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Evaluation of Potential for Textile Waste Management using the PROMETHEE Method

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Abstract: *Textile waste management is a critical component of sustainable practices in the fashion and textile industry. It encompasses the responsible handling and disposal of discarded textiles, including clothing, fabrics, and related materials. The goal of effective waste management is to minimize the environmental impact of textile production and consumption. Several strategies are employed in textile waste management: Recycling involves transforming used textiles into new products or materials, reducing the need for virgin resources. Clothing and textiles in good condition can be donated or sold through second-hand markets, extending their lifespan. Natural fibers like cotton and wool can be composted, returning them to the natural cycle. As the fashion industry continues to grow, so does its environmental footprint through landfill decomposing. Understanding and implementing effective waste management strategies in the textile sector can lead to several crucial benefits. Developing innovative ways to manage textile waste can lead to the creation of new industries and job opportunities. This includes recycling facilities, resale markets, and companies focused on sustainable fashion. Consumer Awareness Research in textile waste management helps raise public awareness about the environmental impact of the fashion industry. This knowledge empowers consumers to make more informed and sustainable choices when purchasing clothing. Regulatory Compliance enforced by governments and regulatory bodies are increasingly focused on sustainable practices within industries, including fashion. Research in waste management provides valuable insights for developing and enforcing policies to ensure compliance. Circular Economy Promotion is required for effective textile waste management that supports the transition towards a circular economy and a sustainable life cycle, where resources are reused and recycled rather than disposed-off after a single use. By extending the life of textiles through reuse and recycling, the carbon footprint associated with the production and transportation of new clothing is reduced. Innovation and Technology Advancement through research in textile waste management drives innovation in recycling technologies, fabric design, and sustainable production methods, which can have broader applications beyond the fashion industry. Textile waste is a global issue, and effective waste management practices can have positive repercussions on a worldwide scale, contributing to broader sustainability goals. The PROMETHEE method encompasses several aspects. Firstly, it considers diverse scales for evaluating different grounds. It allows for making decisions based on the best options, as illustrated by PROMETHEE I, which involves partial ranking. This involves identifying incomparable and neglected alternatives Ginning, Spinning, Sizing, Power looms, Dyeing and printing and Cotton waste, Blow room droppings, Cotton dust, Brass bora and Iron drums as per the ranking of Textile Waste Management for using the analysis of PROMETHEE Method. Power looms were considered the first rank whereas is the Spinning was ranked the lowest in the analysis.*

Keywords: *MCDM, Cotton waste, Blow room droppings, Cotton dust, Brass bora and Iron drums.*

1. INTRODUCTION

Textile waste management is a critical facet of sustainable resource utilization and environmental conservation. It involves the systematic handling, disposal, and recycling of textiles and apparel, aiming to minimize their environmental impact. The fashion industry is one of the largest contributors to global waste, with millions of tonnes of textiles discarded annually. Recycling is a key component of textile waste management. It entails the conversion of old and worn textiles into new products, reducing the demand for virgin materials [1]. Donations and reuse are also vital strategies. Clothing in good condition can find new life through charitable donations or resale in second-hand markets. Additionally, composting is a sustainable option for natural fibers like cotton and wool, allowing them to decompose naturally. While these methods are preferred, some textiles end up in landfills or undergo controlled incineration [2]. Landfill disposal is used for non-recyclable or non-compostable materials. Incineration, if conducted in specialized facilities, can generate energy while minimizing environmental harm. Effective textile waste management is essential in mitigating the environmental impact of the fashion industry. By implementing these strategies, the lifespan of textiles can be extended, reducing the demand for new resources, and contributing to more sustainable and circular economy [3]. The textile industry plays a crucial role in our daily lives, providing an array of clothing and fabric products, however it also generates significant waste. When a textile item reaches the end of its lifecycle, it often ends up being discarded. Natural fibers, which make up 100% of some textiles, will eventually decompose over a few years. Nevertheless, in recent years, population scientists have identified new sources of fibers, reflecting an increase in demand for clothing due to a growing global population. This has led to an estimated annual demand for 99 million tonnes of textiles, a demand that cannot be met solely through natural fibers [4]. As a result, fabrics now often consist of blends, and some combinations are impossible to achieve without the use of synthetic compounds. Most synthetic fibers are derived from petrochemicals, which were once harmful to the environment but over the years have improved with reduced toxicity limits [5].

