Socio-Environmentally sustainable framework to support South African fashion design entrepreneurs in the production of sustainable clothes

BY

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ABSTRACT

There is an upsurge of socio-environmentally harmful fast-fashion clothes in South Africa. Sustainable systems can reduce socio-environmental harm and maintain socio-environmental equilibrium. The production of sustainable clothes through sustainable supply chain systems will decrease the textile and clothing industry contribution to socio-environmental harm. Fashion design entrepreneurs are often involved in every supply chain of their business. Yet, a small number of South African fashion designers produce sustainable clothes. This necessitates a framework that can aid them in transforming their current supply chain operations. Like fashion design entrepreneurs, customers have the responsibility to purchase clothes that have socio-environmental benefits. The study investigates fashion design entrepreneurs' awareness of sustainable practices and their current practices at fabric sourcing, garment design and manufacturing stages. The study explores customers preferred sustainable clothes attributes and, the influence of sustainability literacy on their purchases. Qualitative approach by means of semi-structured interviews were used to collect data from six fashion design entrepreneurs and five sustainability practitioners. Quantitative approach by means of structured online questionnaire was employed to collect data from 305 customers. Qualitative results revealed that majority of the participants are aware of sustainable fabrics. Three of the participants produced sustainable clothes on a small scale due to the high price of the fabrics. All the participants showed minimal awareness of sustainable garment design methods. Quantitative results revealed that although durability (75%) was the highest-ranked attribute, it only influenced 46% of the participants purchases. This study recommends an in-depth knowledge and skills development hub as a socio-environmentally sustainable framework for South African fashion design entrepreneurs. The framework consists of education, private and public, the natural environment, fashion customer, and the textile and clothing industry substructures. Proceedings such as tradeshows, fashion shows, and exhibitions are suitable platforms to conduct the in-depth knowledge and skills development hub.

Keywords: Sustainable Supply Chain, Fashion Design Entrepreneurs, Sustainable Clothes, Clothing Attributes, Customer purchasing behavior

INTRODUCTION

The textile and clothing industry relies on the environment and society for its existence and economic growth. Fast-fashion clothes are produced using synthetic fibres that contain dangerous chemicals that are harmful to the wearer and the environment (Whitehead, 2014; Cline, 2012). There is widespread availability of low-cost Asian imports in South African retail stores (Smal, 2016; Patel, 2016). Sustainability is a model for planning an enhanced standard of life in which environmental, social, and economic way of life are in equilibrium for the upcoming generation" (UNESCO, 2012). Sustainable fashion supply chain can benefit the environment, society, and economy (Niinimäki, 2013). Entrepreneurs are innovative in developing businesses systems, new processes, and products (Tilley & Young, 2009, p. 80; Brubaker, 2015). Similarly, a designer by nature of their profession is visionary and solves complex problems through their design thinking (Palomo-Lovinski & Hahn, 2014) that can be applied in fashion supply chain operations. Fashion design entrepreneurs can be providers of creative, innovative solutions to harmful socio-environmental supply chain operations. However, there is a small number of sustainable fashion designers in South Africa (SA) (May, 2019). To increase the number of sustainable fashion design entrepreneurs in SA a framework that inspires and promotes sustainable supply chain operations is required.

Like fashion design entrepreneurs, customers have the responsibility and power to make choices that will benefit the environment, people, and promote economic growth. One of the ways clothing customers can contribute to sustainable fashion supply chain is by purchasing sustainable clothes. Sustainable clothes are clothes produced from textiles that are durable, recyclable and have minimum damage on society and the environment throughout their production and life cycle. Knowing customers' needs and desired attributes is an essential component in designing an effective product (Rai, 201). For customers to support sustainable clothes, customers' desired clothing attributes must be addressed within the concept of sustainable development.

In 2016, Desiree Smal developed an environmentally sustainable fashion-design-driven framework for SA solely based on data collected from three sub-units. The three sub-units represents small-to-medium enterprises and specifically produce environmentally sustainable garments. Two of the sub-units have been operating for more than 20 years while another two have received international recognition for their environmentally sustainable work. Furthermore, one of the sub-units' garments can be found in 43 retail stores in large shopping malls.

