a circular economy as a solution for managing textile waste. By integrating circular principles, the fashion industry can significantly reduce the environmental footprint of textile

waste. The paper discusses strategies like garment repair, reuse, recycling, and upcycling, while also stressing the importance of sustainable design. It highlights the need for comprehensive policy frameworks and better consumer participation in recycling initiatives (MDPI, 2023).

Environmental Sustainability of Textile Waste Management Systems investigates the sustainability of various textile waste management systems. The researchers found that waste-to-energy systems and landfilling present high environmental impacts, with landfilling contributing to long-term environmental degradation due to leaching and methane emissions. Recycling, although beneficial, remains underutilized due to logistical and economic barriers, including inadequate infrastructure for sorting and processing textile waste. The study calls for improved recycling technologies and better policy incentives (ScienceDirect, 2025).

In *Textile Waste Recycling and Management for Sustainability*, the study reviews current technological advancements in recycling and explores the potential for improved material recovery. It discusses the environmental challenges associated with the textile supply chain, including high water and energy consumption in production. The study concludes that increasing the use of recycled fibres in textile production can reduce these impacts, and developing chemical recycling technologies for mixed-fibre fabrics is key to enhancing sustainability in the industry (Taylor & Francis, 2024).

Textile Waste and Human Health: A Review focuses on the health implications associated with textile waste, particularly the release of hazardous chemicals from synthetic textiles, such as dyes, plastics, and flame retardants. These chemicals can pose risks to human health, especially in communities where textile waste is dumped or incinerated. The study underscores the need for more stringent regulations on textile production and waste management practices to protect both environmental and human health (PMC, 2007).

The article *Sustainable Textile Waste Management Strategies: A Global Perspective* compares global approaches to sustainable textile waste management. It finds that while developed countries have made strides in recycling and waste reduction, developing nations still face significant challenges, such as inadequate infrastructure and lack of consumer awareness. The paper advocates for a multi-tiered approach involving government policies, industry innovation, and consumer education to address textile waste effectively (Frontiers in Environmental Science, 2024).

In *Waste of Textiles: A Global Crisis*, the authors discuss the global scale of textile waste, emphasizing its contribution to landfills and pollution. The article quantifies the environmental costs, particularly focusing on the water and chemical footprint of textile production. The study urges industries to adopt more sustainable manufacturing processes and highlights the importance of a global shift toward circular economies and product life extension (Nature Sustainability, 2020).

The paper *Sustainable Design and Textile Waste* explores the intersection of sustainable design and textile waste, proposing that design for disassembly and the use of biodegradable materials can reduce waste. It argues that integrating sustainability into design can help reduce textile waste and environmental impacts at the product's end of life. It calls for increased collaboration between designers, manufacturers, and consumers to ensure that sustainability is prioritized in the fashion industry (SAGE Journals, 2024).

According to the U.S. Environmental Protection Agency (EPA, 2023), textile waste constitutes a significant portion of the overall municipal solid waste, with millions of tons of textiles discarded annually. The EPA report highlights the benefits of recycling, including the conservation of resources and the reduction of landfill use. The report also addresses the economic advantages of textile recycling and stresses the importance of public participation in recycling programs.

2.2) Textile Waste and Its Environmental Impact

Fletcher (2008) highlighted that fast fashion, characterized by cheap, disposable clothing, significantly contributes to the accumulation of textile waste. Consumers tend to discard garments after minimal use, leading to environmental issues such as landfilling and incineration. The study emphasized the need for sustainable design and consumer awareness.

Birtwistle and Moore (2007) examined consumer behaviour in relation to fast fashion and found that low-cost garments promote a "throwaway culture." The study revealed that more than 30% of garments purchased are not worn more than once, contributing heavily to textile waste in the UK. This behavior has become a key factor in increasing textile landfills.

WRAP (2012) estimated that the UK alone sends over 350,000 tonnes of clothing to landfill each year. The environmental impact includes methane emissions during decomposition,

chemical leachate, and the inefficient use of water and energy resources during production. The report advocates for recycling and reusing garments to reduce waste.

Norimaki and Hassi (2011) argued that sustainability in fashion must go beyond production and include ethical consumption. Their study links overconsumption to environmental degradation and suggests that sustainable consumer behaviour can significantly reduce textile waste. They also propose that design thinking should involve product longevity and end-of-life consideration.

Shen (2014) conducted a life cycle assessment of various textile fibres and found that synthetic fibres like polyester have higher carbon footprints due to their dependence on fossil fuels. Natural fibres such as cotton, while biodegradable, consume significant water and pesticide inputs. The study urges the need for developing low-impact materials.

Wang (2010) focused on post-consumer textile waste and emphasized the limited infrastructure for recycling garments. The study identified that only a small portion of discarded textiles is recycled due to lack of awareness, collection systems, and technological limitations in sorting and processing mixed fibres.

Claudio (2007) reported that the dyeing and finishing processes of textiles release vast amounts of hazardous chemicals into water bodies. These chemicals can harm aquatic life and contaminate drinking water sources. The study called for stricter regulations and the use of eco-friendly dyes and processes.

Domina and Koch (2002) studied consumer attitudes toward clothing disposal and found that although many people were aware of environmental impacts, convenience often dictated disposal methods. The study recommends implementing community-based recycling programs and incentivizing sustainable disposal habits.

Muthu (2015) compiled a comprehensive overview of the environmental impacts of textile production, including greenhouse gas emissions, toxic effluents, and solid waste. His work emphasizes the importance of adopting cleaner technologies, circular economy models, and sustainable certifications in the industry.

Rossi et al. (2020) analysed the global patterns of textile waste generation and management. They reported that developing countries face additional challenges due to limited infrastructure

and rising imports of second-hand clothes. The study advocates for global policy frameworks to address textile waste at both production and consumption levels.

2.3) Fast Fashion and Consumer Behaviour

The fast fashion industry has dramatically altered clothing consumption patterns, leading to significant environmental impacts, particularly in the form of textile waste. Numerous studies have investigated the intricate relationship between fast fashion, consumer behaviour, and waste generation, each contributing unique insights to this growing concern.

Fletcher (2008) initially highlighted how the acceleration of fashion cycles directly influenced consumer purchasing habits, resulting in increased clothing disposal rates. According to her study, the shift toward cheaper, mass-produced garments encouraged consumers to treat clothing as disposable commodities, thereby intensifying textile waste accumulation.

Building upon Fletcher's work, Birtwistle and Moore (2007) explored the paradox between consumer awareness and behaviour. They found that although consumers expressed concern for environmental issues, their actual shopping practices, driven by low prices and rapidly changing trends, perpetuated unsustainable consumption. Their findings emphasized a disconnect between values and actions, positioning fast fashion as a catalyst for "throwaway culture."

Further deepening this understanding, Joung (2014) examined young consumers' apparel disposal behaviours. Her research revealed that factors such as low emotional attachment, impulsive buying tendencies, and easy accessibility to affordable fashion contributed heavily to frequent discarding of clothing. Joung emphasized that promoting emotional durability of garments could be a potential solution to reducing waste.

Meanwhile, Niinimäki and Hassi (2011) investigated the psychological drivers behind fast fashion consumption. They found that consumers often associate new clothing purchases with self-expression and social belonging. This emotional connection to newness, rather than to the garments themselves, compounded the cycle of overconsumption and rapid disposal.

Adding a socio-economic perspective, Claudio (2007) discussed the role of globalization in expanding fast fashion's reach. Her study showed how global supply chains and offshore manufacturing reduced production costs, making fashion even more accessible but

simultaneously creating environmental and ethical issues, including massive amounts of textile waste ending up in landfills globally.

In contrast to these findings, Morgan and Birtwistle (2009) emphasized the critical role of consumer education. Their research suggested that when consumers were provided with information about the environmental impacts of fast fashion, their purchasing intentions shifted toward more sustainable alternatives. However, the shift often remained at the intention stage rather than translating into tangible behaviour changes.

Exploring the barriers to sustainable consumption, McNeill and Moore (2015) found that consumers faced significant challenges in altering their habits. Convenience, price sensitivity, and limited availability of sustainable options were major obstacles that prevented consumers from embracing eco-friendly practices despite growing awareness of environmental issues.

Armstrong et al. (2015) further explored how value-driven consumption could foster sustainable behaviour. Their study demonstrated that individuals with higher intrinsic motivations, such as concern for the environment and ethical responsibility, were more likely to engage in practices like upcycling, garment repair, and purchasing second-hand clothing, thus mitigating textile waste generation.