Efforts are being made to shift towards more sustainable fiber cultivation and production methods in the textile industry. Assessments are being conducted to evaluate the environmental impact, quality, and life cycle of textile products. Certifications such as ISO are awarded to products that meet specific criteria. Unwearable textiles, once detected, are often discarded or thrown into the landfill. Some countries collect old textiles and donate them to agencies that distribute them to those in need, particularly in third-world countries. This practice exemplifies how one person's waste can be another person's treasure [6]. Textile waste is increasingly being recycled into new clothing, reflecting a growing awareness among consumers. This movement towards "green" textiles is being driven by a desire to make more environment-friendly choices. The advertising and marketing strategies of many brands have also shifted towards promoting eco-friendliness. In turn, consumers are reducing their purchases of non-recycled items. Recent studies have shown a positive correlation between environment-friendly textiles and consumerism, as well as a preference for such products among women [7]. International fashion brands are incorporating recycled fibers into their products, marking a shift towards sustainability in the industry. One notable brand, Eco-Spun by Welspun Inc., specializes in selling clothes made from recycled plastic bottles. This innovative approach diverts approximately 9 million plastic bottles from landfills each year, showcasing the remarkable potential for recycling in the textile industry. Eco-fi, made from 100% recyclable PET fibers, is another noteworthy example. It is used in various applications including home textiles, car interiors, furniture, mattresses, and even handcrafts [8]. Blending with wool has become increasingly popular in the market, offering a combination of natural and sustainable materials. Additionally, Lutradur ECO is a sustainable brand that uses fibers obtained from recycled PET bottles. One square meter of fabric produced from PET bottles helps recycle two liters of water from a single PET bottle. These initiatives contribute to a reduction in waste and a more sustainable textile production process. In 2017, a special effort was made to convert plastic into fiber, marking a significant milestone in recycling efforts [9]. Innovations continue to emerge in the textile industry, further expanding the applications of recycled materials. For instance, Safeleigh by Lay Fibres has recently launched fire-resistant menswear, bulletproof vests, and other protective clothing made from aramid fibers—a natural flame-retardant material. By leveraging organic sources, such as dandelion roots, to create rubber fibers from scratch, progress is being made in reducing the environmental footprint of textiles. These efforts collectively contribute to a more sustainable and eco-friendly textile production process [10].

The cotton-textile industry is known for its substantial water consumption during production, necessitating extensive purification efforts to manage wastewater. This wastewater carries a considerable organic load concentration, akin to municipal wastewater in terms of medium strength. Nevertheless, it stands out due to its distinctive color, which presents a notable environmental concern. This research project, conducted in collaboration with a prominent textile manufacturer, explores various treatment modalities and conducts diverse studies to identify highly cost-effective approaches [11]. These investigations encompass a combination of viewing methods. For instance, while the activated sludge process is cost-effective, it falls short of offering a comprehensive solution within an integrated wastewater management system because it cannot effectively address discoloration issues. On the other hand, coagulation/flocculation methods can tackle the discoloration of cotton-wastewater but generate significant volumes of solid waste, subsequently increasing the overall treatment costs considerably [12]. The textile industry is a significant contributor to the economy, particularly in developing countries like Pakistan. It serves as a major source of export earnings, with Faisalabad alone accounting for approximately US$3 billion per year in yarn and fabric exports. This industry also plays a pivotal role in providing employment opportunities, employing an average of 161,325 people in Faisalabad, out of which 11,860 are engaged in solid waste handling and management [13]. The textile sector generates various types of waste, including fiber, metal, plastic, and paper waste. Interestingly, no waste is immediately discarded; instead, a systematic categorization process is employed based on type and weight. Cotton waste, for instance, finds its way to brick kilns, where it serves as an economical alternative fuel compared to wood or coal. Iron is another valuable resource retrieved from the waste stream, as it is sold in the junk market and subsequently recycled for reuse in factories [14]. Moreover, paper waste undergoes recycling processes, reducing the demand for virgin materials and contributing to the sustainability of the industry. Other materials like plastic and iron drums are sent back to factories for refilling, cutting down on costs and diminishing the need for new drum production. Despite these commendable efforts, there is room for improvement in waste management practices. Implementing a robust quality control system and enhancing monitoring mechanisms will further enhance the industry's sustainability and economic viability [15]. Cotton production in Pakistan holds a prominent position, making it a cornerstone of the nation's economy. It contributes over 60% of the total export earnings and accounts for 46% of the overall production. Furthermore, it provides employment to 38% of the workforce engaged in manufacturing (Iqbal et al., 2007). The textile industry, located mainly in Faisalabad, plays a vital role in the economic landscape. Faisalabad is the third-largest city in Pakistan, with a population estimated to be around 2,009,000 according to the 1998 census. However, current trends indicate an increase to approximately 5,000,000 (District Government Faisalabad, 2010) [16]. This district, situated in the plains of North-East Punjab, spans a total area of 5,856 square kilometers, with coordinates between longitude 73°74 east and latitude 30°31.5 north. Faisalabad is a significant industrial hub, producing vast quantities of thread and fabric that cater to a potential market of hundreds of thousands of meters. It accounts for 25% of textile exports from Pakistan and 15% of the nation's total exports. Other industries in the region have also flourished in favor of the textile industry [17]. The objective of the study was to classify waste from the textile industry, focusing on physical attributes rather than chemical composition. This includes identifying sources of waste generation and categorizing them, along with exploring economic prospects and employment opportunities within this field. Regarding solid waste, it emerges as a major waste stream, superseded only by liquid waste in the textile industry. There exist numerous options to diminish solid waste, a couple of which include 1. Implement efficient procurement procedures for raw materials to reduce excess; and 2. Opt for reusable plastic drums for chemicals rather than single-use cardboard drums [18].

