

ASSESSMENT OF DESIGN CRITERIA FOR REINVENTION OF FABRIC WASTE TO PRODUCE CHILDRENS CLOTHING ARTICLES BY CLOTHING ENTREPRENEURS IN KANO STATE NIGERIA

^{1*}Obiana Uche Viola; ^{2*}Edache Ajunwa ^{3*}Isiguzo Valentina

^{1&3*}Department of Home Science and Management, Federal University, Gashua, Yobe State, Nigeria, ^{2*} Department of Home Science and Management, Federal University of Agriculture

**Corresponding Author; Emails: ucheviolaanazodoobiana@gmail.com*

ABSTRACT

This study explores design criterion for reinvention of fabric waste to produce children's clothing articles by clothing entrepreneurs in kano state Nigeria. Objectively, the study identified design criteria required for reinvention of fabric waste to produce children's clothing articles, the types and characteristics of fabric waste to be reinvented to produce children's clothing articles by clothing entrepreneurship in Kano State. A survey design was used for the study. Population was 15,824 made up of 600 registered clothing entrepreneurs and 15,269 mothers that registered for post-natal and pediatric care in federal, state government and private hospitals in Kano State. Multi-stage sampling technique and purposive sampling was used to select a sample size of 612 respondents, comprising of 378 mothers and 234 clothing entrepreneurs. Questionnaire titled "Assessment of Design Criteria for Reinvention of Fabric Waste to produce Children's Clothing Article Instrument for Mothers and Clothing Entrepreneurs (DCRFWPCCAIMCE)" was used for data collection. Internal consistency of instrument was determined using Cronbach alpha which yielded 0.82 for design criteria and 0.89 for fabric characteristics. Data were analyzed using mean and standard deviation. Result of the Findings revealed sixteen design criteria identified for reinvention of fabric waste to produce children's clothing articles. These include: children's clothing articles being comfortable (4.00 ± 0.00 ; 4.00 ± 0.00); safe for the wearer (3.93 ± 0.98 ; (3.93 ± 0.98) for mothers and clothing entrepreneurs respectively among others. 41 characteristics of fabric waste were identified for the production of children's clothing articles by clothing entrepreneurship. These include: cotton fabric waste (3.75 ± 0.94 ; 3.53 ± 0.88); bright color fabrics (3.50 ± 0.88 ; 3.26 ± 0.82), light fabric waste (3.90 ± 0.98 ; 3.73 ± 0.93) among others. The study recommended that clothing entrepreneurs and mothers should reinvent fabric waste to produce a lot of useful children's clothing articles and other clothing accessories that require small pieces of fabrics to produce.

Keywords: *Children, Clothing, Fabric Waste, Design Criteria, Production, Entrepreneurship*

INTRODUCTION

Reinvention of fabric waste refers to the process of transforming old or discarded textiles into new materials through recycling. This involves recovering fibers, yarns, and fabrics from used clothing and industrial scraps, which can then be repurposed into new products. Globally, on yearly basis around 92 million tons of textile waste are accumulated at different phases of life cycles; amongst those, 50% of trash is mustered at a post-consumption level. With only 15–20% of waste is collected for reuse and recycling and more than 80% of clothing waste is discarded in landfills for dumping and/or incineration leading to higher carbon footprint, energy, and raw material losses (Gupta et al., 2022, Shamsuzzaman et al., 2023). Moreover, more than 100–150 billion pieces of garments are produced yearly, consuming 93 billion cubic meters of water, yielding 1.2 billion tons of CO₂ as atmospheric emission, and 500 thousand tons of micro-plastic fibers dumped into oceans as waste., (Shamsuzzaman et al 2025).

The fashion industry has undertaken numerous efforts to recycling, reuse, and manufacture of new waste-based products through programs that support zero-waste design, reuse, repairable, and resource-sharing practices that maximizes a product's life cycle, from origin to manufacturing, and from consumption to disposal (Chen et al., 2021). Li et al., (2021) opined that Instead of proposing mandatory implementation laws for proper waste disposal which negatively affects the landfills, emit methane, and pollute groundwater from toxic leachate, creative reinvention should be promoted. During processing and post-consumption, clothing waste must be checked with circular economy (CE) regimes as waste is considered a resource, and by adopting reverse logistics, the waste materials can potentially be added back to their supply chain at various points (Islam et al., 2025). Fashion industry must promote sustainability by emphasizing longer-lasting products, utilizing and recycling resources, and appropriately disposing any item at the end of their useful lives (Semba et al., 2020).. Upcycling or material recycling techniques is also gaining popularity as customers' concerns about sustainability issues are rising in recent days (Li et al., 2021)). Over 50 % of clothing waste is generated during post-consumption period, and effective recycling can substantially reduce the environmental impact caused by waste furthermore create entrepreneurial and employment opportunities in recycling and upcycling industries, benefiting local economies. However, fashion industries on a global scale lack strategic design criteria in place for reinvention and their implementations for sustainability manufacture of fabric waste-based products (DeVoy et al., 2021). The garment entrepreneurs is known for its creativity, fast-paced trends, and global reach, but it also faces a pressing environmental challenge. Such as textile waste. Every year, millions of tons of fabric scraps, offcuts, and unsold clothing end up in landfills or are incinerated, contributing significantly to pollution, carbon emissions, and resource depletion. For garment manufacturers, reducing fabric waste by reinventing textile waste isn't just an ethical obligation, it's also a smart business move. Fabric cutting waste when creatively recreated by manufacturers generate and save money, boost operational efficiency, and enhance their brand's sustainability profile.

