



## Modular Footwear in Sustainable Fashion

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### ABSTRACT:

A ground-breaking formal shoe solution for professionals and students who need flexibility without having to buy and discard several pairs. Users can effortlessly switch up their look while reusing the same durable sole thanks to the detachable upper made of premium vegan leather. This cost-effective and environmentally friendly design minimises its impact on the environment while keeping up with current fashion trends. The fashion industry, especially the footwear industry, has a significant impact on the environment because it generates waste and uses a lot of resources. Thus, the focus on sustainable footwear have gained widespread attention amongst the students and working professionals. This research also examines the key drivers of sustainable shoe adoption, awareness and liking among the consumers

**Keywords:** Durable, environmentally friendly, vegan leather, footwear industry, students, working professionals, sustainable shoes.

### 1. Introduction

Innovation and quickly shifting trends have long been hallmarks of the fashion industry. But in recent years, people have become more conscious of how fashion affects the environment, particularly when it comes to the making of shoes. Conventional shoe production methods generate a lot of waste and consume a lot of resources. As consumer awareness of environmental issues has increased and innovative solutions have emerged, green footwear has grown in popularity.

#### 1.1. Importance of Sustainability in Fashion:

The fashion industry produces a lot of waste and has a significant carbon footprint. Conventional methods overuse natural resources and contribute to pollution. Sustainability encourages the use of ethical production practices and environmentally friendly materials. It promotes conscientious consumption to lessen its impact on the environment. An essential component of this move towards more responsible decisions is footwear.

#### 1.2 Evolution of Eco-Friendly Footwear:

Over time, eco-friendly footwear has changed dramatically. Previous initiatives emphasised the use of natural fibres and the avoidance of hazardous chemicals. As technology developed, companies started experimenting with energy-efficient manufacturing, plant-based materials, and recycled plastics. The newest development in making footwear more environmentally friendly and consumer-friendly is the idea of modular shoes, where components like soles and uppers can be changed or personalized.

#### 1.3 Problem Statement:

Due to resource consumption and waste production, traditional footwear production causes significant environmental harm. For fashion or practical reasons, consumers frequently purchase multiple pairs of shoes, which adds to the waste. The goal of this project is to investigate the market's acceptance of sustainable footwear with detachable uppers and whether such innovations can provide convenience and personalisation while lowering environmental impact.

#### 1.4 Objectives of the study:

- To understand the awareness and perception of sustainable footwear with removable uppers.
- To identify key factors influencing purchase decisions for customizable and eco-friendly footwear.
- To assess the potential market acceptance of footwear with removable uppers.

### 1.5 Review of Literature:

**Loganathan T et al. (2024)**: This study analyzes sustainable materials for sports footwear, emphasizing the use of recycled and eco-friendly materials to reduce environmental impact. **Aleman S. (2023)**: This chapter discusses the Sustainable Product Evaluation, Engineering, and Design (SPEED) process in footwear, highlighting the complexity of designing sustainable shoes. **Pantazi-Băjenaru et al. (2023)**: Investigated the environmental impact of sustainable footwear, focusing on material selection and production processes to reduce carbon footprints. **Spahiu et al. (2023)**: Explored the role of Industry 4.0 in sustainable footwear production, highlighting technological integration for enhanced sustainability. **Tsai et al. (2023)**: Proposed a dynamic approach to sustainable knitted footwear production, integrating profitability and carbon efficiency within Industry 4.0 frameworks.

## 2. Research Methodology

### 2.1 Research Design

To learn more about consumer preferences and perceptions of sustainable footwear with detachable uppers, the study used a descriptive design. This strategy made it possible to compile comprehensive data on adoption-influencing factors, purchase behaviour, and awareness.

### 2.2 Data Collection Methods

Structured questionnaires were used to gather primary data from Bangalore consumers through questionnaire with a mix of (13-close ended questions, 6 Likert scale, and 1 open ended question. Journals, articles, and other scholarly publications were the sources of secondary data used to bolster findings and offer context.