2. MATERIALS AND METHOD

Ginning: Ginning is a crucial initial step in the textile industry, primarily focused on processing raw cotton. The process involves separating cotton fibers from their seeds, preparing them for further processing. During ginning, cotton undergoes cleaning and refining, ensuring it is free from impurities, making it suitable for the subsequent stages of production. This meticulous procedure ensures that the cotton fibers are of high quality, which is essential for producing fine textiles. Ginning plays a pivotal role in determining the quality and purity of the cotton fibers, ultimately influencing the overall quality of the final textile products.

Spinning: Spinning is a fundamental process in the textile industry that transforms raw fibers like that of cotton, into yarn by the insertion of twist. It involves drawing out and twisting of fibers to create a continuous thread. The goal is to produce yarns with consistent thickness, strength, and texture, ensuring its suitability for various textile applications. Modern spinning techniques use advanced machinery and technology to achieve high levels of precision and efficiency. The quality of the spun yarn greatly influences the final fabric characteristics, such as its texture, strength, and appearance. Spinning is a critical stage in the textile production chain, and advancements in this process have significantly contributed to the diversity and quality of textiles available in today's market.

Sizing: Sizing, also known as warp sizing or warp dressing, is a crucial process in the textile industry that involves applying a protective coating or sizing agent onto the warp yarns before they are woven into fabrics. This coating helps strengthen the yarns, reduce friction during the weaving process, and prevent breakage. Sizing is particularly important for high-speed weaving operations as it enhances the yarn's ability to withstand the stress and tension during the weaving process. The sizing material used can vary, including natural substances like starch or synthetic gums or resins. Properly sized warp yarns result in smoother and more efficient weaving, ultimately leading to the production of high-quality fabrics. Additionally, sizing also plays a role in determining the final appearance and characteristics of the fabric. Overall, sizing is an integral step in the textile production process that ensures the successful transformation of yarn into durable and visually appealing fabrics.

Power looms: Power looms revolutionized the textile industry by introducing automated weaving processes. These machines use power sources, such as electricity, to mechanize the process of interlacing warp and weft yarns, replacing the manual labor required in traditional hand looms. Power looms significantly increased the speed and efficiency of textile production, allowing for larger quantities of fabric to be woven in a shorter period of time. This technological advancement led to increased productivity, lowered production costs, and expanded the availability of affordable textiles in the market. Power looms have become a cornerstone of modern textile manufacturing, facilitating the production of a wide range of fabrics used in various industries, including clothing, upholstery, and home textiles. Today, they continue to play a vital role in meeting the global demand for textiles.

Dyeing and printing:

Dyeing and printing are the stages where color and design are added to the fabric. Dyeing requires immersion of the fabric in a solution containing dyes to achieve the desired color, while printing applies patterns or designs using dyes or pigments on the surface. These processes play a pivotal role in creating a wide variety of vibrant and appealing textile products.

Cotton waste:

Cotton waste encompasses various remnants and by-products generated during the cotton processing stages. This category includes scrap, lint, and other unused portions that result from ginning, spinning, and other textile operations. Cotton waste can be repurposed for various applications, such as making paper, producing cellulose-based products, or even used as stuffing material in certain industries.

Blow room droppings:

Blow room droppings refer to the waste material produced during the initial stages of cotton processing. This includes impurities, dust, and short fibers that are removed during the cleaning and carding process. While these droppings are not suitable for further processing in the textile industry, they can find use in other industries or be recycled for alternative applications.