There are a lot of practical, impactful strategies clothing entrepreneurs can implement to reduce textile waste, stay competitive, and help reshape the future of fashion into one that's both stylish and sustainable among different age groups especially children's wears. These includes. Simplify garment designs often mean more offcuts and reduce fabric consumption. Incorporate Zero-Waste Design Practice is gaining popularity in both luxury and everyday fashion circles and it challenges designers to create garments in a way that leaves no fabric behind—literally zero waste. Recycle and Repurpose Fabric Scraps is a necessity among many families in this challenging times. No matter how efficient a tailor is, there will always be some amount of leftover fabric. The question is - what do you do with it? Instead of sending it to the trash, manufacturers and entrepreneurs can put those scraps to good use through these options for scrap reuse such as Downcycling: Turn scraps into lower-grade products like insulation material, carpet padding, or industrial rags. Upcycling: Create new high-value items such as tote bags, accessories, or even small clothing pieces from leftover fabric and collaborate with recyclers: Some companies specialize in transforming textile waste into new fibers and yarns. Partnering with them can give scraps a new life (Kim et al., 2021). Reinventing textile waste is no longer a niche initiative; it's a business imperative. By optimizing design, leveraging technology, collaborating across the supply chain, and building a strong culture of sustainability, garment manufacturers can become leaders in the global shift toward circular fashion. (OCS Admin-April 29, 2025).

Entrepreneurship has been seen as one of the genuine channel of restoration to the challenges of unemployment and poverty in Nigeria and the world globally. Indeed, there is a paradigm shift in the labour market as employment opportunities are becoming increasingly competitive and the jobs opening opportunity equally limited (Maku and Alime, 2018). Entrepreneurship world over has been noted to be a powerful engine of economic growth and wealth creation. It is crucial for improving the quality, number and variety of employment opportunities for the society. Entrepreneurship has

several multiplier effects on any nation's economy, it spurs innovation and fosters investment in people, which is a better source of competitive advantage than other natural resources which stands being depleted (Agu and Onoh, 2019). Entrepreneurship is a process through which individuals identify opportunities, allocate resources and create values. This creation of values is often through the identification of needs of a people that is unmet or through the identification of opportunities for change. Entrepreneurship is increasingly accepted as an important means and a valuable additional strategy to create jobs and improve livelihoods and economic independence of people for sustainable living. A lot of innovative ingenuity and entrepreneurship activities abound in Nigeria in various areas of agriculture, telecommunication, food and nutrition and clothing and textiles among others (Surbhi, 2018; Crampton, 2019). Textiles have important roles to play in an individual daily life as it is an ancient industry that goes back to the beginning of the history of humanity and its products ranged from products of daily usage to technical ones. Every day of an individual life he/she come in contact with textile products of some kind or the other. In recent years, the textile and clothing industry has shown dynamic growth in the global production of textiles and clothing products (Murtala, Rahmatu, Hammed and Kifilah, 2018). Textiles in the form of clothing is among the three basic needs of man after food and shelter. Clothing serves a lot of function as man uses it for protection, communication, status and cultures. Clothing are made from textiles that are transformed into fabrics. Fabrics in the textile industry are constituted fibers, and then distributed to clothing manufacturers of textiles and garments. According to Obiana (2019), fabric is the conventional name for textile articles obtained by weaving. Fabrics are the product of different fibers with a host of special finishes used by tailors in garment and other clothing articles construction centers and a lot of fabric waste are generated during clothing construction processes (Obiana, 2019).