The framework proposes "a holistic and integrated approach to design-driven environmental sustainability in the South African fashion industry" (Smal, 2016). The framework explains the responsibility of the fashion designer in the application of environmental sustainability in the fashion supply chain. This study seeks to develop a framework based on the experiences of microto-small fashion design entrepreneurs who are not sustainable throughout their fashion supply-chain operations. This framework incorporates customers' desired clothing attributes, and the influence of sustainability literacy on their purchasing behaviour, which was not factored into Smal's framework. In addition, the framework amalgamates expertise from micro-to-small fashion design entrepreneurs and sustainable fashion design entrepreneurs. Challenges encountered by micro-to-small mainstream fashion design entrepreneurs are different from those experienced by sustainable fashion design entrepreneurs. These challenges

influence their approach to supply-chain operations and may affect their perception and reception to sustainable practices and processes. Therefore, insights gained from both micro and small fashion design entrepreneurs, customers, and Smals' framework can aid in developing a sustainable framework that promotes the production of sustainable clothes by South African fashion design entrepreneurs.

LITERATURE REVIEW

Entrepreneurship is an important instrument for ushering in radical change and encourage more socio- environmentally sustainable merchandise and methods (Zu, 2014). To integrate socioenvironmentally friendly methods, fashion design entrepreneurs should be knowledgeable about socio-environmentally friendly solutions that they can integrate into their supply-chain operations (Sherburne, 2009). The sustainable supply chain operations chosen for this study are sourcing, designing, and manufacturing stages. Practices and processes undertaken in these three supply chain stages are critical in the production of sustainable clothes. Furthermore, fashion design entrepreneurs should know and incorporate South African customers' desired clothing attributes before engaging in the various stages of the fashion supply chain. The look, feel, price, and durability are the most recognized desired clothing attributes among customers (KPMG, 2019; Niinimäki, 2010; Carpenter & Moore, 2010).

Clothing attributes and customer purchasing behavior

Physical attributes in clothes are of great value for all types of customers, including those who actively support socio-environmental values (Niinimäki, 2010). According to KPMG (2019) customers living in Hong Kong, UK, New York, Shanghai, and Tokyo purchase sustainable clothes firstly based on price, durability, fabric and look of the garment. Customers sustainable purchasing conduct is generally not associated with favourable perspective regarding sustainable clothes (Mandari´c, Hunjet, & Vukovi´c, 2022). Sustainability related benefits of a product are not sufficient motivation for purchases (Chen &Chang, 2012). Even though customers are knowledgeable and demonstrate care for environmental challenges, they are still to change their clothing purchasing behaviour (KPMG, 2019). Most of the customers reported that they would most likely purchase sustainable if it was priced like mainstream fashion (ibid). Customers are unwilling to overlook their preferred product attributes over a sustainable product that doesn't meet their preferred product attributes (Chen &Chang, 2012). Fashion business need to find out customers main focus on sustainable clothes make necessary changes (Mandari´c, Hunjet, & Vukovi´c, 2022). Tsakiridou, Boutsouki, Zotos, & Mattas (2008) found that when purchasing merchandise, socio-environmental matters were less important than functional attributes that met customers' specific needs. It is crucial to investigate South African customers desired sustainable clothing attributes to encourage and improve South African customers sustainable clothes consumption. South African fashion design entrepreneurs to knowledgeable of customers' desired clothing attributes before engaging in the various stages of the fashion supply chain. Socio-environmental benefits must be mixed with "good design and fashion" to manufacture more aesthetically pleasing sustainable clothes (Niinimäki, 2010). Designing sustainable garments based on customers' clothing attributes while engaging in sustainable sourcing, design, and manufacturing can provide customers with the best of both worlds.