Building on this, Shen, Zheng, and Chow (2014) investigated the concept of "green perceived value" and its influence on consumer decision-making. They found that consumers who perceived environmental benefits in their clothing purchases were more inclined to choose sustainable fashion products, suggesting that enhancing green marketing strategies could shift consumption patterns positively.

Finally, Joy et al. (2012) synthesized these themes by examining the inherent contradictions in consumer attitudes. Their study revealed that while consumers enjoyed the affordability and novelty of fast fashion, many also expressed guilt and concern regarding its environmental impact. This cognitive dissonance indicated that while awareness is rising, significant behavioral change remains elusive without systemic industry shifts and stronger regulatory interventions.

2.4) Sustainable Practices in the Fashion Industry

Mellor, 2023 explores how businesses in the fashion industry can integrate sustainable practices into their operations and the challenges they face. The research highlights that sustainability can lead to long-term profitability, though initial costs may be higher. Companies are encouraged to adopt circular business models and focus on transparency to improve their sustainability performance. Sustainable fashion practices not only enhance environmental benefits but also resonate with consumers' growing concern for sustainability, affecting brand loyalty and market positioning (Mellor et al., 2023).

Bertolotti et al. (2023) examine how digital transformation impacts sustainable practices in the fashion industry. They emphasize the role of e-commerce platforms in promoting eco-friendly fashion and educating consumers about sustainability. The research concludes that while digital consumption reduces the carbon footprint compared to traditional retail, it also encourages overconsumption, which presents challenges for sustainable fashion. There is a clear need for a balance between consumer demand and sustainable practices (Bertolotti et al., 2023).

Duarte et al. (2023) systematically categorize and assess various sustainable fashion practices, examining the entire lifecycle of fashion products—from production to disposal. They identify the pre-purchase, use, and post-use phases as key stages for promoting sustainability, suggesting that the industry needs to increase consumer awareness about sustainable choices. The study also emphasizes the importance of innovations such as recycling, upcycling, and the use of sustainable materials (Duarte et al., 2023).

The article by *Columbia Climate School* (2022) addresses the complexity of achieving sustainability in the fast fashion industry. It discusses the trade-off between fast fashion's demand for constant innovation and the sustainability imperative. Sustainable fashion is seen as a complex challenge requiring the industry to reassess its business model, emphasizing durability, eco-friendly materials, and reducing the carbon footprint. The article also underscores the importance of collective industry action and consumer education to drive change (Columbia Climate School, 2022).

According to *Oracle Retail* (2022), the fashion industry faces numerous sustainability challenges, such as high raw material costs, waste, and ethical labor practices. The study stresses that while brands are under increasing pressure to adopt sustainable practices, the

financial implications of such practices can be significant. Nonetheless, the research highlights that consumers are increasingly demanding sustainable products, pushing companies to find innovative solutions such as sustainable sourcing and better waste management strategies (Oracle, 2022).

Lindenwood University (2023) examines various eco-friendly practices within the fashion industry, focusing on both challenges and opportunities. The authors discuss how eco-conscious fashion brands are embracing ethical production methods, such as using organic materials, and how this is contributing to both the industry's sustainability and consumer trust. They also point out that consumer education and transparency are vital for fostering long-term sustainability (Lindenwood University, 2023).

The article by *ScienceDirect* (2022) focuses on the issue of greenwashing within the fashion industry, where brands falsely advertise their products as sustainable to appeal to eco-conscious consumers. It highlights that, while many companies make sustainability claims, the lack of genuine efforts undermines consumer trust. The paper advocates for stricter regulatory measures and the implementation of reliable certification systems to prevent misleading claims and encourage authentic sustainable practices in the industry (ScienceDirect, 2022).

2.5) In India -Upcycling and Innovation

Kant (2012) initiated a discourse on the *Environmental Hazards Posed By The Textile Industry*, highlighting the urgency for consumer education to mitigate waste production. The study identified that although large manufacturing sectors are often criticized, small-scale units like tailoring shops contribute substantially to waste generation. This foundational insight underlines the necessity of grassroots awareness, especially among consumers who interact directly with tailoring services.

Building on Kant's environmental perspective, Bhatia and Sharma (2015) analyzed *Consumer Behaviour Toward Textile Waste In Urban India*. They found a direct correlation between consumer knowledge and sustainable practices, indicating that increased awareness campaigns could lead to a decline in textile waste from tailoring units. Their research stressed that tailored garments often produce more offcuts compared to factory-made apparel, thus requiring specific educational interventions for consumers who prefer bespoke clothing.

Extending the discussion to a regional context, Menon (2017) conducted a case study in Kerala, revealing that traditional tailoring units are significant yet overlooked sources of textile waste. Menon observed that while tailoring units are culturally ingrained in Kerala's society, consumers seldom inquire about fabric leftovers or sustainable disposal practices. The study emphasized the necessity for localized education programs that respect cultural preferences while promoting eco-friendly choices.

Further elaborating on the Kerala context, Suresh and Pillai (2018) investigated public participation in textile waste reduction initiatives in Thiruvananthapuram. Their findings suggested that when consumers are informed about the life cycle of textiles and waste consequences, they are more likely to engage in reuse or recycling practices. Suresh and Pillai's work recommended integrating consumer education modules into community events and tailoring shops themselves.

While Suresh and Pillai focused on community-level engagement, Joseph et al. (2019) explored the impact of school-based education programs on shaping sustainable consumer behaviour. Their experimental study in Kochi demonstrated that early awareness initiatives significantly influenced family purchasing and disposal habits. Joseph et al. Advocated for a bottom-up approach, where children act as change agents within households, indirectly influencing tailoring unit waste dynamics.

Adding a socio-economic dimension, Rao and Patel (2020) studied the relationship between socio-economic status and textile waste awareness across India. They found that higher income groups often generated more waste through frequent custom-made purchases yet lacked awareness regarding waste disposal. Conversely, lower-income groups, despite generating less waste, exhibited higher rates of reuse. Their study highlighted the need for differentiated educational strategies tailored to diverse socio-economic backgrounds.

Responding to Rao and Patel's call for customized strategies, Nair (2020) conducted research on the effectiveness of visual campaigns in Kerala's tailoring hubs. The study found that graphical representations of waste impact, displayed in tailoring shops, significantly increased consumer inquiries about fabric management and reuse options. Nair emphasized that visual and easily comprehensible communication could bridge the awareness gap effectively.

Chandran (2021) focused on digital education platforms in Kerala aimed at promoting sustainable tailoring practices. The study assessed initiatives like webinars, social media campaigns, and mobile applications targeting both tailors and consumers. Chandran's research revealed that digital tools, when localized linguistically and culturally, significantly enhanced consumer engagement in textile waste reduction practices.

Subsequently, Mathew and Varghese (2022) examined the role of tailor associations in promoting consumer awareness in Kerala. Their field study documented initiatives where tailoring units collaborated with NGOs to distribute educational pamphlets and offer incentives for customers who brought reusable materials. The study indicated that direct intervention at the tailoring unit-consumer interface holds promise for widespread behavioural change.

Finally, linking back to the broader environmental imperative, Thomas (2023) reviewed the policy framework regarding textile waste in India. He pointed out that existing regulations largely overlook small-scale units and emphasized that consumer education must be recognized formally in policy discourse. Thomas advocated for mandatory awareness signage in tailoring units and the inclusion of textile waste management education in broader environmental sustainability programs.

2.6) Consumer Awareness and Education

Bhatia and Sharma (2015) analysed consumer behaviour toward textile waste in urban India. They found a direct correlation between consumer knowledge and sustainable practices, indicating that increased awareness campaigns could lead to a decline in textile waste from tailoring units. Their research stressed that tailored garments often produce more offcuts compared to factory-made apparel, thus requiring specific educational interventions for consumers who prefer bespoke clothing.

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2.7) Government and NGO Initiatives in India

Sharma and Gupta (2019) explore various government policies and NGO efforts in India aimed at tackling textile waste. They discuss the role of NGOs like Goonj and Chintan Environmental Research and Action Group in promoting sustainable textile waste management through upcycling initiatives. Government efforts, such as the *lSwachh Bharat Abhiyan, have contributed indirectly by encouraging cleanliness drives that also address textile waste in urban areas. The study highlights the challenges in scaling up these efforts due to insufficient infrastructure and lack of awareness.

Patel and Bhat (2020) focus on Kerala as a case study to explore upcycling initiatives in the textile sector. Their research examines local NGOs working in the region to reduce textile waste by repurposing it into usable products like bags and home decor items. The study concludes that Kerala has shown potential in integrating traditional techniques with modern sustainable practices, but challenges remain in terms of providing a steady supply of waste materials and fostering wider community involvement.

