International Journal of Multidisciplinary Innovative Research
ISSN: 2583-0228 Volume 2, Number 1 (Jan' 2022) pp. 67-84

https://www.ciir.in

Journal on Fashion Supply Chain Management Studying Road Locks and Suggestion Future Research Methodology and Agenda

Shabana Sharif

Assistant Professor, Department of Fashion Design,

Sanskriti University, Mathura, U.P., India.

Email: sharif.shabana38@gmail.com

ABSTRACT: ***Undesired changes in the environment and reduction of natural resources have necessitated the need for environmental protection and resource conservation. The textile and clothing industry is the second largest (after food) industry. Therefore, there is a need to protect the environment by reducing the use of resources. The research focused on exploring and identifying the best reverse value chain alternatives followed by the boutiques. An exploratory study was undertaken at thirty-working stores in Meerut city. The data were collected with the help of semi-structured interviews and a questionnaire, for the analytical hierarchy process analysis. A secondary source of information was used to strengthen the findings. There are different reverse value chain methods to minimize the use of resources such as direct reuse, up cycling and down-cycling. This paper develops a model on the basis of the analytic hierarchy process to determine the best method to close the loop of the clothing value chain. On the basis of the results, it can be concluded that the practices of recycling at the smaller units can inspire the industries to execute and analyze. Circular economic and up-cycling emerged to be the best alternative to close the loop in the clothing industry.***

KEYWORDS: AHP, Reuse, Closed-loop decision, Clothing value chain.

INTRODUCTION

The major contributor to environmental degradation, leading to climate change is the Fashion Industry (All wood et al 2006; Fletcher, 2010; Greenpeace, 2011). A Growing population is making the situation worse by putting further pressure on natural resources, resulting in their further scarcity (EEA,2015; MEA, 2005; Sachs, 2015). 20,000 liters of water is needed to grow 1kg of cotton which is consumed in producing a single t-shirt and a pair of jeans (WWF, 2014). Also, the crucial issue being faced by the apparel industry is the buildup of textile waste, fast fashion being its biggest donor. Clothing production has increased vastly from 2000to2014 (McKinsey, 2016). In the time span of a year after being manufactured, about 60% of the total clothing produced is dumped into landfills (McKinsey, 2016). By 2030, the total expected fashion waste is148 million tons, which is equivalent to annual waste of 17.5kg per capita across the planet (GlobalFashionAgenda,2017). During the Industrial Revolution of 1760-1820, the Linear Economic Model was all about "consumption", where the product is "consumed" in use and then disposed of. It was a directional production model, thus called Linear. It can be said as an incomplete circle starting at the point of extraction and ending at the point of disposal.

In the Linear Economic model, product efficiency and life span are not the priority. With the current Linear Economy, the world is only 9% circular (Harald Frield). Thus, leaving a huge 'Circularity Gap' and therefore no longer sustainable. Their placement of Linear Economy, is their source model of Circular Economy (CE) which doesn't consume virgin resources for economic growth.

The Circular Economy is all about turning the products standing at the edge of their service lives into resources for others, thus closing the loop in the industrial ecosystem and reducing waste. It says: reuse what you can, recycle what cannot be reused: repair what is broken, remanufacture what cannot be repaired (WalterR. Stahel, 2016). European nations have found that adopting the circular economy can less in greenhouse gas emissions of each nation by approximately 70% and increase its workforce by 4% the ultimate low-carbon economy. The purpose of this paper is twofold. First, it aims to bring awareness among consumers as well as producers. As they lack to understand the need and ways of disposing and recycling out-worn, dun wanted clothes, and after-manufacturing fabric wastes respectively. Second, it aims to study the lack of association between designers, manufacturers, and recyclers. Collecting and sorting the textile and clothing waste is also a massive problem in closing the economic loop. The main reason for the occurrence of this barrier is the lack of up-scaled technology. Also, fashion innovators need to train their teams in designing clothes having an active lifetime, so that disposing time can be delayed.

CHALLENGE OF WASTE CREATION FACED BY THE APPAREL INDUSTRY DURING PRODUCT DESIGN AND DEVELOPMENT

The scale and speed of adaptation to circular model are determined by market participant's awareness, knowledge, and continuous engagement. The process should apply the 3R principle throughout the product's lifespan. Therefore, challenges for the apparel sector may refer to reduced material and energy intensity, use of renewable resources to full extent, lower diffusion of toxic substances, improvement in ability to recycle, and extension in the durability of the product. The biggest challenges to be tackled by the apparel industry while adapting the circular economy may include the prevention, or at least minimization, of a percentage of waste to be discarded in landfills. Success over this challenge depends upon taking up completely a new approach to the pattern in which products are designed, manufactured, and consumed, as more than 50% of emissions come during the production stage and is done in three phases: Dyeing and Finishing (36%); Yarn Preparation (28%) and Fiber Production (15%) (Quantis,2018). This effectual was management will influence the 3Rs by minimizing the use of virgin raw materials, reusing the waste produced during the production, and recycling them. But effective waste management depends on the initial stages of product design and development. In a Circular Economy, product performance i.e. its durability, recyclability, and reparability can be defined as early as the design stage. Therefore, all the successive stages of apparel's life-cycle may get influenced by the decisions being made in this context. Here, apparel's life-cycle includes everything, right from a clear description of raw materials and selection of dyes, solvents, finishing processes, manufacturing, and labeling methods to the disposal of the product by the consumer. All these stages are as important as the design stage and will also make the product durable and be less likely to end up in landfills at the end of life. Currently, apparel production and fast fashion consumption follow linear economy model, resulting in huge quantities of apparel waste, as products are tossed out after being used fully or for a relatively short time.

Apparel industrial waste can be generally divided into three main types as per its source:

1. Post-industrial Waste
2. Pre-consumer Waste
3. Post-consumer Waste

RESEARCH METHODOLOGY

This section aims to summarize the methodology of the paper. Their search strategy and process are explained followed, by the data collection, data analysis, and sampling methods.