Sustainable supply chain operations Fashion design entrepreneurs must take careful consideration of their practices and process when sourcing fabric, designing, and manufacturing garments as well as the after-effects of those choices. These considerations form a foundation to "ethical thinking" and future-focused "value creation" (Niinimäki, 2013). The starting point for fashion design entrepreneurs is to strategies towards sustainable fabric sourcing (Cadigan, 2014). Fashion design entrepreneurs can practice sustainable fabric sourcing by firstly sourcing fabrics that do minimal harm to the environment and society. Secondly, sourcing fabrics manufactured in SA and, within the African continent. Sourcing locally has socioenvironmental and economic advantages for the country (Cadigan, 2014; Ho & Choi, 2012) and the textile and clothing industry (TCI). These advantages include building local communities through employment creation and, lessening of greenhouse gas incurred in shipping and travel costs (Sprague, 2015; Schwartz, 2009). Once the fashion design entrepreneurs have sourced fabric, the process of designing clothes begins. Sustainable design practice and process include trend and, market analysis and minimising socioenvironmental effect of the chosen fabric during garment manufacturing stage, and customer use (Zoltkowski, 2022) and disposal phase. Draping, jigsaw puzzle pattern-cutting, subtraction patterncutting, transformable garment design and, emotional durability design is some of the sustainable design practices and processes that fashion design entrepreneurs can incorporate at the design stage. Draping, jigsaw puzzle patterncutting, subtraction pattern-cutting are practices and processes centred on reducing fabric waste at the design, and manufacturing stage (Rissanen, 2013). The essential components of the zero-waste design method are the need to balance garment aesthetics, fit, cost, and pattern cutting (Rissanen, 2013). Transformable garment design and, emotional durability design can reduce customers purchases of new fashion (Lang & Wei, 2019; Durrani, Ravnløkke, & Niinimäki, 2016; Chapman, 2015), extend the life cycle of a garment, and thereby reduce the number of garments in landfills (Koo, Dunne, & Bye, 2014; Chapman, 2015). Transformable clothes are garments that can be transformed into numerous outfits and purpose dependant on the customers desires (Chen, 2019). Reversible garments, a garment with various elements that can be added or removed by the wearers depending on the occasion, are examples of transformable clothes (Future Learn n.d.). Transformational clothes contribute to the emotional value of the garment by allowing the customers to determine how to wear the garments on various occasions (Durrani, Ravnløkke, & Niinimäki, 2016). Customers are generally not involved during the design stage of the garments. However, design for emotional durability requires collaboration between the fashion designer and the customer. The goal behind emotional durability is to decrease the "consumption and waste" of fabrics and garments by improving the durability of the connection between the garments and the customers (Chapman, 2015; Durrani, Ravnløkke, & Niinimäki, 2016).

Reusing and recycling pre-customer fabric waste and post-customer garment waste are sustainable manufacturing practices and processes that reduce the number of garments in landfills. Reuse and recycling of clothes are primary challenges that must be addressed to preserve the planet (Sherburne, 2009). Pre-customer fabric waste is all fabric off-cuts that does not reach the customer (Cuc & Vidovic, 2011). Garment reuse practices consists of reselling, renting, swapping, and repairing (Hendriksz, 2016; Holm, 2013). Recycling can also be defined as a process whereby used garments are transformed into

other fabrics (WRAP, 2016; Sandin & Peters, 2018). Post-customer garment waste consists of garments that the customers no longer desire (Cuc &

Vidovic, 2011). There are several reasons for postcustomer fabric waste, such as clothes reached their end-of-use, are no longer considered fashionable, and garments no longer fit the customers (Cuc & Vidovic, 2011). Recycling worn-out clothes and reusing the resources is important to guarantee the industry does not use more from the environment than it can provide (Hendriksz, 2016).

The advantages of reuse and recycling practices and processes are as follows: •Eliminate the unnecessary use of natural resources (Sherburne, 2009; Cuc & Vidovic, 2011) Decreases the need for up-to-date fibres (Holm, 2013; Cuc & Vidovic, 2011).

•A substantial decrease in the amount of carbon emissions caused by the TCI (Wrap, 2016; Cuc & Vidovic, 2011).

•Reduces the quantity of landfill tax, and various waste management and disposal charges local governments incur (Wrap, 2016; Cuc & Vidovi.c 2011). •Provides new jobs (Wrap, 2016; Cuc & Vidovic, 2011).

The rising cost of landfill sites in SA, requires TCI to improve its reusing and recycling systems (Enviroserv, n.d.). It is crucial that the South African government aids the SATCI in obtaining technologically advanced equipment to improve the industry's recycling capacity (Mollel-Matodzi, Mastamet-Mason, & Moodley-Diar, 2020).