Clark, (2018) refers to fabrics waste as cut-offs or scraps from fabrics found in garment production centers. It is commonly observed that, the cutting process of garment manufacturing creates the largest amount of pre-consumer fabric waste. Textile waste can be broadly classified into two categories that is pre-consumer and post-consumer waste. The waste generated at factory floors during cutting, and during the manufacturing process of apparel making. leftover fabric scraps is called pre-consumer waste. Postconsumer waste is generated by articles like used apparel, towels, bedsheets, carpets, rugs, upholstery, and other textile items. The waste created in the textile and garment industry consists of fabrics and trims—including buttons, embroidery threads, and other adornments. It is estimated that 10-25% of fabric is wasted during cutting process. Waste can happen because of misprints and embroidery mistakes. If the printing and embroidery is done efficiently, it can help eliminate textile waste to a great extent. The cutting floor waste can be generated because of wrong sample making, sewing waste from poor craftsmanship, and finishing process waste from dyeing and embroidery can be eliminated by good craftsmanship and care. Correct estimation of fabric consumption can help reduce waste by avoiding of orders of excess fabric quantities (Sonye, C. U., & Nzurumike, N. 2022).



Figure 2: Garment waste

Commercially, it is commonly found that, the manufacturing of textile goods influences **textile waste** generation. These fabric waste generated from clothing construction centres are heaped in the shops and are littered in surroundings as waste. Sometimes these fabric wastes are also thrown away into drainages. When this happens, it causes blockage in drainages resulting to some of the drainage challenges experienced in Kano State leading to flooding in the area during heavy rainfall. Also, these waste fabrics are sometimes burnt because of the challenges of evacuating them and non-utilization in any other meaningful ways. Burning this fabric waste result to environmental pollution, health hazard as well as soil degradation. This fabric waste that are generated by clothing construction centers and are abandoned and thrown away as worthless can be joined together to obtain required length and width using different clothing construction techniques to produce useful infant clothing articles with entrepreneurship. beautiful designs for clothing (Gupta et al 2022; De Voy et al 2021)

To reduce the waste generation and integrate waste management system, fabric waste can be reinvented by recycling the fibers, production of children's clothing, for cleansing cloth, yarns untwisted and re-spun into new yarn varieties, mattresses, and wadding. Another process is regeneration, where the fiber is regenerated from a natural source using heat and chemicals. However, fabric waste are resources that can be converted to new production They are abundant in every clothing construction centers, yet these valuable resources are wasted due mainly to poor economic knowledge, poor creativity and innovative ideas, poor entrepreneurial skills and inability to see opportunities in the environment. Fabrics waste are considered as waste and useless in many clothing construction centers, but these wastes could serve as an enormous source of income generation for clothing entrepreneurs. This is because useful clothing articles could be produced from them for clothing entrepreneurship. These fabric waste resources need to be reinvented for job creation, generation of income and economic sustainability. Clothing entrepreneurs that are creative and innovative can reinvent and design fabric waste into excellent and useful finished products for children (Gupta, et al , 2021).

A child (pl. children) is a human being between the stages of birth and puberty, or between the developmental period of infancy and puberty. However, in English-speaking countries, the legal definition of child generally refers to a minor, (Wikipedia :Text under CC-BY-SA license). The African Charter on the Rights and Welfare of the Child, 1990 Article 2: Define Children to means every human being below the age of 18 years (Office of the United Nations High Commissioner for Human Rights and Rädä barnen (Society: Sweden), 2007, p. 30. The international/regional legal framework under. Children need almost constant care and attention from adults. Children's clothing articles are items of clothing used to protect children against, sun, rain and other environmental

hazards as well as for adornment. These children's clothing articles include garments, bed covers, receiving blanket, hat, cot bumpers, duvet, bib, diaper bag, burp cloth, protective panties, jacket, toys, among others.

Kim Inho (2025) noted that Children's clothing is more than just miniature fashion; it is a critical component of a child's safety and well-being. Unlike adult apparel, children's garments must meet stringent safety standards and design considerations due to the unique vulnerabilities of infants, toddlers, and young children. From the materials used to the construction methods employed, every aspect of a child's garment must be carefully evaluated to prevent potential hazards such as choking, strangulation, skin irritation, and flammability. This article delves into the complex world of selecting appropriate fabric materials, and considering crucial design elements that ensure the safety and comfort of the youngest consumers. Understanding these principles is paramount for manufacturers, designers, and consumers alike to make informed decisions that prioritize the health and safety of children. The focus on kids' fabric safety is not merely a legal requirement but a moral imperative, shaping an industry dedicated to protecting its most precious users.