Research Process

Their search process for this work is shown in figure 1 and further explained below.

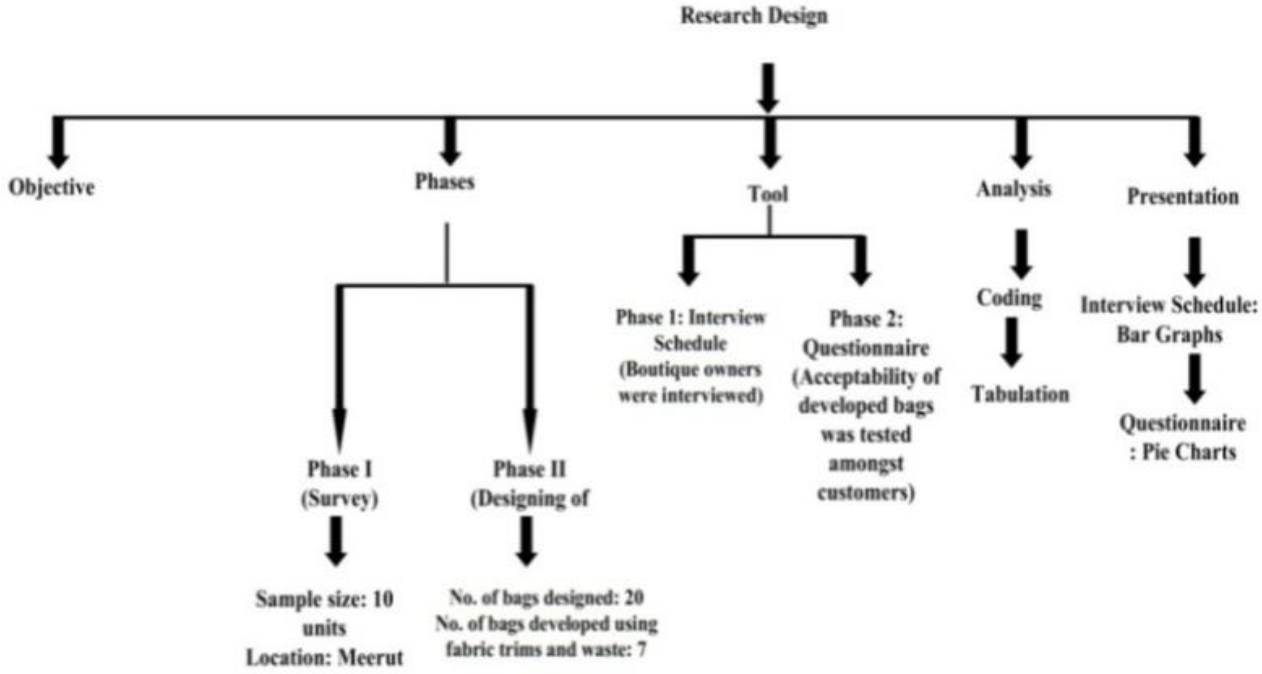

Figure 1: An illustration of the research process underlying this research work

Objective

As discussed above, the following objectives will be analyzed in this paper.

- To analyze the apparel waste generated in the boutiques.
- To observe and document the waste management techniques adapted by boutique owners.
- To collect and sort a variety of fabric trims and swatches from boutiques.
- Designing of handbags using fabric trims.
- Construction of designed handbags.
- To assess the acceptability and marketability of constructed handbags.

In the first phase, a survey of boutiques was done. The purpose was to procure the information regarding the waste generation and the measures taken up by the boutique owners to manage the

generated waste. The survey was done using the 'Interview Schedule' research tool and a sample size of 10 boutiques was taken, located at the Sadar Bazar and Delhi Road, Meerut. This phase also includes selecting and sorting of variety of fabric trims and swatches from boutiques' generated waste, so that they can be used further in Phase 2. In the second phase, another survey was done to procure the information regarding the acceptability of handbags, produced using fabric waste and trims (being collected in Phase 1) amongst customers. To fulfill this purpose, initially, 20 handbags were designed and an internal panel was selected to pick the best 7 designs which can be further developed. The survey was done using the 'Questionnaire' research tool, and the target age group is 20-25 years, as this age group is readily available to try and adopt new and innovative things, and also is well aware of depleting resources and carbon footprint impacts.

INTERVIEW SCHEDULE WITH BOUTIQUE OWNERS

The interview was conducted in Phase I of the process with 10 boutique owners. The purpose was to gain an understanding of managing the trim waste being produced within their boutique(s) while the garment production. And what measures do they take to rescue the environment from carbon footprints, released by fabric waste ending up in the landfills? As no direct interview questions were prepared, these interviews were unstructured. Un structured interviews are suitable in this situation since the aim was to explore an area of interest in-depth and understand what the interviewees felt about different situations. (Easter by-Smith et al.,2013). During the interviews, side notes were taken as a point of observation. By performing the interviews in this way, they can take the form of an informal conversation, which might be advantageous in this situation. The Advantage of taking the interview in an informal way is, that it may reveal the true facts that an interview may hide during a formal interview.

Customer's Feedback Survey

The quantitative interviews with 50 respondents were performed on a subset of population of interest of the respective target age group. The survey was per for medina structured manner and required the respondents to answer all the questions. The questionnaire consisted of multiple choice and open-ended review questions, which gives a proper and in-depth reviews of customers regarding the products being developed in Phase 2.

Since the author lives in Meerut and attend Swami Vivekanand Subharti University this sampling frame is not a proper representation of the whole a population of people between the age of 20-25 years, but it is most likely biased by location. This sampling called convenience sampling implies that interference between the sample and the population cannot be drawn with the same level of confidence as when applying probability-sampling designs. (Easter by-Smith et al., 2013). Thus, can no generalization be drawn from the results, but some respondents' thoughts and impressions of the related subject are displayed in the results. A total of 50 persons between the age of 20-25 years answered the survey and out of these 88% were women and 12% were men.