Customers and entrepreneurs have important roles to play in the recycling (Cuc & Vidovic, 2011) and reuse practices and processes. However, South African customers are not well informed about garment reuse and recycling. Fashion designers are capable of shaping customers' habits in the use and disposal phase of clothes' life cycles (Gwilt, 2014, p. 22). Most clothing customers are neither capable of fixing their own clothes, nor are they able to make clothes (Niinimäki, 2013). Customers' lack of garment-related skills shows that there is a need for fashion design entrepreneurs to provide repair, recycling, and reuse services to their customers (Mollel-Matodzi, Mastamet-Mason, & Moodley-Diar, 2020). Fashion design entrepreneurs can integrate sustainable manufacturing practices and process into their businesses by firstly providing reuse and recycling garment services. Secondly, produce garments, and accessories from pre-customer fabric waste and post-customer garment waste. Thirdly, support, and collaborate with companies that are involved in similar practices and processes. Promoting a culture of reusing clothes through second hand-clothes purchases in SA may increase the number of customers that participate in sustainable manufacturing practices because in South Africa second-hand clothes tend to be more affordable than new clothes (Mollel-Matodzi, Mastamet-Mason, & Moodley-Diar, 2020). Sustainable sourcing, designing, and manufacturing while considering customers' desired clothing attributes is vital in the production of sustainable clothes.

Based on the literature the sub-aims of the study are presented in **Table 1**.

Table 1. Sub-aims of the study

1	Investigate and describe fashion design entrepreneurs' knowledge of sustainable fabrics and, clothing design methods
2	Explore and describe methods fashion design entrepreneurs use to balance economical sustainability and Socio-environmental sustainability while sourcing fabrics, designing clothes and manufacturing clothes
3	Explore and describe fashion design entrepreneurs' current methods while sourcing fabrics and,
	manufacturing clothes
4	Investigate and explain fashion design entrepreneurs' current methods towards economic sustainability in sourcing fabrics, designing clothes and manufacturing clothes
5	Investigate customers preferred sustainable clothes attributes

Table 2. Qualitative participants selection criteria

Criteria	Justification
Must produce clothes for men or women.	It is assumed that entrepreneurs in the fashion business would understand and address the clothing needs and challenges of their customers.
Must be in business for at least three years.	Three years or more in business allows entrepreneurs to have an in-depth understanding of their business and the industry.
Do not primarily produce sustainable clothes.	Explore their awareness of sustainable supply-chain operations. Explore their sourcing, designing, and manufacturing practices.

METHODOLOGY

This exploratory and descriptive study has two phases and employed mixed research methods. According to Leavy (2017, p. 9), mixed-method research provides a broad comprehension of the phenomenon of the study due to the combination of qualitative and quantitative data. The first phase of the study involved fashion design entrepreneur and the second phase involved customers. The first phase of the study involved data collection by means of document analysis from participants' business websites, social media records, and semistructured interviews. Participants for the qualitative phase of the study were contacted via email and social media platforms and semi-structured interviews were conducted telephonically. Six participants (Participant A – participant F) who have online, and physical stores were selected purposively, **Table 2** presents the criteria.

During data collection, it became clear that it is necessary to gain insight from South African sustainable practitioners, as this will provide understanding on how far the practice is in existence in South Africa. The sustainable practitioners consisted of three sustainable fashion design entrepreneurs (Participants G – participant I) and two individuals (Participant J and K) who are involved in promoting sustainable textiles and clothes in various companies. Semi-structured interviews were also used to collect data from five sustainable fashion practitioners. The criteria employed to maintain trustworthiness of the study were credibility, dependability, and confirmability. The qualitative data from the semi-structured interviews were recorded, transcribed, coded, categorised, and arranged for analysis as suggested by Babbie (2016). The semi-

structured interviews were recorded with permission from participants, then transcribed and subjected to scrutiny and data triangulation to maintain credibility of the data set. An audit trail involves the evaluation of data collection, data analysis, and interpretation of the data (Riazi, 2016). On-going discussions with supervisors to evaluate the data, data analysis and its interpretation were conducted to establish dependability and confirmability. For the second phase of the study structured online questionnaires were employed to solicit information from customers. Three hundred and five participants were selected purposively through fashion and lifestyle bloggers as well as the primary researchers' social network. This study used Survey Legend, an online survey application for quantitative data collection. The link to the questionnaire was distributed through various social media platforms. The captured data was statistically analysed using Stata/SE 14.0. Stata is "a complete, integrated software package that provides all your data science needs, such as data manipulation, visualisation, statistics, and reproducible reporting" (Stata, n.d.). Stability reliability was employed by adopting some of the questions from former studies and pilot testing the questionnaire before retesting it on the selected sample. Internal reliability was maintained using the Cronbach alpha test. Hypotheses testing was done with a 5% level of significance. Representative reliability was maintained by administering the questionnaire to men and women customers from diverse ethnic backgrounds and age. representative reliability, and internal reliability were used to maintain the quality of quantitative data. Furthermore, face validity, content validity and criterion validity were to maintain the validity of the study.