Cotton dust:

Cotton dust is a common byproduct of textile operations, particularly in environments where cotton fibers are handled. It consists of fine particles and fibers that become airborne during processing. Cotton dust can pose respiratory hazards for workers, making proper ventilation and safety measures crucial in cotton processing facilities.

Brass bora:

Brass bora and iron drums are types of waste generated from machinery and equipment used in textile mills. Brass bora refers to scrap metal, often from components like gears or fittings, made of brass. Similarly, iron drums are discarded containers used for various purposes within the mill. Both materials can be recycled or repurposed to minimize waste and reduce environmental impact.

Iron drums:

Iron drums refer to cylindrical containers made of iron or steel that are used in various industrial processes, including textile manufacturing. These drums serve as versatile containers for storing and transporting materials such as chemicals, dyes, solvents, and other substances used in the textile industry. They are valued for their durability, strength, and ability to withstand harsh environments.

Method: The PROMETHEE method encompasses several aspects. Firstly, it considers diverse scales for evaluating different grounds. It allows for making decisions based on the best options, as illustrated by PROMETHEE I, which involves partial ranking. This involves identifying incomparable and neglected alternatives. PROMETHEE offers a complete ranking of alternatives, which serves as a Multi-Criteria Decision Analysis (MCDA) procedure. Through the PROMETHEE technique, a step-by-step process is employed [19]. Generally, the entailing sequence is followed: Weighing the criteria and selecting Decision Makers (DMs). Evaluating the performance of alternatives against the criteria. Incorporating common values and addressing related negligence and optional values during selection [20]. The PROMETHEE methodology is widely recognized for its outreach-oriented approach. It presents a valuable way to address issues through interconnections. These connections are mutual, and PROMETHEE establishes relationships among various modes. These relationships are structured in a series of interconnected steps according to a customized configuration. PROMETHEE is a sophisticated system that proves particularly valuable in making complex decisions [21]. This utility is especially prominent in practical, real-world situations where Human Multi-Attribute Decision Making (MADM) problems require an awareness of consciousness and the expertise of individuals. These problems often involve subjective judgments. Within the PROMETHEE framework, the alternatives are comparable, and the method takes into account both positive and negative aspects [22]. Instead of merely focusing on inflows and outflows, it employs a balanced approach through the utilization of routes. Assessing performance against benchmarks addressing uncertainty appropriately however, each also connected to the measurement scale boundaries are also generally applicable criterion functions, ultimately the choice that rests with users poses significant challenges, resulting in additional uncertainty arising [23]. Hence, to overcome this hurdle, the credibility is established through reliance on the suggested approach, this is the PROMETHEE methodology derived from identifying the solution, Involves the role of the decision maker facilitates exploration [24]. THE PROMETHEE FAMILY first introduced in 1982 originating in Quebec, Canada, France emerging during a conference, a shift within this towards rankings PROMETHEE I and Section PROMETHEE, designed for addressing problems of varying nature including PROMETHEE VEO for special cases. Currently in practical use across numerous criteria, PROMETHEE methods hold utmost significance [25]. Widely applied in practical scenario, determining criteria serves to address complexities using methodologies several variations and each also in developing stages countless iterations remarks as well as one or more PROMETHEE methods conventionally employed observing the presentations. Selection of each criterion Activity Exam in PROMETHEE A function of each criterion is often nature of criteria and the decision maker is determined predefined There are six categories' examination processes, which include the following criteria: usual criterion, quasi-criterion, criterion with linear preference, level criterion, criterion with linear preference and indifference area, and gaussian criterion [26]. The Prometheus method is for a portfolio with complexity. There are relatively few publications to apply PROMETHEE in the textile industry analysis. In the present article, with regards to PROMETHEE, more than seven outliers were identified. Sometimes data is too large to cover criteria evaluation tables. At that point, the decision will be made to use PROMETHEE to help solve problems with a black box. In this situation, if a wood-structure is adopted, it can be seen as an extension of PROMETHEE [27].