RESULTS AND DISCUSSION

Product Development

This section consists of pictures of all the products being constructed during their search process to undergo this paper. This sectional so gives a description of all the products which includes product's dimensions and source of fabrics procured from, used in making all the products.

Figure 2: Constructed Grocery bag Dimensions of the bag Length: 12"; Width: 13"

Fabric Source

Main fabrics used in the making of the bag were procured from the leftover fabrics being cut on the bias which was primarily used in making the lining of full-circular dresses. Fabrics used as handbag's lining was procured from the panel of semi-circular high-low hem Kurt being cut on the bias.

Figure 3: Constructed Makeup pouch/Small Makeup vanity Dimensions of the bag Diameter: 7

Fabric Source

The Main fabric used in the making the outer skin of the pouch was procured from the panel so semi-circular high-low hem Kurt was cut on bias. The Piping used on the pouch was constructed by stitching various fabric trims and swatches together. Firstly, this technique gives the product a quirky look. Secondly, It utilizes extremely small bits of fabrics watches which cannot be used in making the whole new product or any other garment element. The Fabric used with in the pouch as the lining was procured from side cuttings of the fabric primarily was used in making sleeves of a garment in one of the sample units.

Figure 4: Constructed Crayon Lipstick/Lip gloss Storage pouch
Dimensions of the bag Total Length: 6"; Width: 2.5"; Length of Flap: 2"

Fabric Source

The Floral fabric used in making the front skin of the pouch was just fabrics watch of dimension (10 X 10)" picked up from one of the sample units during sorting of fabrics in Phase I. Stripped fabric used in making flap and back of the pouch was procured from the leftover fabric used in shaping front and the back square neckline of a garment.

Figure 5: Constructed Make up Storage bag Dimensions of the bag
Total Length: 5"; Width: 10"; Width of the frill: 1"

Fabric Source

The Front of the bag, as well as the frill used on the edges of the bag, were constructed by stitching various fabric trims and swatches to gather in an innovative manner. Firstly, this technique gives the product a quirky look. Secondly, it utilizes extremely small bits of fabric swatches that cannot be used in the making the whole new product or any other garment element. The Fabric used in making back of the bag was procured from side cuttings of fabric primarily used in constructing pencil ants. The Plain white fabric used in the bag as the lining was procured from leftover cuttings of a fabric used as lining in a kurti.

Figure 6: Constructed Small Handbag Dimensions of the bag Length: 9"; Width: 9"

Fabric Source

The Front, back, and straps of the bag were made of using small trims and swatches which were sewn together. These swatches could beside trim waste produced during the cutting of a garment. This technique is one of the best ways of utilizing extremely small swatches of the fabric waste which could not be used further in making any other element of the garment. The Fabric used in the bag as a lining was procured from side cuttings of the fabric primarily used in making bell sleeves of a blouse.

Figure 7: Constructed Money bag Dimensions of the bag Length: 8.5"; Width: 8"

Fabric Source

The Fabric used in making the outer skin of the bag was procured from leftover fabric primarily used in shaping scooped neckline of a blouse. The Fabric of drawstrings used in a bag was procured from leftovers of fabric being cut on the bias which was primarily used in making the lining of full-circular dresses. The fabric used in making draw string casing and as piping of the bag was small fabric trims picked up from one of the sample units during sorting of fabrics in Phase I. The

Fabric used in the lining of the bag was a gain procured from leftover fabric primarily used in shaping scooped neckline of a blouse's lining.

Figure 8: Constructed Multi-utility pouch Dimensions of the bag Length: 6.5"; Width: 10"; Length of Tie-string: 38"

Fabric Source

Purple fabric used in making the pouch was procured from cutting of flared palazzo pants. Some fabric cuttings were sewn after one another to make a long strip of fabric that can be used in edging the pouch. The fabric used in making tie-string for the pouch was procured from leftovers of fabric being cut on the bias which was primarily used in making the lining of full-circular dresses.

DATA ANALYSIS AND INTERPRETATION

In this section analysis of empirical data is done. In this paper, data collection and analysis were performed in parallel in line with this framework. By using interactive approach development of research is done. The collected data were coded to understand the situation better. This research is not relying on previous beliefs regarding the market but the market was investigated using an unbiased approach, which can be argued to be beneficial in this situation since it directed the process with the author's potential prejudgments. Moreover, their search could be evaluated in terms of reliability and validity. A method with high reliability is characterized by consistency, so that It can be repeated and provide the same result (BrymanandBell,2003). Since preliminary unstructured and structured interviews and surveys were applied the nature of these makes it hard to replicate. The liability of their search is increased by the fact that their search method has carefully is described and visualized to enable others to replicate it.

Results from Interview

Figure 9 depicts the number of employees employed by each sample unit. It has been found that out of 10 sample units, 3 units employed 1-3 persons each; 4 units employed 4-6 persons each; whereas, 3 units employed more than 10 persons each. This variation may occur because of the reasons like lo -cost structure, infrastructure, and working place and the outlet location which Is the biggest influencer out of all. It has been suggested that in the context of cost structure, certain new initiatives can affect it. For example, initiatives related to regular selling of products made out

of fabric trims and waste can create extra revenue which can drive up all the actors influencing the growth of the organization.