Kumar and Singh (2021) provide a comprehensive review of government regulations regarding textile waste management in India. They analyse policies such as the *Extended Producer Responsibility (EPR)* framework and its implications for textile producers. The authors argue that while the government has established regulations to manage textile waste, their implementation remains inconsistent, particularly in smaller tailoring units. They advocate for more robust policies that encourage the adoption of upcycling technologies at the grassroots level.

Thomas and Joseph (2022) investigate how local NGOs in Kerala have been working closely with tailoring units to implement upcycling programs. The research reveals that NGOs have been instrumental in providing training to workers on how to upcycle textile waste into new products, helping reduce environmental impact while simultaneously generating income for local communities. The study finds that such initiatives are most effective when there is strong collaboration between NGOs, the government, and local businesses.

Patel and Singh (2023) examine the synergy between governmental and non-governmental organizations in reducing textile waste in Kerala. They highlight the *Kerala State Pollution Control Board's* efforts in promoting awareness about textile waste and the role of NGOs in providing alternative livelihoods through upcycled products. Their study suggests that collaboration between these entities has been instrumental in creating a circular economy for textile waste.

Rao and Sharma (2021) explore upcycling initiatives in South India, with a focus on both government schemes and NGO-led projects. They report on the implementation of the *National Mission on Sustainable Agriculture* and *Swachh Bharat Mission* in states like Kerala. Their findings show that while there is an increase in awareness and some positive outcomes, the lack of infrastructure and market linkages for upcycled products hinders scalability. They suggest the integration of upcycled products into mainstream markets could drive further success.

George and Nair (2021) investigate the role of NGOs in Kerala's tailoring industry, particularly focusing on the reuse and upcycling of textile waste. Their study demonstrates how small tailoring units have started adopting sustainable practices with the help of NGOs, which have introduced innovative techniques for transforming fabric waste into new, saleable products. The research highlights a lack of formal certification processes, which may affect the credibility and acceptance of upcycled products in larger markets.

Singh and Mehta (2020) discuss the role of government schemes, such as *Make in India and* the *National Textile Policy*, in addressing textile waste reduction. They argue that while the government has introduced schemes to promote sustainable practices, tailoring units often fail to access these benefits due to the lack of outreach programs in rural and semi-urban areas. The authors call for better alignment between government initiatives and the specific needs of tailoring units in small-scale settings.

Verma and Iyer (2021) assess the challenges and opportunities in scaling up textile upcycling initiatives in Kerala. They analyse both government and NGO contributions to waste reduction, highlighting successful case studies and programs. Their study reveals that while upcycling initiatives have achieved some level of success in terms of local engagement and waste reduction, issues related to waste segregation, labour conditions, and financial support for small-scale enterprises persist.

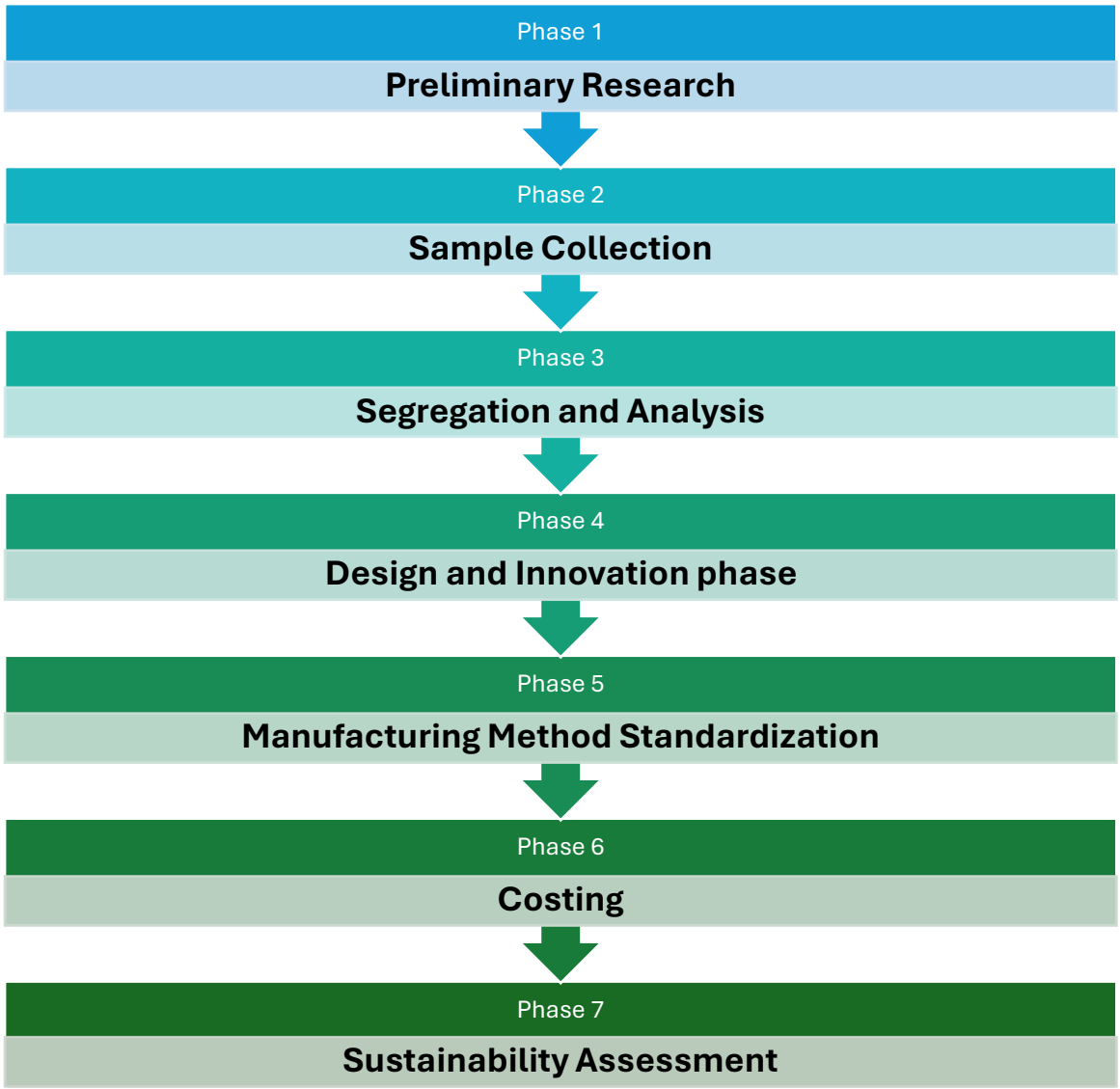
Patil and Fernandes (2023) provide a detailed case study of Kerala's textile waste management system, focusing on the role of policies and NGO interventions. Their research suggests that while there are numerous policies in place to curb textile waste, their enforcement is often lacking. NGOs play a critical role in educating tailoring units about the benefits of upcycling, yet financial and technical support remains a barrier to widespread adoption. The study advocates for enhanced government-NGO collaboration to create a more sustainable textile waste management system.

METHODOLOGY

CHAPTER 3

METHODOLOGY

This research involves creative, environmentally-friendly products that are manufactured in an upcycling process of unused fabric as the by-product of unused fabric materials. The exploratory and experimental method employed involves a systematic treatment of examining, choosing, designing, and creating green products. The research process has been divided into six major phases to facilitate a thorough and systematic examination of the upcycling process of fabric waste: Preliminary Research, Sample Collection, Segregation and Analysis, Design and Innovation Phase, Costing, and Evaluation and Sustainability Assessment.



1. Preliminary Research

The first research stage is necessary in order to understand the current situation of upcycled fabric goods, consumer fashion, market trends, and future potential for green innovations. For this stage, a thorough online market study was conducted in order to gather information about product demand made out of fabric wastage, popularity of certain design techniques, existing product ranges, and pricing adopted by other competitors in this space.

It involved the study of websites, online shops, blogs, and social media pages of brands and individual designers selling upcycled textile products. Emphasis was placed on product categories such as bags, pouches, home decor, and apparel, which were found to have high appeal among consumers who care about the environment. Data collected made it possible to find out what type of fabric wastage was used most often, in what forms it was processed, and via which channels they were sold and at what price.

The knowledge acquired from this stage formed the basis for the rest of the stages by assisting in defining the design emphasis, intended audience, and appropriate materials. It also assisted in the identification of market loopholes that the ongoing project could target to fill, such as a shortage of multifunctional products using common tailor rubbish or innovative uses of mixed textile leftovers.