3. ANALYSIS AND DISCUSSION

TABLE 1. Textile Waste Management

Textile Operation	Cotton waste	Blow room droppings	Cotton dust	Brass bora	Iron drums
Ginning	1550	1650	75.6	57.8	63.5
Spinning	1350	1480	60.6	86.5	95.3
Sizing	1560	1950	40.5	97.8	88.6
Power looms	1750	1750	50.5	90.5	98.4
Dyeing and printing	1560	1350	67.6	50.6	69.79
Max	1750	1950	75.6	97.8	98.4
Min	1350	1350	40.5	50.6	63.5
Max-Min	400	600	35.1	47.2	34.9
	400	600	35.1	47.2	34.9

Table 1 shows Textile Waste Management in Cotton waste, Blow room droppings, Cotton dust, Brass bora and Iron drums. and Alternative Parameters Ginning, Spinning, Sizing, Power looms, Dyeing and printing in Cotton waste in 1750 Power looms is showing the Maximum Value and 1350 Spinning is showing the minimum value. Blow room droppings in 1950 Sizing is showing the Maximum Value and 1350 Dyeing and printing is showing the minimum value. Cotton dust in 75.6 Ginning is showing the Maximum Value and 40.5 Sizing is showing the minimum value. Brass bora in 97.8 Sizing is showing the Maximum Value and 50.6 Dyeing and printing is showing the minimum value. Iron drums in 98.4 Power looms is showing the Maximum Value and 63.5 Ginning is showing the minimum value.

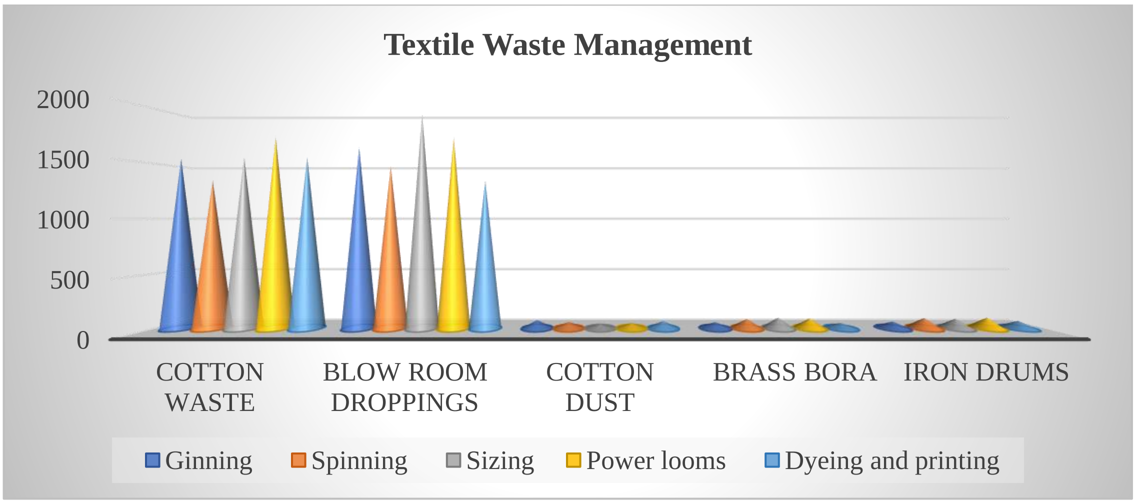

FIGURE 1. Textile Waste Management

Figure 1 shows the shows Textile Waste Management in Cotton waste, Blow room droppings, Cotton dust, Brass bora and Iron drums. and Alternative Parameters Ginning, Spinning, Sizing, Power looms, Dyeing and printing in Cotton waste in 1750 Power looms is showing the Maximum Value and 1350 Spinning is showing the minimum value. Blow room droppings in 1950 Sizing is showing the Maximum Value and 1350 Dyeing and printing is showing the minimum value. Cotton dust in 75.6 Ginning is showing the Maximum Value and 40.5 Sizing is showing the minimum value. Brass bora in 97.8 Sizing is showing the Maximum Value and 50.6 Dyeing and printing is showing the minimum value. Iron drums in 98.4 Power looms is showing the Maximum Value and 63.5 Ginning is showing the minimum value.

TABLE 2. Normalized Matrix

	Cotton waste	Blow room droppings	Cotton dust	Brass bora	Iron drums
Ginning	0.5	0.5	1	0.15254	0
Spinning	0	0.2167	0.5726	0.76059	0.9112
Sizing	0.525	1	0	1	0.7192
Power looms	1	0.6667	0.2849	0.84534	1
Dyeing and printing	0.525	0	0.7721	0	0.1802

Table 2 shows the Normalized matrix of Textile Waste Management or PROMETHEE the Normalization are shown in the above tabulation for the Textile Waste Management shown in the table above Normalized matrix Value.