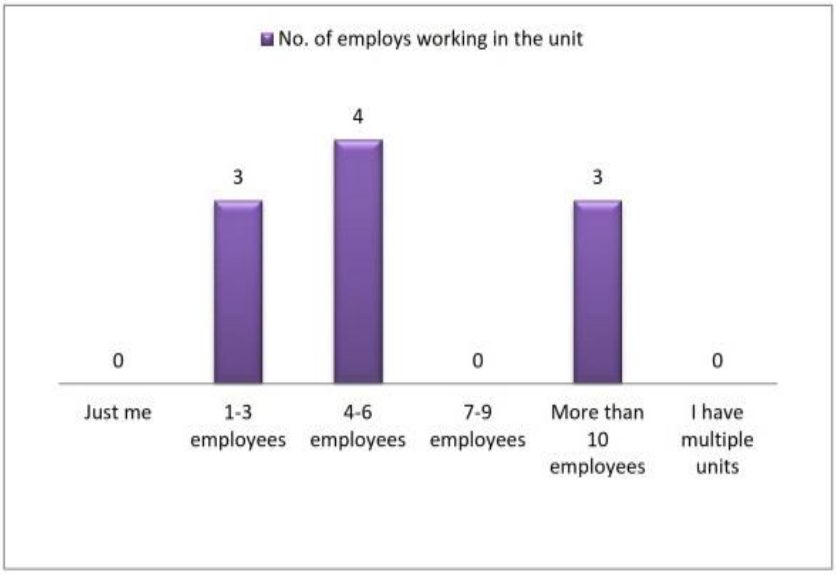

Figure 9: Interpretation of number of employees working in each unit

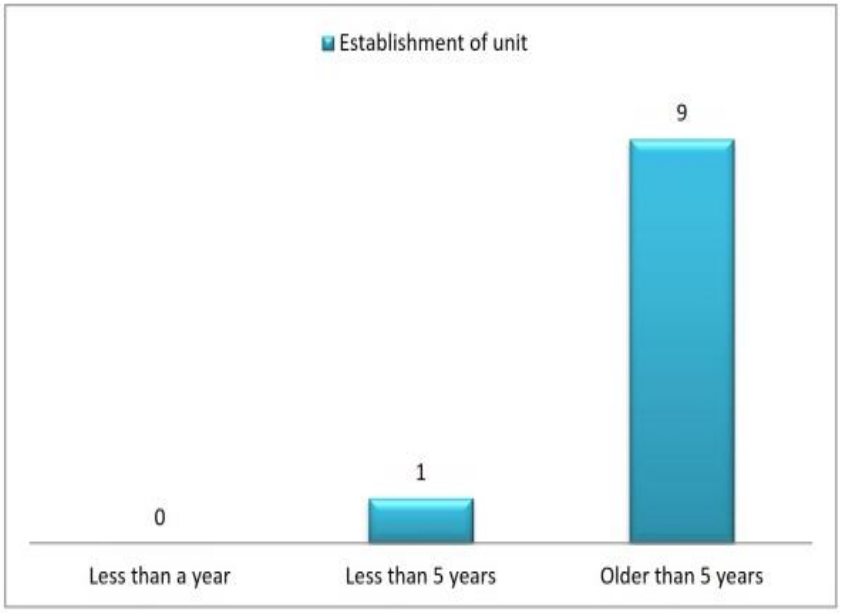

Figure 10: Interpretation of establishment of units

Figure 10 depicts the establishment period of each unit. 9 out of10 sample units, were established before 5years. And only 1 unit which was established just 3 years before is most concerned and working in the direction of making the fashion sustainable. The interview has 18 employees in total, out of which 8 persons are specifically hired to make merchandise out of fabric waste on

daily basis. Firstly, innovative products with a practical approach are designed and developed which may include fabric jewelry, rugged mats, patched cushion covers, bed covers, and floor runners-up. Then fabric trims and cuttings left behind after developing these products are used as cushion and pillow fillings. To influence customers and make them aware of sustainability, the interviewee has even created a custom wallpaper for her store just using fabric swatches, and trims.

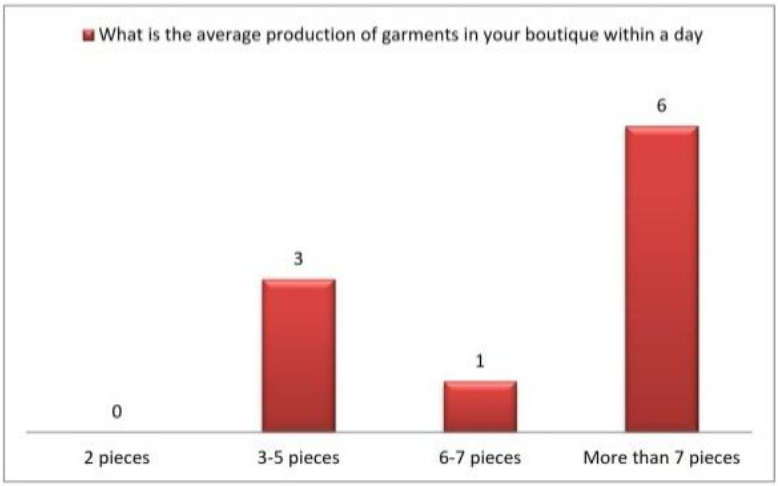

Figure 11: Interpretation of average production of garments in each unit

Figure11 depicts the average production taking place in each unit within a day. 6 out of 10 sample units produce more than 7 pieces a day which is a huge figure in perception with a generation of fabric waste multiplied by each working day of the unit. Moreover, as stated by some of the interviewees this figure may double up in the festive season because of increasing customer demands.