2. Sample Collection

At the end of the research process, focus was directed to the tangible aspect of the project—the acquisition of fabric waste samples. The aim was to collect extensive varieties of cloth remnants that may be utilised as raw materials in the product manufacturing process.

Scrap cloth was primarily procured from domestic tailor shops, small-scale garment manufacturing units, and textile dustbins in Ernakulam, Kerala. These locations were chosen because they were nearby, accessible, and regularly disposed of mixed textile rubbish. This entailed not only scrap collection but also documentation of the source, category, and status of scrap materials collected. Textile variation in prints, textures, and sizes was indispensable in creating original flexibility in design development. The materials obtained were cotton, denim, polyester blends, silk scraps, and synthetic knits, presenting a wide range of options for experimentation.

3. Segregation and Analysis

After gathering, sorting, analysing, and evaluating the fabric samples were the subsequent steps. This was the determining phase on what materials were to be reused and how they were to be integrated into the design process.

Sort by Fabric Type

The separation of the fabric samples according to the kind of fibres and fabrics it was composed of was the initial level of segregation. Categorisations were:

- Natural fabrics (cotton, silk, linen)
- Semi-synthetic materials (rayon, viscose)
- Synthetic materials (polyester, nylon)
- Blended materials (cotton-poly blends, stretch denim)

Each category had unique properties that made them particularly well-suited for specific purposes. Cotton scrap, for instance, was better suited for patchwork, while stretchy poly blends were better suited for stretchy items like pouches or covers.

Identify Recyclable or Reusable Materials

The second tier of analysis was on identifying the materials that were recyclable or reusable. This examined each fabric sample for usability considerations like strength, texture, stretch, colourfastness, and water absorbing capacity. Other fabrics were discarded if they were too small, too worn, or could not be further processed.

This assessment was conducted mainly through trial-and-error methods. For instance, samples were tried out by stitching small pieces together and observing how they behave when ironed, washed, or stretched. Testing allowed for the identification of fabrics that were easy to handle, aesthetically pleasing, and held together well for product creation.

Final Selection

Based on the above assessments, a carefully chosen selection of waste fabric was concluded. Such fabrics were chosen not merely for their functionality but also for looks and creativity. Selected fabrics were segregated and stored in a systematic manner to make designing easier.

4. Design and Innovation phase

This phase was the core of the project where practicality and creativity intersected. The activity here involved redesigning raw waste fabric material into functional and pleasing products through cautious thinking, prototyping, and innovation.

Product Identification and Design Development

A line of products was conceptualized based on the earlier market research and availability of materials. *Fabric Lilly Flower, Fabric Orchid, Wrist rest cushion, Key organiser, Tiffin Box Carrier Bag, Specs Pouch, Floral Fabric Bracelets, Car seat belt cushion protector* were selected as being good upcycling prospects since they have uncomplicated structures, marketability, and utility value.

Initial sketches were made, followed by paper patterns. The designs incorporated the properties and limitations of the chosen fabric materials. The prototyping process was iterative, involving the production of trial versions of each product, identifying design flaws, and making adjustments to dimensions, seams, and structural supports.

Design Techniques

Various upcycling and innovative textile methods were employed to effectively utilize the fabric waste:

- **Patchwork**: Ideal for limited quantities of linen and cotton, patchwork allowed for a dense, textured, and eye-catching appearance.
- **Deconstruction and Reconstruction**: Extensive parts of frayed clothes or leftover fabric bits were deconstructed and reconstructed in a new form.
- **Layering & Stuffing:** In products like pouches and coasters, pieces of different fabrics were stitched together in layers to provide thickness and durability. This was stuffed with fabric cut pieces for cushioning.

All these processes were attempted with an artistic yet practical approach so that the final product was not only sustainable but also market-fitting in terms of functionality and design.

5. Manufacturing Method Standardization

A standard process for the production of each product was developed to maintain consistency and scalability. This included:

- Creating accurate cutting patterns to ensure maximum use of fabric and reduce waste

- Creating sewing instructions with diagrams
- Establishing quality control measures such as the quality of stitching, seam strength, and finishing

Care was taken to reduce secondary waste generated in sewing and cutting. Proper layout planning (fabric nesting) ensured optimal utilization of each piece of cloth.

Reusable templates and tools were developed to provide consistency across all of the items, especially if mass production is ever an option in future releases.

6. Costing

An understanding of the product development process economics was essential to make the project financially feasible. This stage was all about costing production and formulating pricing strategies.

Cost Evaluation

The total cost of production for each product was calculated by considering:

- Material Cost: Though free waste fabric was gathered, the costs of transportation, cleaning, and storage were taken into account.

Pricing Strategies

End-product pricing was received based on a value-based pricing method. It considered the following:

- Production cost
- cost plus pricing was used

The items were priced in a way that they maintain an appropriate profit margin but are not very expensive for green-conscious consumers.

RESULTS

&

DISCUSSION

CHAPTER 4

RESULTS & DISCUSSION

The fashion industry's waste problem is impossible to ignore—mountains of discarded fabric pile up in landfills, polluting our planet while valuable materials go to waste. But what if we could change that? This study dives into the creative world of textile upcycling, showing how something as simple as fabric scraps from tailors can be reborn as stylish, functional products. By giving new life to discarded materials, we're not just reducing waste—we're building a more sustainable future. In the Results section, the study discovered, from the types of fabrics most commonly thrown away to the surprising range of products we crafted from them. Then, in the Discussion, it explores the real-world challenges (like inconsistent material quality and shifting consumer mindsets) as well as the exciting possibilities, from community workshops to scalable eco-friendly businesses. This isn't just about recycling—it's about rethinking waste altogether, proving that sustainability and creativity can go hand in hand.

4.1) Online survey assessment on upcycled fabric products

4.2) Fabric Exploration and Choice

4.3) Product Identification, Design and Development

4.4) Standardisation of procedure for making floral products from fabric waste

4.5) Manufacturing method and cost evaluation

4.1 Online survey assessment on upcycled fabric products

The given table showa the various upcycled products of fabric waste that are available on online websites.

Table 4.1

Online market survey of fabric upcycled products

SL. NO	Company name	Upcycled products of fabric waste available	Country of origin	Online site product available	Website address
1	ScrapShala	Handcrafts	India	Company Website	https://scrapshala.com/
2	ReCharkha – The EcoSocial Tribe	Bags, home decor	India	Company Website	https://www.recharkha.org/
3	Upcycled Treasures	Fabric Flowers	USA	Etsy, Company Website	www.upcycledtreasures.com
4	Rebloom Designs	Fabric Wall Art	Canada	Etsy, Company Website	www.rebloomdesigns.ca
5	The Fabric Alchemist	Fabric Jewellery	UK	Etsy	www.thefabric-alchemist.com
6	Eco Chic Creations	Fabric Home Decor	Australia	Company Website	www.ecochiccreations.com.au

4.2) Fabric Exploration and Choice

To assess the availability of fabric waste, field visits were conducted to several local tailoring shops across different areas. Instead of employing random sampling, a targeted approach was adopted, and visits were concluded once no new types of fabric waste were identified, ensuring a comprehensive understanding of the waste materials generated.

During these visits, fabric scraps discarded in waste bins were carefully examined, and informal conversations were held with tailors to gather insights into fabric usage and disposal practices. Particular attention was given to the types of materials discarded, along with their sizes, colours, conditions, and whether they were of natural (e.g., cotton) or synthetic origin. Textures and weaving patterns were also closely observed. To facilitate detailed analysis, photographs of the fabric scraps were taken, aiding in the sorting and categorisation process. The findings indicated that satin, cotton, and organza were among the most commonly

discarded materials, suggesting strong potential for upcycling and sustainable reuse. Data collection relied on direct observation combined with informal interviews, providing a practical understanding of the quantity and quality of fabric waste generated. This hands-on method ensured that the findings were both accurate and applicable for future reuse projects. This phase of the study successfully identified the materials most suitable for sustainable repurposing, contributing to waste reduction efforts and supporting eco-friendly practices within the tailoring units.

Figure 4.1: Scrap clothes from tailoring units

4.3) Product identification, Design and Development

Product Identification

1. Fabric Lilly Flower
2. Fabric Orchid
3. Wrist rest cushion
4. Key organiser
5. Tiffin Box Carrier Bag
6. Specs Pouch
7. Floral Fabric Bracelets
8. Car seat belt cushion protector

4.3.1 Fabric Lilly Flower

Fabric lily flowers are handmade creations crafted from leftover satin fabric collected from local tailoring shops. These sustainable floral alternatives offer an eco-friendly option compared to fresh or plastic arrangements. By repurposing satin scraps that would otherwise be discarded, these creations contribute to reducing textile waste and promote a circular economy within the fashion industry.