Design criteria are the specific standards, requirements, and goals that guide the design process to ensure a product or project meets functional, safety, aesthetic, and performance expectations. Design criteria are predefined guidelines and requirements that dictate how a clothing article, product, system, or project should be designed to achieve success. Examples of design criteria in children's articles include:

Fabric properties like weight, elasticity, or melting point. Shape of the clothing article. Safety standards and regulatory compliance. Ergonomics and user accessibility. Environmental considerations and life cycle impact. Design criteria provide a measurable and actionable framework for evaluating design options, selecting materials, and ensuring that the final product meets both technical and user requirements. They also help in comparing solutions, guiding innovation, and ensuring that projects are completed efficiently and effectively to meet the wearers' requirement. (Saterbak Ann., & Wettergreen, Mathew., 2021). To care for a child perfectly, certain clothing articles are needed. These clothing articles should be suitable as they are the basic necessities that must be provided for children. To make these clothing articles comfortable and suitable, the needs of children must be considered before production. Afroza, (2018) established that mothers consider comfort, safety, warmth, durability, maintenance and cost when providing clothing article for their infants. In the same vein, Mckinley (2018) added that comfort and safety are important factors to consider when designing, producing and selecting infant clothing articles. Sonye and Nzurumike (2022) also added that in designing infant clothing articles, the designer needs much more concentration on comfort, safety, simplicity and new look in designing infant clothing article and that safety and comfort are considered as top priority when selecting fabrics for production of infant clothing articles.

Kim Inho 2025 noted these Key Fabric Properties for Children's Wear should possess some key properties such as Breathability Softness, Hypoallergenic, Durability Moisture-Wicking Non-toxic. These properties are key to: for temperature regulation and preventing overheating. prevent skin irritation and ensure comfort against delicate skin, Minimizes the risk of allergic reactions, must withstand frequent washing and active play, Able to draw moisture away from the skin, keeping the child dry and comfortable, Free from harmful chemicals, dyes, and finishes. Designers should Prioritize these fabric characteristics and choose certified natural fibers that enhances kids fabric safety and comfort significantly. Beyond material selection, the design and construction of children's clothing play an equally vital role in ensuring safety. Every design element, from fasteners to embellishments, must be scrutinized for potential hazards before use. To make these clothing articles comfortable and suitable certain design criteria must be considered before production. Hence the need for this study in Kano State.

Objective of the Study: The major objective of the study was to examine the design criteria for production and reinvention of fabric waste to children's clothing articles by clothing entrepreneurs in Kano State. Specifically, the study sought to: 1. determine designs criteria required for reinvention of fabric waste to construct children's clothing articles by clothing entrepreneurs. 2. determine the types of fabric waste to be reinvented to produce children's clothing articles by clothing entrepreneurs.

Research Questions:

1. What are the designs criteria required for reinvention of fabric waste to produce children's clothing articles by clothing entrepreneurs?
2. What are the types of fabric waste to be reinvented to produce children's clothing articles by clothing entrepreneurs in Kano State?

METHODOLOGY

Design of the Study: Descriptive survey research design was adopted in this study by gathering the opinion of respondents in this study population using questionnaire. The study was carried out in Kano State, Nigeria because Kano state is publicly documented to serve as a massive densely populated commercial hub in the Northern Nigeria and lots of clothing construction entrepreneurs exist in Kano State and these clothing construction centers generate a lot of fabric waste that can be usefully reinvented for the production of children's clothing articles. Moreover, there is huge market for children's clothing articles in the area as child bearing is culturally and religiously motivated and mothers are ready to spend money on unique designs of clothing for their infants. The population for the study comprised of 15,462 respondents made up of 600 registered clothing entrepreneurs (Ministry of Commerce, 2022/2023 update) and 14,862 mothers (post-natal record from government owned hospital in Kano State, 2024). The sample size for the study was 794 respondents comprising: 234 registered clothing entrepreneurs and 560 mothers. The 234 registered clothing entrepreneurs and 560 mothers that made up the sample size was drawn using Krejcie and Morgan table for determining sample size in research activities to select from 600 registered clothing entrepreneurs and 14,862 pediatric and post-natal mothers. Simple random sampling techniques was used to select 234 registered clothing entrepreneurs. Multi-stage sampling technique was used to select sample size for mothers. In the first stage, the 44 Local government Areas in Kano State were divided into three senatorial zones for administrative and electoral purpose but the state had been administratively been structured into Five distinct emirate namely; kano Bichi, Rano, Gaya, Karaye. In the second stage, Kano emirate district was purposively selected because it is the Metropolitan city with most of the population. In the third stage, All the eight local government (Kano municipal, Fegge, Dala, Gwale, Tarauni, Nassarawa, Ungogo and Kumbotso) in the Kano metropolitan city were sampled. Four communities were randomly selected from the 12 LGAs given a total of 40 communities. In the fourth stage, two government hospitals were selected from the 40 communities given a total of 80 hospitals. In the fifth stage, 7 mothers were randomly selected from the 80 hospitals each given a total of 560 mothers. The instrument used for data collection was a structured questionnaire developed from literature by the researchers titled "Assessment of Design Criteria for Reinvention of Fabric Waste to produce Children Clothing Article Instrument for Mothers and Clothing Entrepreneur's (ADCRFWPCCAIMCE)". The questionnaire was divided into three sections A, B and C. Section A of the instrument contained demographic information of the respondents. Section B had four-point scales measuring 16 design criteria required for the production of infant clothing articles by clothing entrepreneurs and section C had four-point scale measuring 41 characteristics of fabric waste to be reinvented to produce children clothing articles for clothing entrepreneurship. The response options were based on a 4- point Gothman rating scale comprising, Strongly Agreed (4). Agree (3) Disagree (2) and Strongly Disagree (1)