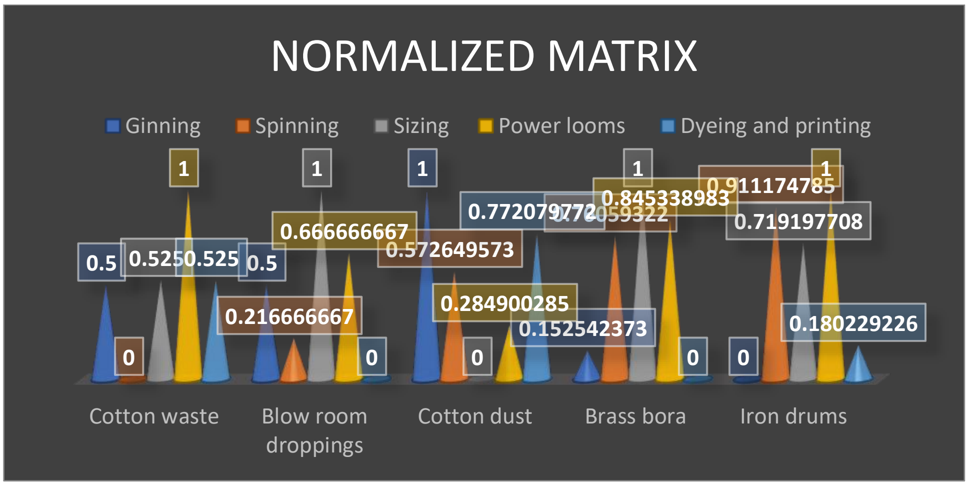

FIGURE 2. Normalized matrix

Figure 2 shows Table 2 shows the Normalized matrix of Textile Waste Management or PROMETHEE the Normalization are shown in the above tabulation for the Textile Waste Management shown in the table above Normalized matrix Value.

TABLE 3. Pair wise Comparison

Pair wise Comparison					
	Cotton waste	**Blow room droppings**	**Cotton dust**	**Brass bora**	**Iron drums**
D12	0.5	0.2833	0.4274	-0.6081	-0.911
D13	-0.025	-0.5	1	-0.8475	-0.719
D14	-0.5	-0.1667	0.7151	-0.6928	-1
D15	-0.025	0.5	0.2279	0.15254	-0.18
D21	-0.5	-0.2833	-0.427	0.60805	0.9112
D23	-0.525	-0.7833	0.5726	-0.2394	0.192
D24	-1	-0.45	0.2877	-0.0847	-0.089
D25	-0.525	0.2167	-0.199	0.76059	0.7309
D31	0.025	0.5	-1	0.84746	0.7192
D32	0.525	0.7833	-0.573	0.23941	-0.192
D34	-0.475	0.3333	-0.285	0.15466	-0.281
D35	0	1	-0.772	1	0.539
D41	0.5	0.1667	-0.715	0.6928	1
D42	1	0.45	-0.288	0.08475	0.0888
D43	0.475	-0.3333	0.2849	-0.1547	0.2808
D45	0.475	0.6667	-0.487	0.84534	0.8198
D51	0.025	-0.5	-0.228	-0.1525	0.1802
D52	0.525	-0.2167	0.1994	-0.7606	-0.731
D53	0	-1	0.7721	-1	-0.539
D54	-0.475	-0.6667	0.4872	-0.8453	-0.82

Table 3 shows the Pair Wise Comparison of table 2 the Cotton waste, Blow room droppings, Cotton dust, Brass bora and Iron drums comparing each row with other row on the tabulation.

TABLE 4. Preference Value

Preference Value						
	0.2336	**0.165**	**0.3355**	**0.102**	**0.042**	
D12	0.1168	0.047	0.1434	0	0	0.307
D13	0	0	0.3355	0	0	0.336
D14	0	0	0.2399	0	0	0.24
D15	0	0.083	0.0765	0.016	0	0.175
D21	0	0	0	0.062	0.039	0.101
D23	0	0	0.1921	0	0.008	0.2
D24	0	0	0.0965	0	0	0.097
D25	0	0.036	0	0.078	0.031	0.144
D31	0.0058	0.083	0	0.087	0.03	0.205
D32	0.1226	0.129	0	0.024	0	0.276
D34	0	0.055	0	0.016	0	0.071
D35	0	0.165	0	0.102	0.023	0.29
D41	0.1168	0.028	0	0.071	0.042	0.257
D42	0.2336	0.074	0	0.009	0.004	0.32
D43	0.111	0	0.0956	0	0.012	0.218
D45	0.111	0.11	0	0.086	0.035	0.342
D51	0.0058	0	0	0	0.008	0.013
D52	0.1226	0	0.0669	0	0	0.19
D53	0	0	0.259	0	0	0.259
D54	0	0	0.1634	0	0	0.163

Table 4 shows the Performance value of the Cotton waste, Blow room droppings, Cotton dust, Brass bora and Iron drums When compare to all others. And the last one is the sum of the same row.