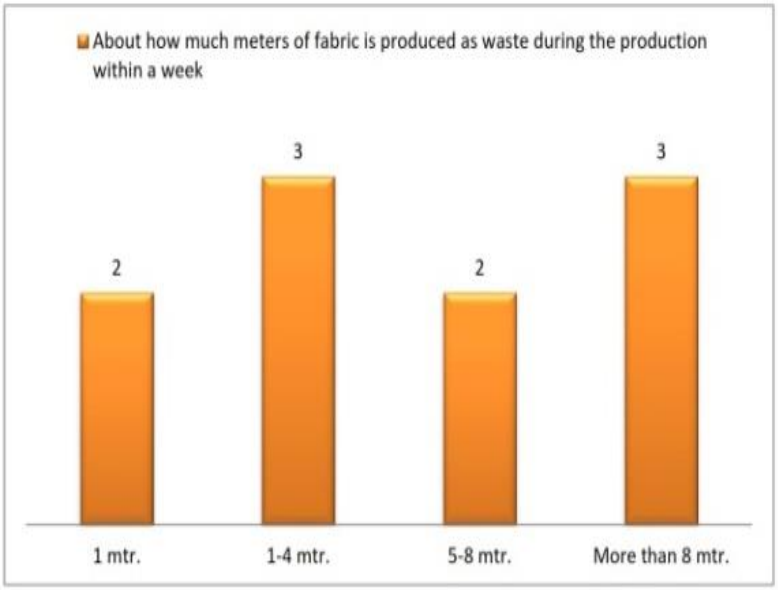

Figure 12: Interpretation of amount of fabric waste produced in each unit within a week

Figure12 depicts the average amount of fabric produced as waste in each unit within a week. Out of 10 sample units, 2units generate about 1mtr. Of waste; 3 units generate 1-4mtr. Of waste; 2units produces5-8mtr.of waste; whereas, 3 units produce more than 8mtr. Of fabric was teach week. This has been observed in Phase I of the research process that, the produced was consists big enough fabrics watches and cuttings which can be used in developing different merchandise. But to do the same, manufacturers need to be more innovative, hard-working, and self-conscious about sustainability and better waste management. They also need to understand the importance of sustainability and negative impacts on the environment because of their poor waste management. Also, working for and towards the direction of a circular economy can help manufacturers improve their brand image which in return let manufacturers expand their business by creating new revenue streams.

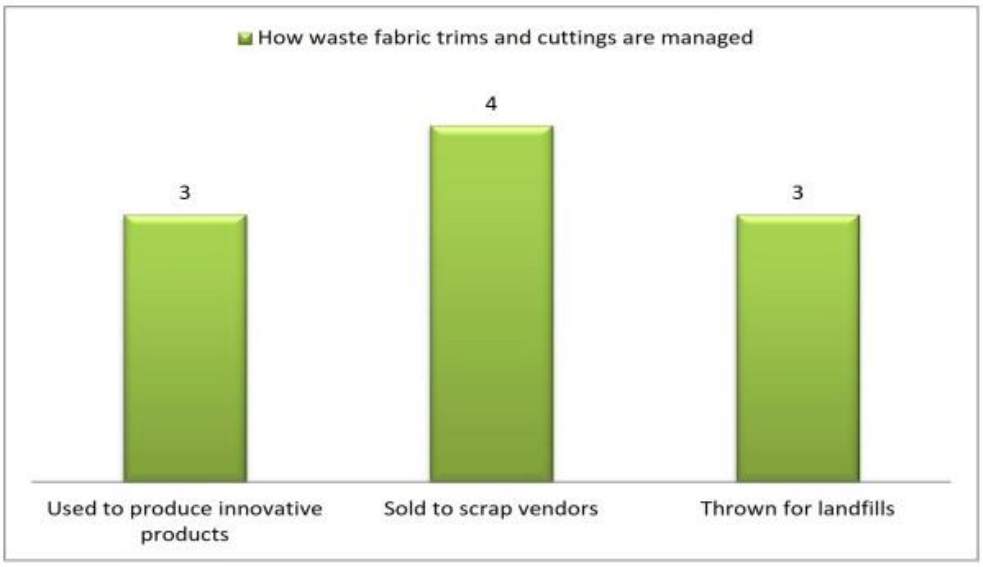

Figure 13: Interpretation of management of fabric trims and cuttings

Figure13 depicts shows boutique owners manage fabric trims and cuttings being produced within their units. Out of 10 sample units, 3units use those cuttings in producing 2 innovative and new merchandise; 4 units sold it to the ear by scarp vendors; whereas, 3 units dump the waste as it is in the garbage which leads to landfills. During the interview, it has been observed that one interviewee donates the trim waste to puppeteers, which use it to stuff its puppets. It is a highly innovative and new approach to dealing with fabric trims' waste.

Results from Survey

Table 1: Tabulation of gender segregation of the survey

Gender	Number	Percentage
Men	6	12%
Women	44	88%

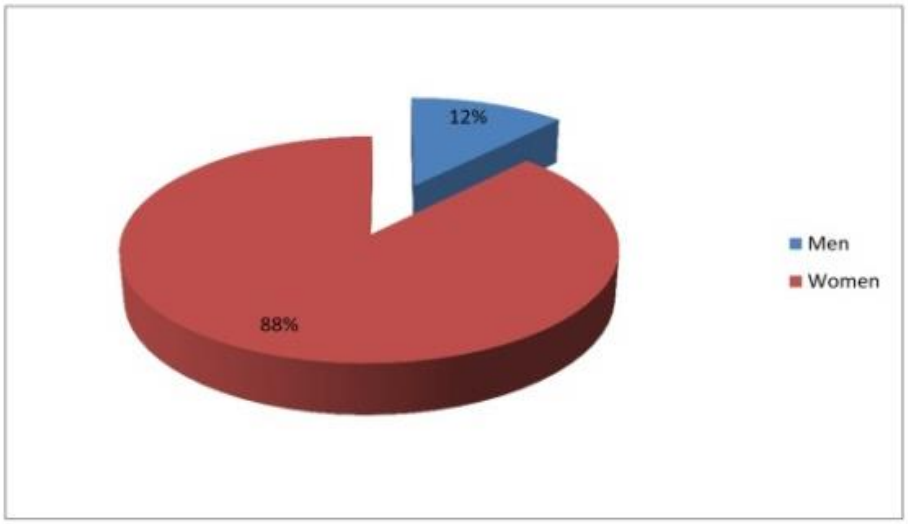

Figure 14: Segregation of survey on the basis of Gender

Figure14 depicts the segregation of surveys on the basis of gender. A sample size of 50 respondents was taken toper form the survey and out of these 12% were men and 88% were women who answered the survey. Convenience sampling was done within the campus of Swami Vivekanand Subharti university - Meerut, targeting this age group of 20-25 years as this age group is most likely to experiment and adapt new and innovative things.