Method of Data Collection: The registered clothing entrepreneurs were visited during their monthly association meetings while the mothers were visited during their post-natal and pediatric hospital visit. At such visits, 612 copies of the "Assessment of Design Criteria for Reinvention of Fabric Waste to produce Children Clothing Article Instrument for Mothers and Clothing Entrepreneur's (ADCRFWPCCAIMCE) were distributed with the help of five research assistants who aid in interpreting the contents of the questionnaire to respondents. only 500 out of the 612 copies (mothers 310 and clothing entrepreneurs 190) were retrieved showing 82%returnn rate.

Method of Data Analysis: Data obtained from the study were analyzed using mean and standard deviation. Mean of 2.50 was used as cut-off point for decision making for the four-point scale of each (ADCRFWPCCAIMCE) items. Any item with mean rating of 2.50 and above was considered as agreed and accepted while mean values below 2.50 were considered disagreed and not accepted. All data collected were analyzed using statistical package of social sciences (SPSS) version 25.0 Result Research Question1 What are the design criteria for reinvention of fabric waste to produce childrens clothing articles by clothing entrepreneurs in Kano State?

Table 1: Mean and Standard Deviation Responses of Mothers and Clothing Entrepreneurs on the design criteria for reinvention of waste fabric to produce children clothing articles

Respondents						
Item statement		M = 560		C.E= 234		
S/N		Mean	Std	Mean	Std	Rmk
1	Apparel design should be comfortable	4.00	0.00	4.00	0.00	A
2	Apparel design should protect the child	3.87	0.97	4.00	0.00	A
3	Apparel design should be safe for the child	3.93	0.93	3.93	0.98	A
4	Apparel design should not irritate the skin	3.87	0.97	4.00	0.00	A
5	Apparel design should have no rough surface	3.93	0.98	4.00	0.00	A
6	Apparel design should allow easy donning and doffing (wearing and taking off)	3.80	0.95	3.33	0.83	A
7	Apparel design should be functional	3.67	0.92	3.60	0.95	A
8	Apparel design should take care of temperature change	3.53	0.88	3.67	0.92	A
9	Apparel design should fit the wearer	3.60	0.90	3.33	0.83	A
10	Apparel design should be aesthetically pleasing	3.47	0.87	33.60	0.90	A
11	Apparel design should have safe fastening	3.73	0.93	3.67	0.92	A
12	Apparel design should be mass produced	2.74	0.68	3.47	0.87	A
13	Apparel design should be affordable by parents	3.40	0.85	3.40	0.85	A
14	Fabric colour should be attractive and beautiful	3.33	0.83	3.80	0.95	A
15	Apparel should be durable and easy to care for	3.60	0.90	3.33	0.83	A
16	Apparel design should be absorbent	3.40	0.85	3.40	0.85	A

Key: A=Agreed, Std=Standard deviation, M=Mothers, C.E=Clothing Entrepreneurs, Rmk=Remark

The result presented in Table 1 shows the mean responses of respondents (mothers and clothing entrepreneurs) on design criteria required for reinvention of fabric waste to produce children's clothing articles by clothing entrepreneurs. The table revealed that the mean value of the 16 items ranges from 4.00- 2.74 for mothers and 4.00- 3.33 for clothing entrepreneurs. The mean values were above the cut-off point of 250) ($X > 250$). This indicated that all the 16 items on design criteria for reinvention of fabric waste to produce children's clothing articles are required. This implies that fabric waste design to be reinvented to clothing articles for children should be comfortable, safe, protective, durable and easy to care for, aesthetically pleasing, attractive, have no rough surface, not irritate the skin among others. The standard deviation of the items ranged from 1.00-0.68 for mothers and 1.00 - 0.83 for clothing Entrepreneurs indicating that the strength of the agreement is close and that mean responses were not far from each other.

Research Question 2: What are the types of fabric waste to be reinvented for the production of children clothing articles by clothing entrepreneurs in Kano State?

Table 2: Mean and Standard Deviation Responses of Mothers and Clothing Entrepreneurs on types of fabric waste to reinvent produce children clothing articles.