Each flower is meticulously handcrafted, demonstrating that discarded materials can be transformed into aesthetically appealing products. The natural shine and softness of satin make it an ideal material for replicating the delicate and graceful form of real lilies. Artisans cut, layer, and shape the fabric into lifelike petals, employing techniques such as folding, pleating, and stitching to enhance depth and realism. Beyond their aesthetic value, these fabric lilies are highly versatile, serving as embellishments for hair accessories, clothing, table centrepieces, and home décor. As each piece is handmade, every flower possesses a unique character, adding a personal and distinctive touch. Moreover, these fabric lilies embody a meaningful narrative of sustainability and innovation. They illustrate how beauty can emerge from discarded materials, encouraging a shift in perspective regarding waste and resourcefulness. Each fabric lily is not only a decorative item but also a symbol of connection to the local tailoring community and the broader upcycling and waste reduction movement. Ultimately, these fabric lilies represent the transformative potential of creative reuse. They serve as a reminder that with thoughtful effort, sustainable practices can produce outcomes that are both environmentally responsible and artistically inspiring.

4.3.2 Fabric Orchid:

Fabric orchids are unique handmade creations, meticulously crafted from leftover fabric collected from local tailoring shops. These artistic floral representations repurpose discarded textiles, transforming them into visually striking decorative pieces. Each orchid is carefully assembled by hand, with fabric scraps shaped into delicate petals, detailed stems, and lifelike floral forms.

Beyond serving as aesthetic decorations, fabric orchids offer a sustainable alternative to fresh flowers, contributing to the reduction of textile waste and supporting circular economy practices. Unlike real plants, they require no watering or maintenance, while still providing the natural elegance and charm associated with floral displays.

In addition to their visual appeal, these upcycled creations symbolise innovation and sustainability, demonstrating the potential to reimagine everyday waste into valuable and artistic products. Fabric orchids are commonly used as home décor accents, adding artistic character to shelves, tables, or wall displays. Some are also exhibited as standalone art pieces, highlighting the craftsmanship and creative skill involved in their production. Fabric orchids further serve as meaningful, environmentally conscious gifts, appealing to individuals who value handmade artistry and sustainable living practices. Each piece conveys a message of environmental stewardship and careful craftsmanship. By selecting fabric orchids, consumers support local artisans and contribute to a broader movement that redefines waste as a resource for artistic and functional creation.

In a society increasingly dominated by disposable goods, fabric orchids offer a compelling reminder of resourcefulness, renewal, and the enduring value of sustainable practices.

4.3.3Wrist Rest Cushion

Handcrafted from leftover fabric scraps sourced from local garment factories, these wrist rest cushions serve as both ergonomic essentials and sustainable solutions for computer users. Designed to support the wrist during mouse usage, they promote a natural hand position, thereby reducing strain and minimising the risk of musculoskeletal disorders (MSDs) commonly associated with prolonged desk work.

In addition to their ergonomic benefits, these cushions contribute to environmental sustainability by repurposing discarded textiles, diverting fabric waste from landfills, and

promoting a circular approach to product design. Each cushion is unique, reflecting the aesthetic potential of upcycled materials and introducing a distinctive artistic element to workspaces.

Beyond their functional utility, these wrist rests embody a broader commitment to sustainability and community empowerment. By transforming textile waste into practical products, they illustrate how thoughtful innovation can address both environmental and health concerns. Whether utilized in home offices or corporate settings, these wrist rest cushions offer a practical means of supporting personal well-being while advancing eco-friendly practices. Thoughtfully crafted and rich in character, these cushions exemplify the intersection of comfort and sustainability, demonstrating that environmentally conscious design can enhance everyday living, one product at a time.

4.3.4 Key organizer

These practical key organizers function not only as convenient accessories but also as eco-friendly solutions for maintaining key organization while supporting sustainability initiatives. Constructed from fabric scraps sourced from local textile workshops, each organizer is meticulously handcrafted, thereby extending the life cycle of materials that might otherwise be discarded in landfills. Through the repurposing of textile waste, these products contribute to waste reduction and promote a circular economy that emphasizes resource reuse over disposal. Each key organizer is distinct, showcasing the creativity and adaptability of upcycled fabrics. Featuring a variety of patterns, textures, and colors, these organizers introduce a unique, artisanal element to everyday routines. Beyond their primary function of securing and managing keys, they serve as tangible reminders of the importance of mindful consumption. The significance of these key organizers lies in their dual impact: offering practical utility while advancing environmental awareness. Selecting a handcrafted, upcycled key organizer supports sustainable production practices and strengthens local artisan communities. These products illustrate how everyday choices can collectively contribute to a more sustainable future by transforming discarded materials into functional and aesthetically pleasing items.

Ultimately, these key organizers symbolize a broader commitment to community engagement and sustainable living, demonstrating that eco-conscious values can be seamlessly integrated into daily life.

4.3.5 Tiffin Box Carrier Bag

This innovative tiffin box carrier bag exemplifies a harmonious blend of practicality and sustainability. Handcrafted from leftover fabric scraps sourced from local tailoring shops, the bag serves more than just as a meal carrier. When unfolded, it transforms into a clean, functional table mat or cover, enhancing the mealtime experience by making it more convenient and mess-free.

The unique value of this bag lies in its eco-conscious design, as it repurposes discarded textile waste, giving new life to materials that would otherwise contribute to landfill accumulation. Each item is distinct, reflecting the appeal of upcycled materials and adding a personal, artisanal touch to everyday use. Beyond its practical function as a meal carrier, the bag embodies a step toward waste reduction and promotes sustainable consumer practices.

In addition to its clever design, the tiffin bag symbolises broader efforts of community collaboration and mindful living. By transforming fabric scraps into a useful and stylish product, it highlights creativity and environmental responsibility. Whether used for work lunches or picnics, the bag serves as a thoughtful, sustainable accessory that seamlessly integrates functionality with eco-conscious values.

4.3.6 Specs Pouch

This stylish and practical specs pouch is meticulously handcrafted from upcycled fabric scraps sourced from local tailors, offering a second life to discarded textile waste. Designed to protect eyeglasses, it also serves as a chic accessory that complements any outfit. By repurposing leftover fabric, these pouches promote sustainable fashion, helping to minimize waste while encouraging creative reuse.

Each pouch is one-of-a-kind, showcasing the beauty of upcycled materials and adding a personalised, artistic touch to everyday essentials. Beyond their functionality, they symbolize a commitment to eco-conscious living and community collaboration, transforming what would otherwise be waste into a statement of creativity and sustainable style. Perfect for pairing with both dresses and casual wear, these pouches seamlessly combine fashion with responsibility, illustrating that small, mindful choices can make a significant impact on the planet.

4.3.7 Floral Fabric Bracelets:

Floral fabric waste bracelets are unique, eco-friendly accessories crafted from leftover textile scraps sourced from local tailors. These bracelets transform discarded fabric into beautiful, wearable art, seamlessly blending sustainability with style. Each piece is meticulously handmade using techniques such as folding, rolling, and stitching to create delicate fabric flowers. Since the materials come from various fabrics, each bracelet features a distinctive combination of colors, textures, and patterns, making every piece one-of-a-kind. More than just aesthetic accessories, these bracelets support sustainable fashion by giving new life to fabric that would otherwise go to waste. They embody the principles of a circular economy, where materials are repurposed instead of discarded. Lightweight and comfortable, they are ideal for daily wear, adding a bohemian touch to any outfit. These bracelets are not only fashion statements but also conversation starters. Wearing one signifies a commitment to environmental responsibility and celebrates the creativity of recycling. They also make meaningful gifts, symbolizing resourcefulness and care for the planet.

By choosing upcycled floral bracelets, consumers are making a small but impactful contribution to a greener future. The intricate designs and the story behind the materials showcase how beauty can emerge from repurposed waste, proving that sustainable fashion can be just as stylish as traditional alternatives.

4.3.8 Car seat belt cushion protector

A car seat belt protector made from textile waste is a practical and eco-friendly innovation that combines comfort with sustainability. Crafted from repurposed fabric scraps sourced from local tailoring units or garment factories, these protectors exemplify the creative reuse of materials that would otherwise contribute to landfill waste. Each protector is carefully handcrafted using techniques such as layering, quilting, and reinforced stitching, ensuring both durability and comfort.

The varied colors, patterns, and textures of the salvaged textiles lend each piece a unique character, ensuring that no two protectors are identical. Designed with user comfort in mind, these soft, cushioned accessories prevent seat belts from rubbing uncomfortably against the skin, particularly during long drives. Their adjustable fit and easy-to-attach design make them

suitable for users of all ages, from children to adults, enhancing the driving experience with a personalized touch.