### 2.3 Sampling Techniques

To ensure accessibility and ease of data collection within the allotted time frame, respondents were chosen using a non-probability convenience sampling technique. People interested in customised footwear and sustainable fashion made up the target sample.

### 2.4 Tools for Data Analysis

- Percentage Analysis
- Chi-Square Test

### 2.5 Limitations of the Study

Bangalore was the sole focus of the study, which might not accurately reflect the opinions of other consumers. The sample size and diversity were impacted by the short time allotted for data collection.

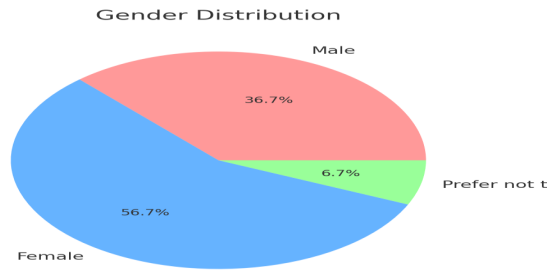
## 3. Data visualization and Interpretation:

The purpose of this chapter is to transform the collected data into meaningful insights using various statistical techniques.

*Table: 3.1.1 Table showing the proportion of male and female respondents:*

Gender	Frequency	Percentage
Male	55	36.7%
Female	85	56.7%
Prefer not to say	10	6.7%
Total	150	100%

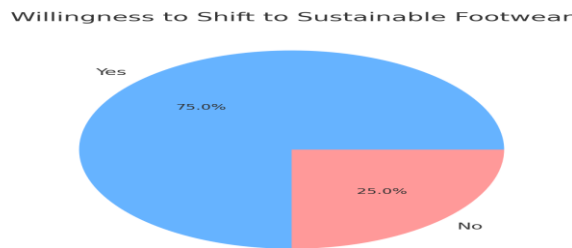
**Chart: 3.1.1 Chart showing the proportion of male and female respondents:**



**Table: 3.1.4 Table showing the willingness to shift to sustainable footwear:**

Willingness	Frequency	Percentage
Yes	90	75%
No	30	25%
Total	120	100%

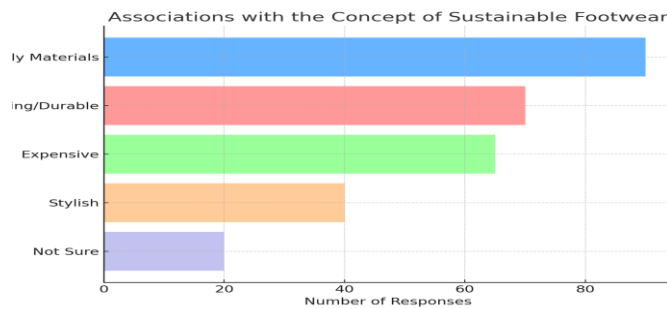
**Chart: 3.1.4 Chart showing willingness to shift to sustainable footwear**



**Table: 3.1.5 Table showing the associations with sustainable footwear:**

Associations	Frequency	Percentage
Environmentally friendly materials	90	60%
Long-lasting/Durable	70	46.7%
Expensive	65	43.3%
Stylish	40	26.7%
Not sure	20	13.3%

**Chart: 3.1.5 Chart showing the associations with sustainable footwear:**



**3.2 Chi-Square Analysis**

- **H<sub>0</sub>**: There is no significant relationship between awareness of sustainable footwear and likelihood of buying in the future.
- **H<sub>1</sub>**: There is a significant relationship between awareness of sustainable footwear and likelihood of buying in the future.