Respondents						
Item statement		Mothers= 560		Clothing		
Entrepreneur= 234		Mean	Std	Mean	Std	
SN						
1	Fabric type					A
A	Cotton fabric	3.75	0.94	3.53	0.88	A
B	Linen fabric	3.55	0.89	3.45	0.86	A
C	Leather fabric	1.81	0.45	1.70	0.43	A
D	Wool fabric	3.42	0.85	3.34	0.84	N/A
E	Polyester fabric	2.25	0.56	2.07	0.52	A
F	Nylon fabric	1.44	0.36	1.73	0.43	A
2	Fabric colour					N/A
A	Bright colour	3.50	0.88	3.26	0.82	A
B	Dull colour	1.70	0.42	1.94	0.48	N/A
C	Bright flora colour I	3.45	0.86	3.13	0.78	A
D	Dull floral colour	1.69	0.42	1.67	0.42	N/A
E	Bright plain colour	3.44	0.86	3.40	0.85	A
F	Bright plain Ankara colour	3.35	0.84	3.33	0.83	A
G	Dull floral Ankara colour	1.67	0.42	2.26	0.82	A
3	Fabric weight					
A	Light weight	3.90	0.98	3.73	0.93	A
B	Heavy /thick weight	1.34	0.33	1.82	0.45	N/A
C	Medium weight	3.71	0.93	3.41	0.85	A
4	Texture of fabric					
A	Soft and smooth fabric	3.41	0.85	3.33	0.83	A
B	Coarse and rough fabric	1.55	0.39	1.27	0.32	N/A
C	Cool fabric	3.58	0.90	3.47	0.87	A
D	Shiny fabric	2.90	0.73	2.80	0.45	N/A
E	Smooth surface	3.50	0.87	3.20	0.80	A
5	Fabric surface design					
A	Aesthetic design	3.03	0.76	3.53	0.88	A
B	Piping	2.96	0.74	3.20	0.80	A

C	Trimmings	3.61	0.90	3.60	0.90	A
D	Patchwork	3.53	0.88	3.67	0.92	A
E	Embroidery	3.18	0.79	2.87	0.72	A
6	Aesthetics design					
A	Piping	3.35	0.84	3.20	0.80	A
B	Trimmings	3.23	0.81	3.01	0.75	A
C	Patchwork	3.48	0.87	3.53	0.88	A
D	Embroidery	3.32	0.83	3.00	0.75	A
7	Care of fabric					A
A	Wash and wear fabric	3.47	0.87	3.80	0.95	A
B	Wash and iron fabric	3.44	0.86	3.53	0.88	A
C	Machine and hand work fabric	3.35	0.84	3.00	0.75	A
8	Fasteners type					A
A	Zip	3.34	0.83	3.06	0.77	A
B	Botton and button hole	3.06	0.77	3.07	0.77	A
C	Botton and loop	3.09	0.77	2.94	0.73	A
D	Velcro	3.35	0.84	3.13	0.78	A
E	Hook and eye	3.10	0.77	3.06	0.77	A
F	Press and STUD	3.44	0.86	3.53	0.88	A
9	Fastening position					A
A	Center front	3.26	0.81	3.06	0.90	A
B	Center back	3.31	0.83	2.94	0.74	A

Key: A=Accepted/Agreed/A=not Accepted, Std= Standard deviation

The result in Table 2 shows the mean and standard deviation of respondents on types of fabric waste to be reinvented in the production of children clothing articles by clothing entrepreneurs. The findings shows that 3-items on fabric type were accepted while 3 items were not accepted by mothers and clothing entrepreneurs. On colours of fabric, 4 items were accepted while 3- items were not accepted by both respondents; on fabric weight, 2 items were accepted while 1-item was not accepted; 4-items on fabric texture were accepted while 1-item was not accepted; All the 5-items on fabric surface design were accepted; all the 4-items on aesthetic design were accepted; All the 3-items on care of fabrics were accepted by mothers and clothing entrepreneurs; All the 6 items were accepted on fastener type and all the three items on fastening position were accepted by both respondents. The items accepted has mean value greater than the cut-off point of 2.50 ($X > 2.50$) and those not accepted has their mean value lesser than the cut-off point of 2.50 ($X < 2.50$) and those not accepted has their mean value lesser than the cut-off point of 2.50 ($X < 2.50$).

The fabric types accepted for the reinvention of fabric waste to produce children clothing articles included cotton fabric, linen fabric, woolen fabric, bright colours, bright floral colours, bright plain colours, bright Ankara colour, light and medium weight fabric, soft, smooth, cool fabric texture, plain and flannel, plain and toweling, plain and flowered, plain and stripped, plain and plaids/ checks surface design among others while nylon, silk, polyester, dull colours, rough/coarse texture fabrics among others were not accepted. The values of the standard deviation which ranges from 0.94 - 0.33 for mothers and 0.95-0.32 for clothing entrepreneurs revealed the strength of the respondent's agreement on fabric waste characteristics to be reinvented for the production of children clothing articles.