Beyond their functional benefits, these seat belt protectors serve as powerful symbols of sustainable living. They embody the principles of a circular economy by extending the lifecycle of discarded materials, thereby reducing the environmental impact of textile waste. The handmade charm and eco-conscious appeal of these protectors make them an ideal gift for consumers who value both comfort and sustainability.

By choosing a car seat belt protector made from textile waste, individuals support artisanal craftsmanship, promote waste reduction, and take a meaningful step toward a greener future. These protectors are not merely practical accessories but also everyday reminders of the beauty and value that can be derived from repurposed materials.

4.4) Standardization of Procedure for Making Floral Products from Fabric Waste:

- **Selection of material :-**

  Materials are chosen carefully, as the cut fabric pieces are not of any same size, texture and other factors like weather the material collected is suitable for making the desired craft.

- **Cleaning, drying and ironing:-**

  In some cases the fabric may not be in hygienic conditions, then they needed to be washed and dried. Ironing before crafting makes the process more easy & give the final product a finishing.

- **Standardized techniques :-**

  Standardized techniques such as cutting, shaping, folding etc. are involved. These techniques are used to maintain the desired quality and aesthetics of the final product.

- **Tools required :-**

  Tools required for crafting from fabric waste are scissors, glue gun, thread, colour powder, thin string wire, flower tape and jewellery pliers, loops, hooks, eye pin etc. for floral jewellery making. Scissors are used for cutting fabric waste into desired shapes and sizes for crafting. A glue gun is used for adhering fabric pieces together, as well as attaching embellishments like loops, hooks, and eye pins to the fabric for jewellery making. Thread is used for stitching fabric pieces together, creating seams, and adding

decorative details to fabric crafts. It's also essential for securing loops and hooks to fabric for jewellery. Colour powder (like fabric dye or pigment) is used for adding colour and patterns to fabric scraps, enhancing their visual appeal for crafting. Thin string wire is used for creating the base structure of some floral jewellery pieces, providing support and shape. It can also be used to attach fabric flowers to jewellery findings. Flower tape is used for wrapping wire stems and securing fabric flowers, creating a neat and professional finish for floral jewellery. Jewellery pliers are used for manipulating jewellery findings like loops, hooks, and eye pins. They help in opening and closing jump rings, bending wire, and creating connections in floral jewellery. Loops, hooks, and eye pins are used as connectors and fasteners in floral jewellery. They allow for the creation of earrings, necklaces, bracelets, and other jewellery pieces by attaching fabric flowers and other embellishments. Sewing machine is also used for stitching.

4.5) Manufacturing Method and Cost Evaluation

- **FABRIC LILY FLOWER**

Materials Required

- Glue gun
- Scissors
- Thread
- Floral tape
- Thin string wire
- Stencil
- Green colour chalk
- Fabric – white and green colour

Procedure

- Cut-out a stencil of 8cm height and 4cm width in a petal shape.
- From the white satin cloth pin the stencil and cut 6 pairs of petals.
- Cut-out 15 cm thin string wire ((Nos:9).
- Stick thin string wire cut piece to back centre of the petals and cover it with its pair petals (sandwich pattern); this will give flexibility and stability to the petals.
- Cover the rest of the thin metal wire cut piece with the floral tape and stick a small yellow piece of fabric at the tip of the string.
- Now join the petals one by one using the thread around the metal wire covered with floral tape. Secure them tightly
- Cover the base of the flower with the floral tape
- Lilly flower is ready.

Figure 4.2 : The making process of the fabric Lily Flower

THE EXPENSES INCURRED FOR PRODUCT – 1

Table 4.2

The Expenses incurred for the making of a fabric Lily Flower

SL NO	Raw Materials	Cost₹
1	Glue stick	5
2	Thread	3
3	Floral tape	15
4	Thin string wire	50
	TOTAL COST.	**₹73**

The above table shows the total expense incurred for the making of a fabric Lily Flower from textile waste.

Figure 4.3: Final form of the fabric Lily Flower

- **FABRIC ORCHID**

Materials Required

- Scissors
- Thread
- Floral tape
- Thin string wire
- Bottle cap
- Fabric – pink (any colour of choice)and green colour

Procedure

- Cut a thin string wire and fold the tip into a hook shape
- Cut out a small square piece of golden fabric and cover the hook shape and secure them with thread.(Nos3)
- Join the 3 together with floral tape
- Cut out thin string wire of 15 cm (according to the petal size required) and with the help of a bottle cap shape the thin metal wire in a circle shape. (Nos5)
- Cut out the pink fabric (preferably thin sheer cloth) in square shape
- Now cover the thin metal wire circle with the fabric and secure them with thread. Cut off excess fabric
- Arrange the petals made around the golden buds made and secure them with thread. Cover the bottom of flowers with floral tape.
- Such a way make two flowers, and five buds along with three leaves
- Take a long thin string wire and fold it into two (for strength) and cover it with floral tape.
- Attach the buds, flowers and leaves to the long string wire.
- Fabric orchid is ready

Figure 4.4: The making process of the fabric Orchid

THE EXPENSES INCURRED FOR PRODUCT – 2

Table 4.3

The Expenses incurred for the making of a fabric Orchid

SL NO	RAW materials	Cost ₹
1	Thin metal wire	50
2	Thread	3
3	Floral tape	15
	Total cost	**63₹**

The above table shows the total expense incurred for the making of a fabric Orchid from textile waste.

Figure 4.5: Final form of the fabric Orchid

- **WRIST REST CUSHION**

Materials Required

- Fabric
- Needle
- Thread
- Velcro tape
- Swing machine

Procedure

- Take a fabric piece and cut 2 square piece out of it. Then stitch right side facing right side by leaving one side open.
- Turn the fabric so that right side comes to the from.
- Through the open side fill it using the small cut fabrics.
- Now make a long strap band and fix Velcro as shown
- Attach the cushion to the band strap.
- Now it’s ready for the use.

Figure 4.6: The making process of the Wrist rest cushion

THE EXPENSES INCURRED FOR PRODUCT – 3

Table 4.4

The Expenses incurred for the making of a fabric Wrist rest cushion

SL. No	Raw materials	Cost (₹)
1	Fabric	0
2	Needle	1
3	Thread	3
4	Velcro	5
	Total cost	**9₹**

The above table shows the total expense incurred for the making of a fabric Wrist rest cushion from textile waste.

Figure 4.7: Final form of the fabric Wrist rest cushion

- **KEY ORGANISER**

Materials Required

- Fabric Pieces
- Sewing machine
- Thread
- Hook
- Velcro

Procedure

- Take a fabric piece and fold it into desired with
- Take to long strips of fabric piece and fix it at the opposite opening ends of the fabric as shown.
- Now create small strips out of the fabric and attach it to the back side of the key organiser and fold one end as shown in image 4 to create a loop to hold the key. Then stitch and secure the loos.
- Cover the top end as shown in figure 9.
- Create new loop and the top end centre to hang the hook.
- Fix Velcro at the opposite open end which we have already covered.
- Now it’s ready for use.

Figure 4.8: The making process of the fabric Key organiser

THE EXPENSES INCURRED FOR PRODUCT – 4

Table 4.5

The Expenses incurred for the making of a fabric Key organiser

SL. NO	Raw materials	Cost (₹)
1	Fabric	0
2	Hook	40
3	Velcro	5
	Total cost	**45₹**

The above table shows the total expense incurred for the making of a fabric Key organiser from textile waste.

Figure 4.9: Final form of the fabric Key organiser

- **TIFFIN CARRIER BAG**

Materials Required

- Fabric
- Thread
- Sewing machine

Procedure

- Take a rectangle fabric piece.
- As shown in the figure 2 stitch both the sides of the fabric.
- Create 2 laces in the length of the fabric.
- Insert the laces through the side loops stitched before.
- Now attached 2 another laces and the width ends of the fabric. This helps to hold or carry the tiffin bag.
- Now it's ready for use.
- Figure 7,8 & 9 shows how to use the tiffin carrier bag made.