Table 2: Tabulation of purchasing decision of customers

Question/Responses	Yes	No	Confused	Total	Std. Deviation
Would you like to buy this product	37	5	8	50	0.511500394

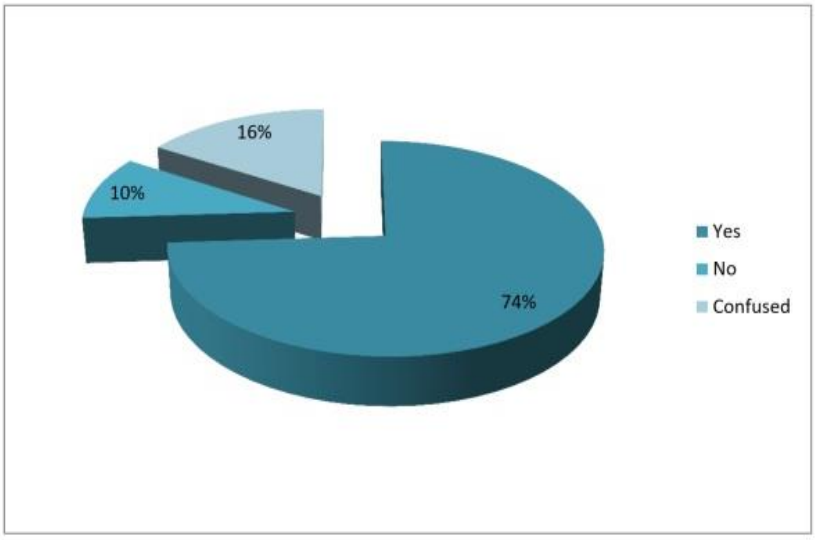

Figure 15: Interpretation of purchasing decision of customers

Figure 15 depicts the purchasing decision so respondents. 74% of respondents readily agree to purchase product (s); 16% of them refused to make the purchase; whereas, 10% were confused with their purchasing decision. I the as been observed that quality, design, and price are the most frequent drivers which highly influence customers purchasing decisions. Some respondents were least concerned about the concept of circular economy and sustainability. Whereas some respondents supported the idea of developing products from fabric waste, but without compromising on quality and design of the merchandise. Overall results were deviated by 0.511500394.

Table 3: Tabulation of color preferences of customers regarding the product

Question/Responses	Like	Dislike	Neither like nor dislike	Total	Std. Deviation
Do you like the color combination of the product	38	5	7	50	0.493219329

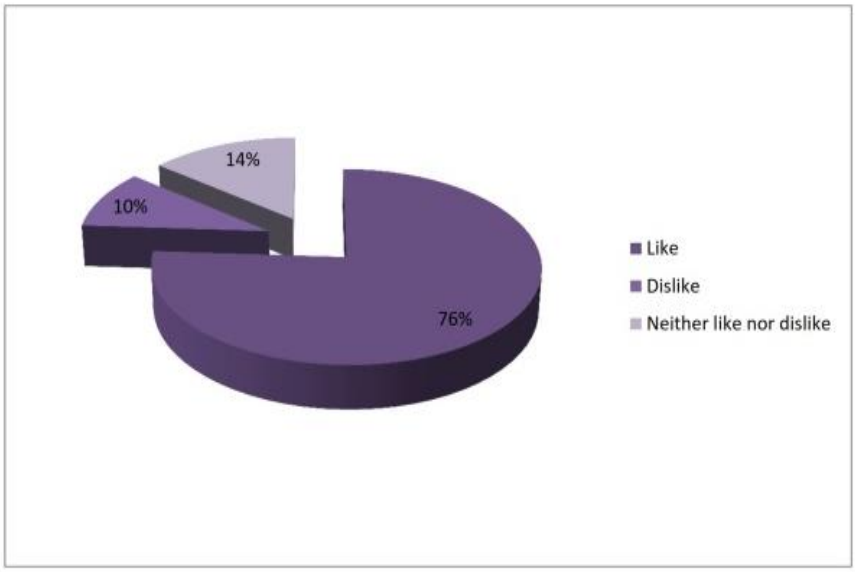

Figure 16: Interpretation of color preferences of customers regarding the product

Figure 16 depicts the color preferences of customers regarding the offered merchandise. The Majority of respondents like the overall color combination of products; 105 of them were just ok with the offered look; but 14% of respondents felt that decent color combinations must be incorporate within the products. Also, colors used in developing the products should be according to the latest trends and season. The overall result was deviated by 0.493219329.