Discussion of Findings This study revealed that the design criteria identified to reinvent fabric waste for the production of children's clothing articles are: Waste fabric to be reinvented to children's clothing articles must be comfortable, safe, protective to the wearer, not irritating the skin, not

having rough surfaces, being functional, aesthetically pleasing, give room for growth among others. This finding is in consonance with the findings of Sonye & Nzurumike. (2022) who observed that the ideal infant clothing articles should be soft, comfortable, easy to put on and take off and comparatively loose; non-flammable, light weight, non-irritating; allow quick transmission of sweat from skin to environment; give room for growth; resist dirt; washable; strong and easy to care. Kim Inho 2025 noted that Fabric Properties for Children's Wear are Breathability, Softness, Hypoallergenic, Durability, Moisture-Wicking, Non-toxic. These properties are key to temperature regulation and preventing overheating, prevent skin irritation and ensure comfort against delicate skin, Minimizes the risk of allergic reactions, withstand frequent washing and active play, able to draw moisture away from the skin, keeping the child dry and comfortable, Free from harmful chemicals, dyes, and finishes. Findings of the study presented in Table 2 shows the type of fabric waste most preferred for reinvention to children's clothing articles are cotton, linen and woolen fabric and that fabrics should have bright colours and not dull colours, bright floral fabrics, bright plain fabrics, bright plain Ankara fabrics, soft smooth cool and shiny surfaces fabrics. Fabric weight should be light and medium weight but not heavy weight. The fabric surface design plain and flowered, plain and stripped, plain and plaids/check were all preferred; Aesthetic designs using piping, trimming, patchwork and embroidery were all preferred. Also, fabric that can easily be cared for which include wash and wear, wash and iron, machine and hand wash were all preferred for producing infant clothing articles. The entire fastener type is accepted with velcro and press studs having the highest mean value. This agrees with the submission of Dickson and Pallack (2000) that fabric type, colour, texture and design be considered in the production of garment for a defined group. Kim Inho (2025), noted that cotton fabrics is highly absorbent, cool to the body and comfortable to wear. In line with the finding, Gupta (2021) asserted that comfort is affected by the way the fabrics are made. According to the authors, open porous weaves such as plain are cooler than close tight weaves. This accounts for the mothers and clothing entrepreneur's choice of plain weave and cotton, linen and woolen fabrics. Hence, fiber content affects body comfort. Kim Inho (2025) reported that fabrics made of natural fibers absorbs perspiration and are generally cooler than fabrics made of synthetic fibers. Sonye and Nzurumike (2022) further supported these findings and explained that children clothing should fulfil the need for movement /posture, comfort, protection/safety, usability, expressive, aesthetic and fit

CONCLUSION

This study concludes that adhering to design criteria for reinvention of fabric waste to children's clothing articles by clothing entrepreneurs in kano state convert waste to wealth, promote entrepreneurship, economic development and reduce unemployment and manage waste effectively in kano state. Recommendations 1. Clothing entrepreneurs should reinvent fabric waste to produce other useful clothing and household articles as its potentiality for income generation, job creation, unemployment and poverty reduction. 2. Other family clothing articles and household every day article apart from children's clothing articles that require pieces should be produced from fabric waste by clothing entrepreneurs to meet the functional and aesthetic needs of children's clothing and the family at large.

REFERENCES

- Afroza, A. R. (2018). Specific requirement for development in children's clothing: customers preference and satisfaction for buying. *International Journal of Business Marketing and Management*: 2(6),113-123.
- Agu, B.O., & Onoh, C. E. (2019). Entrepreneurship and sustainable economic development in Nigeria. *Advance Journal of Management, Accounting and finance*:1,1 11.