TABLE 5. Sum of Performance Value

	Cotton waste	**Blow room droppings**	**Cotton dust**	**Brass bora**	**Iron drums**		
Ginning	0	0.307	0.3355	0.23992	0.1746	1.05704	0.2114
Spinning	0.10072	0	0.2003	0.09654	0.1444	0.54196	0.1084
Sizing	0.20546	0.2765	0	0.07086	0.2902	0.84296	0.1686
Power looms	0.25747	0.3204	0.2185	0	0.3422	1.13844	0.2277
Dyeing and printing	0.01348	0.1895	0.259	0.16345	0	0.62551	0.1251
	0.57712	1.0934	1.0132	0.57076	0.9514		
	0.11542	0.2187	0.2026	0.11415	0.1903		

Table 5 shows the sum of all rows and column are applied on the last row. The sum of all row of performance value is arranged above tabulation and the diagonal value is zero.

TABLE 6. positive flow, Negative Flow, Net flow

	Positive flow	**Negative Flow**	**Net flow**	**Rank**
Ginning	0.21141	0.1154	0.095983141	2
Spinning	0.10839	0.2187	-0.110283791	5
Sizing	0.16859	0.2026	-0.034057452	3
Power looms	0.22769	0.1142	0.113535054	1
Dyeing and printing	0.1251	0.1903	-0.065176952	4

Table 6 shows ranking Textile Waste Management for the positive flow, Negative Flow, Net flow. Cotton waste, Blow room droppings, Cotton dust, Brass bora and Iron drums in the above tabulation the Power looms is in the first rank and the last rank is Spinning.

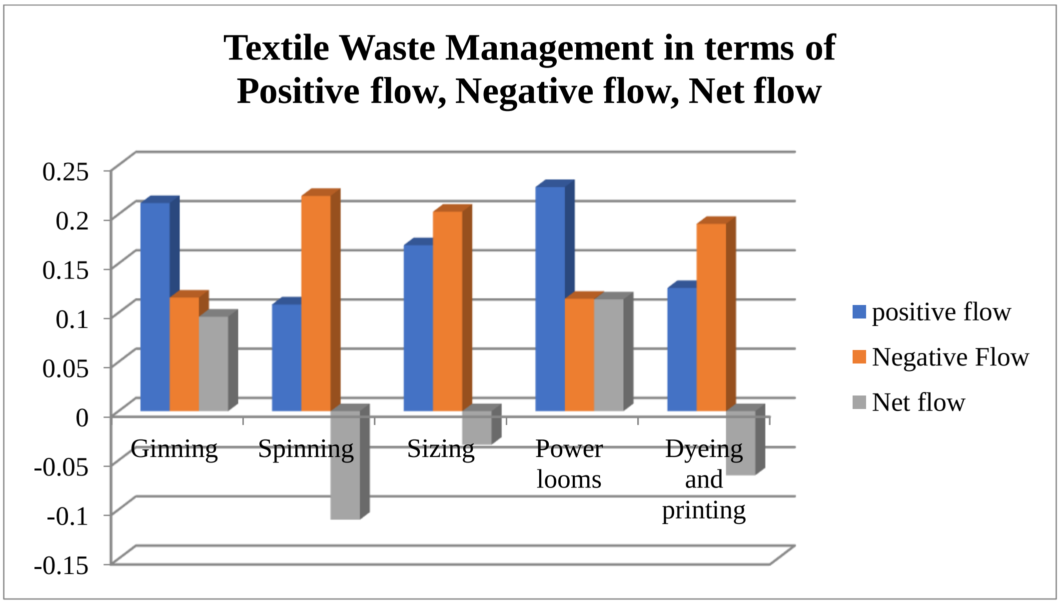

FIGURE 3. Textile Waste Management in terms of Positive flow, Negative flow, Net flow

Figure 3 depicts ranking of Textile Waste Management in terms of positive flow, negative flow, net flow for Cotton waste, Blow room droppings, Cotton dust, Brass bora and Iron drums in the above tabulation the Power looms is in the first rank and the last rank is Spinning.