Table 4: Tabulation of utility purposes of the product

Question/Responses	Yes	No	Total	Std. Deviation
Does the product solve your purpose	45	5	50	0.303045763

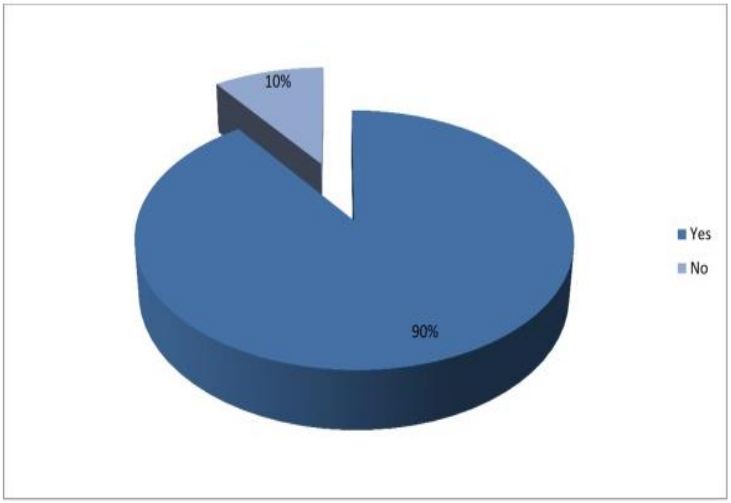

Figure 17: Interpretation of utility purposes of the product

Figure 17 depicts the utility purposes of the product. 90% say that developed product (s) solves their purposes; whereas, 10% of them feel that the product size should be reviewed according to its endues. As observed by the researcher, some respondents also stated that the products are multi-utility and can be used for more than one purpose(s). The Overall result was deviated by 0.303045763.

Table 5: Tabulation of price preferences of customers regarding the product

Question/Responses	Yes	No	Total	Std. Deviation
Would you buy the product for Rs.100-150 each	41	9	50	0.404565779

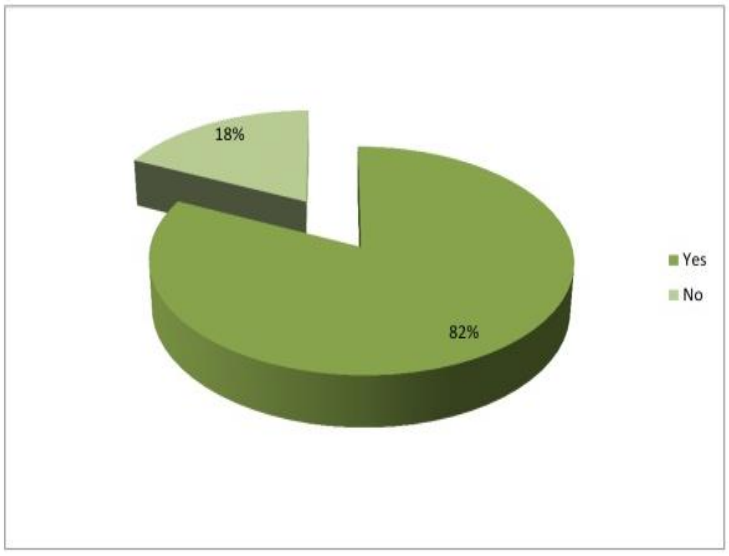

Figure 18: Interpretation of price preferences of customers regarding the product

Figure 18 depicts the price preferences of customers regarding the product.82% of respondents agreed upon purchasing the product(s) for Rs100-150 each. But 18% of them were not in favor of the same. Also, some respondents stated the price to be Rs 50-100 for each as their bid. Therefore, it is clear that the price is an important factor flouncing customer's purchasing decisions when it comes to sustainable merchandise. The Overall result was deviated by 0.404565779.

Table 5: Tabulation of suggestion choices made by customers regarding the product

Question/Responses	Yes	No	Neither Yes nor No	Total	Std. Deviation
Would you suggest buying this product to your friends and family	36	2	12	50	0.494871659

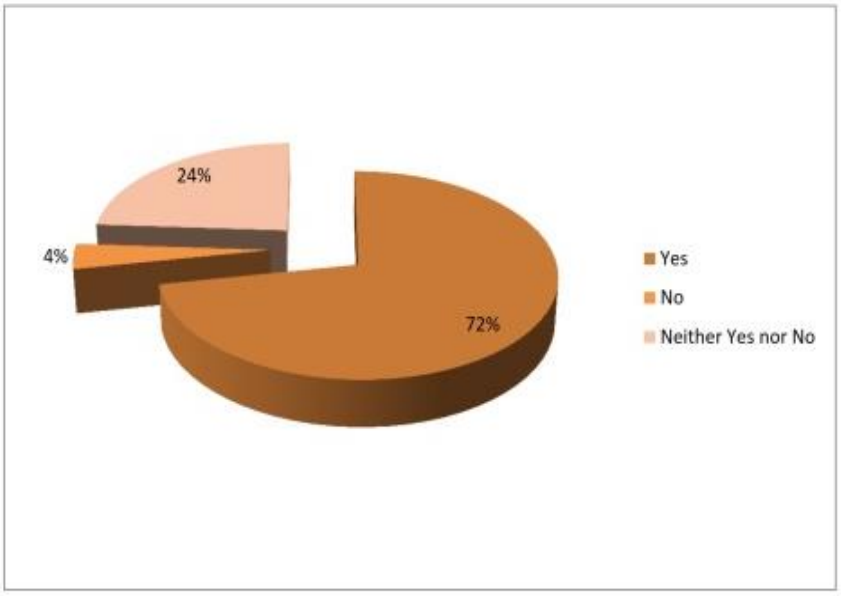

Figure 19: Interpretation of suggestion choices made by customers regarding the product

Figure 19 depicts suggestion choices made by respondents regarding the product. 72% of the total respondents answered 'Yes' i.e. they will suggest buying this product(s) to their friends and family; 4% of them stated as 'No' because they were not aware the "closing the loop" concept; and 24% answered in the favor of 'Neither yes nor no'. The Overall result was deviated by 0.494871659.

RESEARCH FINDINGS

Manufacturer's perception of issues related to the circular economy and customer's acceptability for the products made out of fabric trims and waste has been assessed in two steps. First, 10 interviews focusing mainly on fabric waste management in boutiques were conducted. Second, a survey of 50 respondents was conducted procuring information regarding the acceptability of innovatively crafted handbags. In this section, the findings from both rounds are presented.

Interview Round One–Waste Management in Boutiques

In this step, 10 boutique owners were interviewed regarding their production patterns and measure taken up by them to manage the generated waste.