- Chen et al., 2021(Chen, H.A. Memon, Y. Wang, *et al*). Circular economy and sustainability of the clothing and textile industry. *Mater. Circ. Econ.*, 3 (2021), p. 12, 10.1007/s42824-021-00026-2. Google Scholar
- Clark, Y. (2018). Economic impact of textile recycling in Hethrone, J and Ulasewicz, C (eds). *Sustainable fashion: why now? a conversation exploring issue, practices and possibilities. Fairchild books Inc.*
- DeVoy et al., 2021 (J.E. DeVoy, E. Congiusta, D.J. Lundberg, S. Findeisen, S. Bhattacharya). Post-consumer textile waste and disposal: differences by socioeconomic, demographic, and retail factors in *Waste Manag.*, 136 (2021), pp. 303-309, 10.1016/j.wasman.2021.10.009.
- Dickson, M. A., & Pollack, A. (2000) Clothing and identity among female in-line skaters. *Clothing and Textile Research Journal*. 18(2),65-72.
- Gazzola et al., (2020). Reducing Textile & Apparel Waste, <https://www.aatcc.org>.
- Gupta et al., 2021.(B. Gu, X. Tang, L. Liu, Y. Li, T. Fujiwara, H. Sun, A. Gu, Y. Yao, R. Duan, J. Song, R. Jia). The recyclable waste recycling potential towards zero waste cities-a comparison of three cities in China *J. Clean. Prod.*, 295 (2021), Article 126358, 10.1016/j.jclepro.2021.126358.
- Gupta et al., 2022(R. Gupta, A. Kushwaha, D. Dave, D.N. Mahanta) Chapter 10 - Waste management in fashion and textile industry: Recent advances and trends, life-cycle assessment, and circular economy. *Emerging Trends to Approaching Zero Waste*, Elsevier (2022), pp. 215-242, 10.1016/B978-0-323-85403-0.00004-9. Google Scholar.
- Han et al., 2017 (S.L.C. Han, P.Y.L. Chan, P. Venkatraman, P. Apeageyi, T. Cassidy, D.J. Tyler. Standard vs. Upcycled Fashion Design and Production. ([https. //](https://)). *Fash. Pr.*, 9 (2017), pp. 69-94, 10.1080/17569370.2016.1227146. Google Scholar.
- Islam et al., (2025). M. Islam, M. Shamsuzzaman, H.M.R.U. Hasan, M.A.R. Atik. Environmental sustainability of fashion product made from post-consumer waste: Impact across the life cycle *Sustainability*, 17 (5) (2025), p. 1917, 10.3390/su17051917. Google Scholar.
- Kim Inho. (2025) Children's Clothing: Safety and Design Standards. Taihan Textile Co., Ltd. Business Number: 116-81-33353 | E-commerce License
- Kim et al., 2021(I. Kim, H.J. Jung, Y. Lee). Consumers' value and risk perceptions of circular fashion: Comparison between secondhand, upcycled, and recycled clothing *Sustainability*, 13 (2021), p. 1208, 10.3390/su13031208. Google Scholar.
- Li et al., 2021 (X. Li, L. Wang, X. Ding). Textile supply chain waste management in China. *J. Clean. Prod.*, 289 (125147) (2021), Article 125147, 10.1016/j.jclepro.2020.125147.
- McKinley, J. (2018). *Clothing Hints for Young Children Guide C-401*. Accessed at nmsu.edu >pubs New Mexico State.

- Murtala, M., Rahmatu, B., Hammed, A. L & Kafila L. G. (2018). *Nigerian textile industry. evidence of policy neglect. SARJANA* 33(1).40-56.
- Obiana, Uche Viola. (2025). Introduction of Clothing and Textile Construction; Gilgal International publishers and Editors Limited, Abuja-Nigeria. First publication 2019, copyright at 2025. ISBN : 978 978 58395-5-5.
- Pinheiro, E & de Francisco, A. C. (2016). Management and characterization of textile solid waste in a local productive arrangement. *Fibre and Textile in Eastern Europe*: 24(118).8-13.
- Saterbak, Ann., Wettergreen, Mathew. (2021). Step 3: Define Design Criteria. In: Introduction to Engineering Design. Synthesis Lectures on Engineering, Science, and Technology. Springer, Cham. https://doi.org/10.1007/978-3-031-02093-3_4.
- Semba, et al., 2020 (T. Semba, Y. Sakai, M. Ishikawa, A. Inaba. Greenhouse gas emission reductions by reusing and recycling used clothing in Japan. *Sustainability*, 12 (19) (2020), p. 8214, 10.3390/su12198214 Google Scholar.
- Shamsuzzaman et al., 2025. M. Shamsuzzaman, M.A. Al. Mamun, H.M.R.U. Hasan, R. Hassan, A. Zulkernine, M.A.R. Atik, M. Islam. Fashion circularity: potential of reusing and recycling remnant fabric to create sustainable products *Sustainability*, 17 (5) (2025), p. 2010, 10.3390/su17052010. Google Scholar.
- Shamsuzzaman, et al., (2025). Fashion and textile waste management in the circular economy: A systematic review *Cleaner Waste Systems* Volume 11, June 2025, 100268 <https://doi.org/10.1016/j.clwas.2025.100268>
- Sonye, C. U., & Nzurumike, Ngozi (2022). Design criteria for infant clothing in Rivers. *Nigerian Journal of Home Economics (Nig- JHEC)* Vol.10, Number6, pp.207-213.
- Wikipedia :Text under CC-BY-SA license (2026). The African Charter on the Rights and Welfare of the Child, 1990 Article 2: Definition of A Child. (pl. Children). Office of the United Nations High Commissioner for Human Rights and Rädä barnen (Society: Sweden), 2007, p. 30. The international/regional legal framework under. Children