### 3.2.1 Table showing the Relationship between Awareness of Sustainable Footwear and Likelihood of Buying

Awareness vs. Likelihood of Buying	Very likely	Somewhat likely	Neutral	Unlikely	Very unlikely	TOTAL
Yes	40	30	20	10	5	105
No	10	15	20	20	10	75
<b>TOTAL</b>	<b>50</b>	<b>45</b>	<b>40</b>	<b>30</b>	<b>15</b>	<b>150</b>

O	E	O-E	(O-E) <sup>2</sup>	(O - E) <sup>2</sup> / E
40	35	5	25	0.7143
30	31.50	-1.5	2.25	0.0714
20	28	-8	64	2.2857
10	21	-11	121	5.7619
5	10.5	-5.5	30.25	2.8809
10	15	-5	25	1.6667
15	13.5	1.5	2.25	0.1667
20	12	8	64	5.3333
20	9	11	121	13.4444
10	4.5	5.5	30.25	6.7222

$$\chi^2 = \sum \frac{(O - E)^2}{E} = 23.66$$

**Degrees of Freedom (df):** (2 - 1)\*(5 - 1) = 4

**Table Value at 5% significance level:** 9.49

**Calculated Value:** 23.66

**Interpretation:**

Since the calculated value (23.66) is greater than the table value (9.49) at the 5% significance level, the null hypothesis is rejected. Therefore, there is a significant relationship between awareness of sustainable footwear and the likelihood of buying in the future.

## 4. Findings and recommendations:

### 4.1 Key Findings

- **High Awareness:** Eighty percent of those surveyed are aware of sustainable footwear, suggesting that consumers are becoming more informed about environmentally friendly options.
- **Positive Willingness to Shift:** There is a significant market potential for sustainable footwear, as 75% of consumers indicated that they would be willing to adopt it.
- **Important Associations:** Environmentally friendly materials are the primary association that consumers have with sustainable footwear (60%) followed by durability (46.7%) and high cost (43.3%).
- **Sustainability as a Consideration:** According to the weighted average score of 3.7, sustainability is a significant but not the primary consideration when choosing footwear.
- **Comfort is the Main Reason for Buying:** Since consumers value comfort, cost, and fashion more than sustainability, sustainable footwear must also prioritise affordability and ergonomics.
- **Market Segmentation by Age:** The largest proportion of respondents (36.7%) are between the ages of 23 and 25, indicating that young adults are important buyers of eco-friendly footwear.
- **Purchase Frequency:** 33.3% of participants purchase shoes every four to six months, indicating a chance to provide options that are both long-lasting and adaptable in order to decrease the frequency of purchases.
- **Chi-Square Analysis Finding:** Awareness of sustainable footwear and the probability of buying it in the future are significantly correlated, indicating that educational initiatives can promote adoption.

## 4.2 Recommendations for Businesses

### 4.2.1 Boost Marketing and Awareness:

Use influencer partnerships, digital marketing, and educational initiatives to draw attention to the environmental advantages and personalisation possibilities of footwear with detachable uppers.

### 4.2.3 Strategies for Affordability:

Offer discounts, instalment plans, or tiered pricing structures to counteract the perception of high prices. Pay attention to long-term savings (for example, modular shoes eliminate the need for multiple pairs).

### 4.2.4 Stress Comfort and Style:

To appeal to a wider audience, make sure sustainable shoes place an emphasis on trendy aesthetics, breathability, and ergonomic designs. Emphasise features that allow for customisation as a means of fusing fashion flexibility with sustainability.

### 4.2.5 Product Customisation & Innovation:

To accommodate a range of customer preferences, create easily navigable detachable uppers in a variety of styles. Investigate recycled and biodegradable materials to improve environmental friendliness.

## 5. Conclusion

The findings indicate a high degree of consumer interest in environmentally friendly footwear, with modular designs offering customisation, environmental benefits, and waste reduction. Companies must prioritise comfort, style, and pricing strategies in order to maximise adoption. By combining awareness campaigns, affordability initiatives, and innovative retail strategies, sustainable footwear with detachable uppers has the potential to disrupt the traditional market while reducing its environmental impact.

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