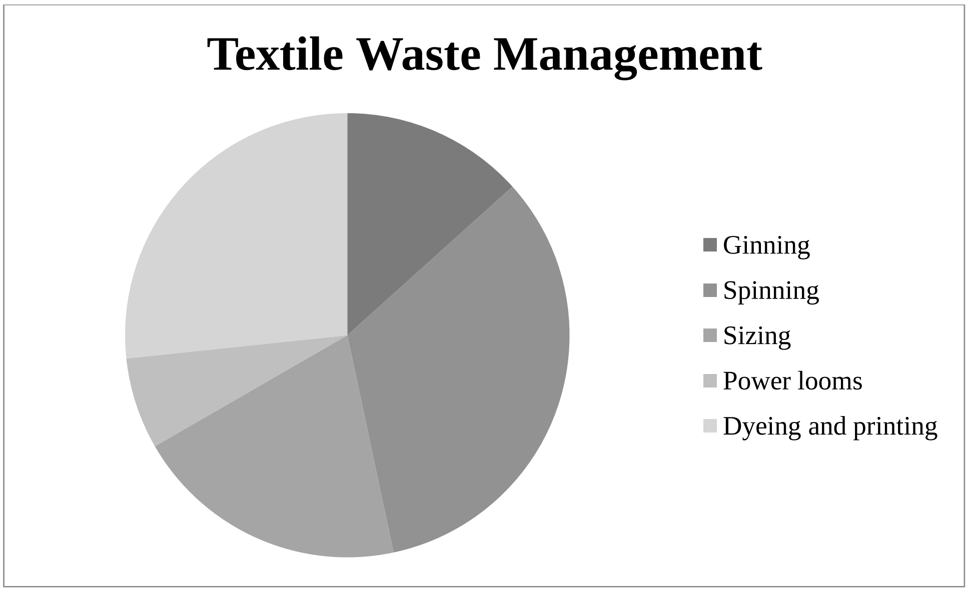

FIGURE 4. Rank

Figure 4 Ranking of Textile Waste Management for using the analysis of PROMETHEE Method. Power looms obtained the first rank whereas is the Spinning had the lowest rank.

4. CONCLUSION

Textile waste management is a critical component for adopting sustainable practices in the fashion and textile industry. It encompasses the responsible handling and disposal of discarded textiles, including clothing, fabrics, and related materials. The goal of effective waste management is to minimize the environmental impact of textile production and consumption. Several strategies are employed in textile waste management: Recycling involves transforming used textiles into new products or materials, reducing the need for virgin resources. Donation and Reuse involves clothing and textiles which are in good condition can be donated or sold through second-hand markets, extending their lifespan. Composting refers to natural fibers like cotton and wool that can be composted, returning them to the natural cycle. Landfill Disposal, while not ideal, it is sometimes necessary for non-recyclable or non-compostable textiles. Incineration includes controlled burning of textiles that can generate energy, but it must be done in specialized facilities to prevent harmful emissions. Textile waste management research holds significant importance in today's global context. As the fashion industry continues to grow, so does its environmental footprint. Understanding and implementing effective waste management strategies in this sector can lead to several crucial benefits: Environmental Conservation: Proper management of textile waste reduces the environmental impact associated with its disposal. This includes minimizing the release of harmful chemicals and reducing the amount of textile waste sent to landfills or incineration facilities. Resource conservation implies recycling and reusing textiles, conserves valuable resources like water, energy, and raw materials. Textile waste is increasingly being recycled into new clothing, reflecting a growing awareness among consumers. This movement towards "green" textiles is being driven by a desire to make more environmentally-friendly choices. The advertising and marketing strategies of many brands have also shifted towards promoting eco-friendliness. In turn, consumers are reducing their purchases of non-recycled items. Recent studies have shown a positive correlation between environment-friendly textiles and consumers attitudes and preferences for such products especially among women. The textile manufacturing processes generates waste at various stages. Ginning is a crucial initial step in the textile industry, primarily focused on processing raw cotton. The process involves separating cotton fibers from their seeds, preparing them for further processing. During ginning, cotton undergoes cleaning and refining, ensuring it is free from impurities, making it suitable for the subsequent stages of production. Spinning is a fundamental process in the textile industry that transforms raw fibers, like cotton, into yarn. It involves the drawing out and twisting of fibers to create a continuous thread. The goal is to produce yarn with consistent thickness, strength, and texture, ensuring its suitability for various textile applications. Modern spinning techniques use advanced machinery and technology to achieve high levels of precision and efficiency. The ranking of Textile Waste Management for using the analysis PROMETHEE Method was evaluated in this paper using the presented data. Power looms was at the first rank whereas Spinning was at the lowest rank.

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