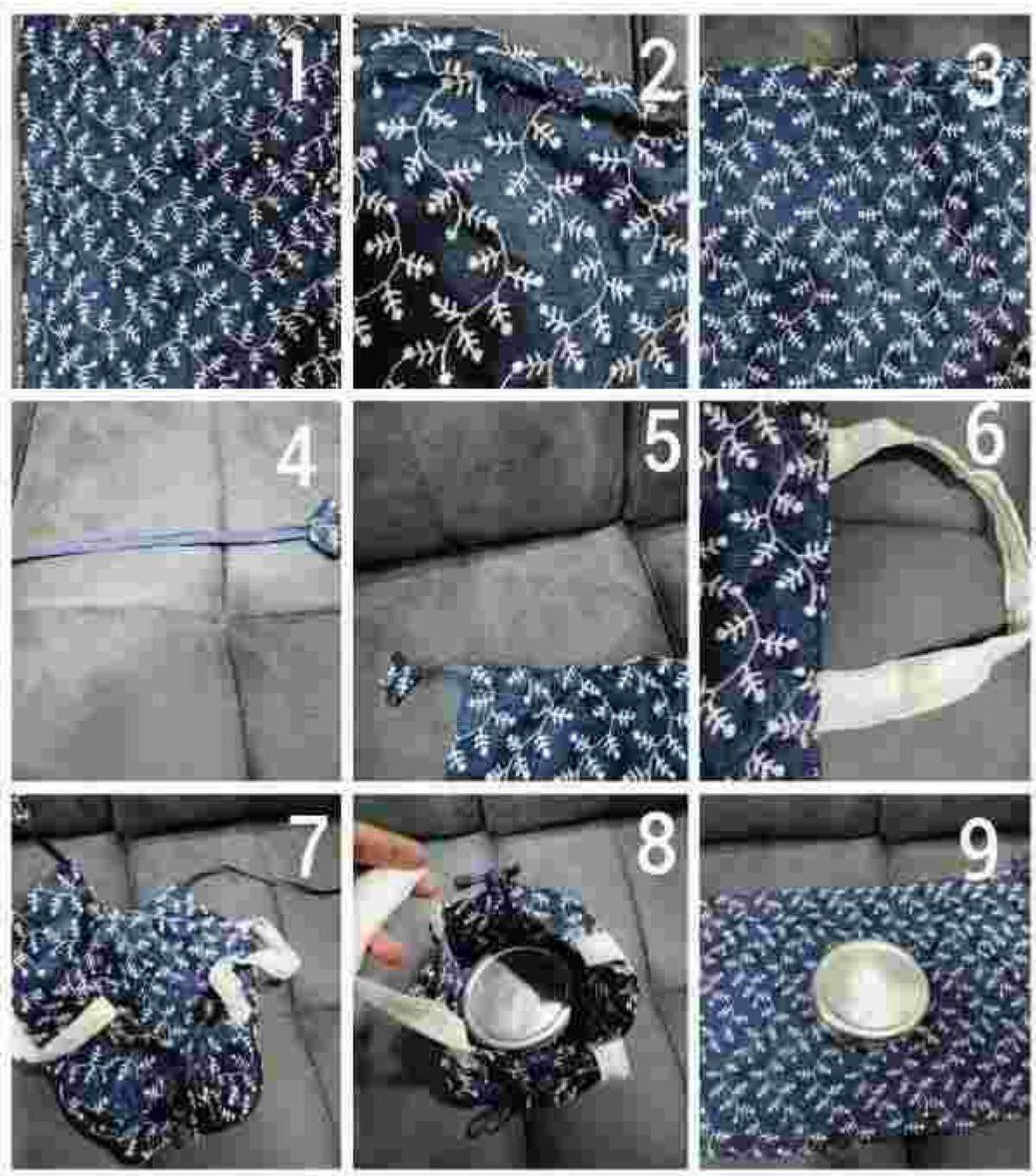


Figure 4.10: The making process of the Tiffin carrier bag

THE EXPENSES INCURRED FOR PRODUCT – 5

Table 4.6

The Expenses incurred for the making of a fabric Tiffin Carrier Bag

SL NO	RAW MATERIALS	Cost(₹)
1	Fabric	0
2	Thread	3

Total cost	₹3

The above table shows the total expense incurred for the making of a fabric Tiffin Carrier Bag from textile waste.

Figure 4.11: Final form of the fabric Tiffin Carrier Bag

- **SPECS POUCH**

Materials Required

- Fabric pieces
- Sewing machine
- Stencil (for accurate measurements)
- Press button

Procedure

- As shown in the figure 1 mark correct measurements in a thick paper.
- Take 2 fabric pieces and mark the measurements on the wrong sides of the fabric.
- Stitch the edges as wrong sides facing each other and turn it so that right side is now outside.
- Fold it and stitch the bottom and side as shown in figure 3.
- Now fix a press button at the top end as to secure the specs inside the pouch.
- Now it's ready for the use.

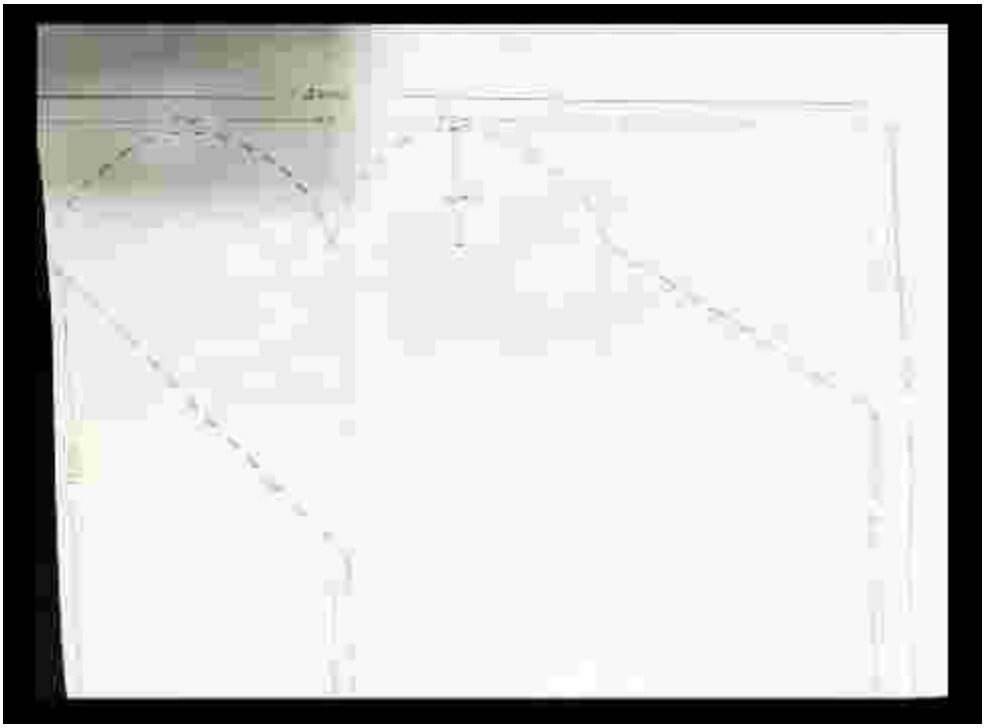


Figure 4.12: The Measurements and outline drawing

Figure 4.13: The making process of the Specs Pouch

THE EXPENSES INCURRED FOR PRODUCT – 6

Table 4.7

The Expenses incurred for the making of a fabric Specs Pouch

SL NO	RAW MATERIALS	COST (₹)
1	Fabric	0
2	Press button	3

Total cost	₹3

The above table shows the total expense incurred for the making of a fabric Specs Pouch from textile waste.

Figure 4.14: Final form of the fabric Specs Pouch

- **FLORAL FABRIC BRACELETS**

Materials required

- Fabric
- Thin metal wire
- Green floral tape
- Thread
- Ribbon

Procedure

- Select the fabric for flower and cut it length wise (30cm)
- Cut the top end as semicircle shape as shown in step 2
- Burn the semicircle end to avoid pull out of the threads.
- Take the thin metal wire and shape the cloth around the metal wire to create a flower and in a similar way make a budget flower.
- Now ta a metal wire of 10 cm an cover it with green floral tape. Then fold both the ends of the metal wire to connect ribbon.
- To the metal wire of 10 cum attach the flower and bud.
- Now to the end loops of the wire tie the ribbon
- Floral fabric bracelet is ready

Figure 4.15: The making process of a floral fabric bracelet

THE EXPENSES INCURRED FOR PRODUCT – 7

Table 4.8

The Expenses incurred for the making of a floral fabric bracelet

SL.NO	RAW MATERIALS	COST (₹)
1	Thin metal wire	50
2	Thread	3
3	Floral tape	15
4	Ribbon	30
	Total cost	₹98

The above table shows the total expense incurred for the making of a floral fabric bracelet from textile waste.