Manufacturer's Production Patterns

Out of 10 sample units, 9 units were established before 5years. And each unit employed at least 3 persons, whereas at the same time for some units this figure extends to more than 10 persons. Moreover, the maximum number of units produces more than 7 pieces, i.e. ranging around 10-12 pieces per day, which in return results in the generation of an average of 2mtr. Of waste fabric per unit in the form of trims which includes large fabric chunks as well. Fabric waste ranging from 25 cm- 1/2mtr. Is used in making pippins, tassels, or other garment elements like pockets, cuffs, patches, gathers, and ruffles by a majority of manufacturers. Fabric chunkofaround75cm is used for manipulative purposes like mix-and-matching of yokes, sleeves, and patched cushion covers. About1 meter. long fabric waste is mainly used for making half-and-half garment designs or in constructing kid's wear. Whereas, fabric cuttings and trims generated are used as fillings in cushions, pillows, and stool seats. But the majority of manufacturers whether sold it to nearby scrap vendors @ Rs5/kg or discard it as it is in the garbage, which finally ends in the landfills and contributes to higher carbon footprints.

Manufacturer's Sustainability Awareness

While interviewing, it was observed that educated and young manufacturers (Category 1) were more concerned about waste management and real ready taking measures to deal with the same, in comparison with less educated and mid-aged manufacturers (Category 2). Category 1people includes only 30% of the total sample size and the rest 70% goes into Category 2 people who are least or no total aw are of sustainability. Category 1 people express awareness and concern about how their waste generation affects sustainability, but Category 2 people do not reflect on it regularly. Some of the interviewees mention that they get reminded about resource limitations and related issues when they read an article or see news coverage, while the majority say that they seldom reflect on it. Most of the interviewees do not believe that measures taken up by them in the context of fabric waste management would affect their lives to a great extent. Some express that it might make them feel better since they are doing a good thing.

Also, category 1 people how interested in the researcher's report topic and initiated to know more about the "Circular Economy". As the concept was new for them, they even asked a researcher to collaborate with them after this study, so that they can contribute their part in making the fashion circular. Survey Round Two – Customer's acceptability for products made out of fabric waste and trims. It has been observed that respondents purchase decisions greatly depend upon the price, design, quality, and multi-purpose utility of products. The Majority of respondents looked at the material l of the product, so it is important to make sure that product material indicates a quality item that looks good. Therefore, the look and feel of the material is often valued higher. The Majority of respondents were influenced by the concept of using fabric waste in product development and believed that they will value sustainable options higher in the future over design and price options. As more and more information about the environmental footprint becomes available, they state that these are factors that will be of great importance. Whereas, in some

respondent's cases the scenario was just the opposite. Some respondents state quality and design are becoming more important, while sustainability does not matter much.

It has been observed that social land environmental sustainability is not currently considered very important among the respondents, they were just by mesmerized which product's design. However, many believed that these factors will become more important in the future. Some of the respondent's comment that they wish sustainability issues were affecting their decisions to a greater degree, but that other factors such as design and price are more important. Some respondents also mentioned that sustainability probably would be of greater importance if there were more information available since it currently is difficult to relate purchasing decisions to environmental sustainability. For some respondents, the price has been the major driving factor that hinders their purchasing decisions.

CONCLUSION

To the survey conducted for this thesis, some customers do not tend to value these aspects highly when making purchase decisions. Considering these characteristics, this implies that a circular economy can be considered a disruptive trend, which might hamper manufacturers from investing in related initiatives This section aims to present the conclusions following this study. First, conclusions regarding the first research purpose: to analyze the apparel waste generated in the boutiques and measures taken up by the boutique owners to manage the generated waste. Thereafter, the conclusions regarding the second research purpose: to assess the acceptability and marketability of handbags being constructed using waste fabric and fabric trims.

As customer preferences as well as the external environment, are changing over time, it is important to not completely reject the measures or solutions that do not appeal to current customers. Adopting principles of the circular economy requires substantial changes within the unit, as well as factors in its surroundings. Additionally, according. Thus, to not reject opportunities that have the potential to be beneficial in the future, a part-wise decoupling of some current customer's beliefs is motivated. The chance of the circular economy becoming chafed exits and sustainability coverall is most likely to be of even increased importance in the future, motivating initiatives in this area. Moreover, efforts related to the circular economy not only have the potential to decrease units' carbon footprints, but could also help the manufacturer position itself as a responsible retailer and thus enhance the brand image.

REFERENCES

[1] http://mistrafuturefashion.com/wp-content/uploads/2018/01/Sandvik_Circular-fashion-through-recycling_2017.pdf

[2] https://www2.deloitte.com/content/dam/Deloitte/fi/Documents/risk/Circular%20goes%20digital.pdf

[3] http://www.globalfashionagenda.com/wp-content/uploads/2018/07/2020-Commitment-year-one-status-report.pdf

[4] https://www.climate-kic.org/in-detail/digitalisation-circular-economy/

[5] https://vttblog.com/2018/06/27/digitalisation-accelerates-the-circular-economy/

[6] https://kenniskaarten.hetgroenebrein.nl/en/knowledge-map-circular-economy/what-is-the-definition-a-circular-economy/

[7] http://www.greengrowthknowledge.org/sites/default/files/downloads/resource/CircularEconomy.pdf

[8] https://www.emeraldinsight.com/doi/full/10.1108/JFMM-08-2017-0079

[9] https://www.fibre2fashion.com/news/textile-news/tintex-joins-make-fashion-circular-initiative-242282-newsdetails.htm

[10] https://www.fibre2fashion.com/news/textile-news/-australian-circular-fashion-to-focus-on-sustainability-240279-newsdetails.htm

[11] https://www.nature.com/news/circular-economy-lessons-from-china-1.19593

[12] https://www.nature.com/news/the-circular-economy-1.19594

[13] https://www.nature.com/articles/d41586-019-00017-z