Figure 4.16: Final form of a floral fabric bracelet

- CAR SEAT BELT CUSHION PROTECTOR

Materials Required

- Cloth
- Small cut piece cloth
- Sewing machine
- Thread
- Velcro

Procedure

- Take square shaped fabric piece
- Fold opposite side and sew along side of both the folds leaving one end open as shown.
- Take another length wise strip of fabric, then cut it into two pieces and attach it to centre portion of the inner side of the folded parts
- Stitch and fix velcro to the strips
- Fill the cut piece clothes through the open side of the folded ends to create the cushioning.
- Stitch the open ends.
- Now it's ready for use.

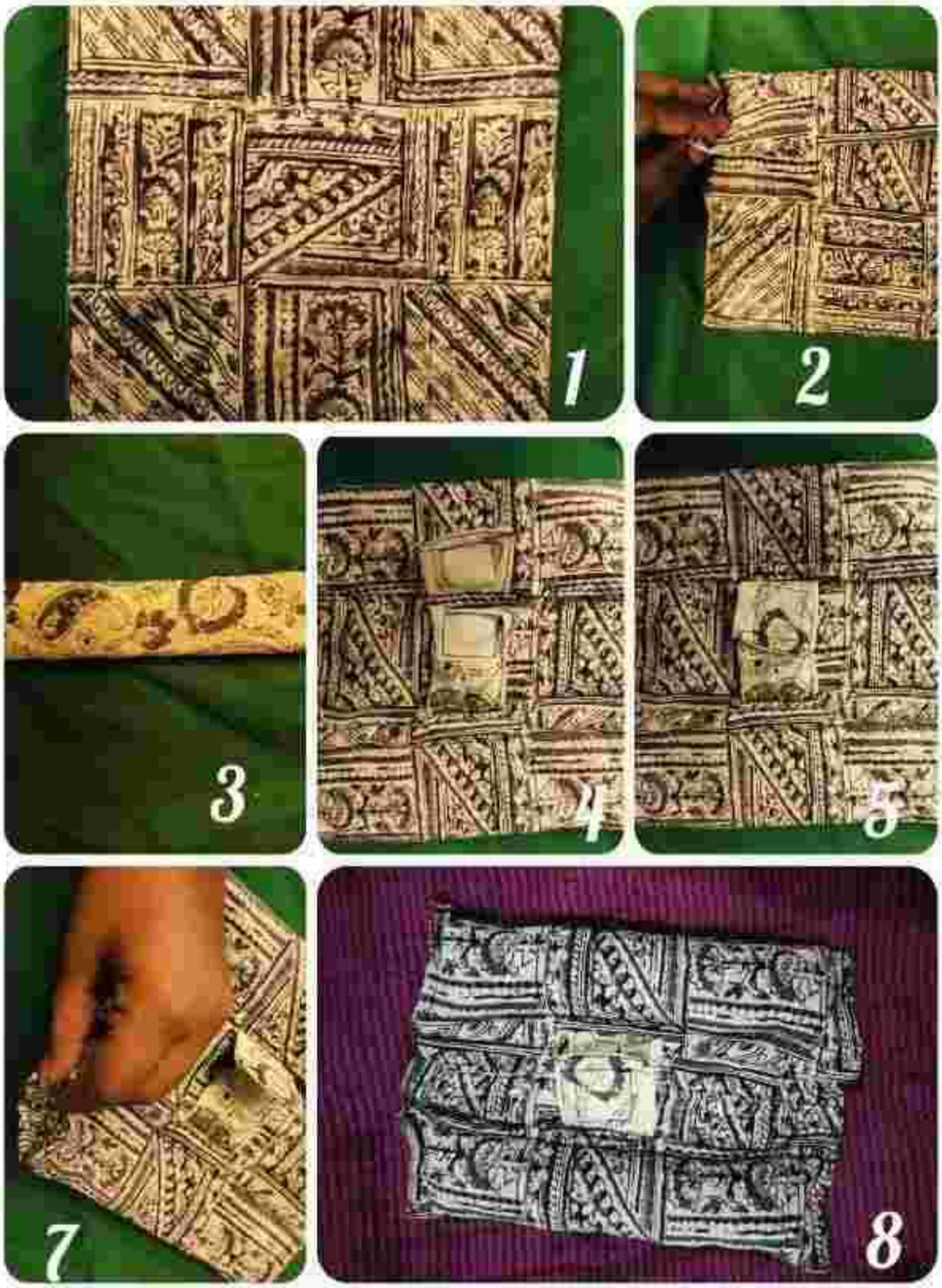


Figure 4.17: The making process of the Car seat belt cushion protector

THE EXPENSES INCURRED FOR PRODUCT – 8

Table 4.9

The Expenses incurred for the making of the Car seat belt cushion protector

SL.NO	RAW MATERIALS	COST (₹)
1	Fabric	0
2	Velcro	3
3	Thread	3
	TOTAL COST	₹6

The above table shows the total expense incurred for the making of the Car seat belt cushion protector from textile waste.

Figure 4.18: Final form of the Car seat belt cushion protector

SUMMARY AND CONCLUSION

CHAPTER 5
SUMMARY AND CONCLUSION

The study **"Trash to Treasure: Sustainable Solutions to Textile Waste Management"** was conducted with the objective of identifying the production and upcycling potential of textile waste generated mainly through tailoring units. This was achieved by analyzing previous research studies on the topic and developing functional and decorative products from fabric waste. Based on the findings, **eight** products were developed.

The methodology comprised **five stages**:

- Preliminary Research
- Sample Collection
- Segregation and Analysis
- Design and Innovation Phase
- Manufacturing Method Standardization
- Costing

1. Preliminary Research

An extensive exploration of market trends was conducted to understand consumer preferences regarding upcycled fabric products.
Data was gathered from brand websites, online stores, and social media platforms to assess the popularity of sustainable fashion.
A growing demand for eco-friendly bags, pouches, home decor, and clothing was identified.
Common waste materials, their applications, and competitor pricing strategies were analyzed.
A significant market gap was observed: the need for multi-functional items crafted from tailor scraps, offering a unique selling proposition.

2. Sample Collection

Fabric scraps were collected from local tailors, small garment factories, and textile waste bins in Ernakulam.
Each piece was documented in terms of its source, fabric type (cotton, denim, silk, etc.), and

condition.
The collection resulted in a diverse assortment of materials—ranging from soft to sturdy—ideal for creative experimentation.

3. Segregation and Analysis

Fabrics were sorted by type (cotton, polyester, etc.) to determine optimal applications.
Durability and colorfastness were tested through stitching samples and washing trials.
Only high-quality, durable, and aesthetically appealing fabrics were selected for product development.
Materials were systematically organized to facilitate streamlined production.

4. Design and Innovation Phase

The creative phase involved transforming fabric scraps into useful and stylish items such as fabric flowers, wrist cushions, and organizers.
Initial rough sketches were refined based on the available materials.
The focus was on designing products that were both environmentally sustainable and commercially viable.

5. Manufacturing Method Standardization

Clear and standardized production processes were established:

- **Cutting**: Patterns were placed strategically to minimize fabric waste.
- **Stitching**: Standardized templates ensured professional and consistent product quality. Processes were simplified to allow for scalability if demand increases.

6. Costing

Although the raw fabric material was obtained free of charge, hidden costs such as transportation and material preparation were accounted for.
Products were priced fairly to cover costs while remaining affordable for eco-conscious consumers.
The pricing strategy aimed to achieve a balance between environmental responsibility, affordability, and business sustainability.

Challenges

- **Inconsistent Materials**: Variations in scrap size and quality complicated standardization efforts.
- **Consumer Bias**: Upcycled products are sometimes perceived as "cheap" or low-quality, indicating a need for consumer education.
- **Design Limitations**: Irregular fabric pieces required creative and adaptive design solutions.

Opportunities and Future Directions

1. **Measure Impact**: Conduct further research on the environmental and economic benefits of upcycling.
2. **Spread Awareness**: Promote upcycling through social media, influencers, and educational programs.
3. **Community Workshops**: Organize workshops to teach upcycling skills and encourage community participation.
4. **Partnerships**: Collaborate with NGOs, brands, and artisans to scale up upcycling initiatives.

Conclusion

The project **"Trash to Treasure: Sustainable Solutions to Textile Waste Management"** demonstrates that with creativity and innovation, fabric scraps can be transformed into beautiful and functional products.

Upcycling not only reduces waste and conserves resources but also strengthens local economies.

Moreover, it fosters a shift in mindset—encouraging a perspective that recognizes value in materials often discarded as waste.

As the adoption of sustainable practices continues to grow, upcycling can play a vital role in building a circular economy where nothing is wasted.

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