RESULTS AND DISCUSSION

This section will firstly present findings from qualitative data and secondly quantitative data. Findings based on qualitative data will be presented based on supply chain operations stages, namely sourcing, design and manufacturing. your major findings and discussions in this section. Regarding knowledge of sustainable fabrics, five of the participants demonstrated knowledge of sustainable fabrics. Participants B, D and F showed advanced knowledge on sustainable fabrics while Participants A and E showed basic knowledge of the fabrics. The participants' knowledge was based on their own personal research. Participant C was the only participant who was not knowledgeable about sustainable fabric. Participant C (2019) stated that "I think more work needs to be done with the communication of sustainable fabrics". This finding indicates the need to provide fashion design entrepreneurs with in-depth knowledge on sustainable fabrics.

This study found that knowledge about sustainable fabrics does not necessarily lead participants to purchase and use the fabrics in their clothing ranges (Mollel-Matodzi, Mastamet-Mason, & Moodley-Diar, 2020). Participants A, B, D, E, F revealed that they found sustainable fabrics to be more expensive than other fabrics. Sustainable participants (G – I) concurred with five of the participants regarding the expensive price of the fabrics. Participant G (2019) stated that Increased demand for the fabrics from fashion design entrepreneurs will decrease the price of the fabrics. In addition, Participant K (2019) confirmed that the fabrics are expensive because there's no demand for it from local fashion designers. However, Orders from large retailers has helped reduced the price of locally produced fabrics. Despite her knowledge on

sustainable fabrics, Participant E (2019) pointed out that she has no information on where to source sustainable fabrics. Findings regarding participants knowledge on sustainable sourcing firstly suggest that the TCI needs to create awareness on the fabrics. Secondly, sustainable fabric manufacturers must be more visible in the marketplace. Thirdly, more fashion design entrepreneurs and large retailers need to get involved in sourcing sustainable fabrics. The study found that all the participants' source natural and synthetic fibres from local wholesalers who stock imported fabrics. The common fibres that the participants use is conventional cotton, linen, wool, polyester, chiffon, techno mesh, rayon, and nylon. Imported fabrics are widespread in SA and given that SA textile manufacturers need to increase its production capacity it is reasonable that the participants largely use imported fabrics. Participant A, C and F source some of their conventional cotton from local textile manufacturers. Participants B, D and F source sustainable fabrics on a small scale from local textile manufacturers. The sustainable fabrics they source include hemp, linen, and cotton from the sustainable cotton cluster. Participants contribution to socio-environmental and economic well-being is visible through their sourcing habits. Participants G, H, I and J indicated that sourcing sustainable fabrics abroad is expensive and that they do this due to limited availability and variety of locally manufactured textiles.

Regarding knowledge of sustainable design practices and processes, all the participants (Participants A – F) showed minimal awareness of sustainable design practices and processes (Mollel-Matodzi, Mastamet-Mason, & MoodleyDiar, 2020). Unknowingly, Participant A is practising design for emotional durability.

Participant As' customer input at the design stage is motivated by boosting sales, and not a desire to reduce customers' clothing consumption behaviour. Participant A (2019) revealed that "our previous customers are part of the design process and some of our designs are actually inspired by some of them". Participant B uses draping because draping provides him with multiple design ideas and originality. The findings regarding knowledge on sustainable design practices and processes suggests that it is crucial to provide in-depth knowledge and skills training on sustainable design practices and processes.

Regarding manufacturing, all participants manufacture their clothes in-house. Regarding manufacturing sustainable clothes, participants B, D and F manufacture sustainable clothes on a small scale for the upper class because most of their customers cannot afford the clothes. (MollelMatodzi, Mastamet-Mason, & Moodley-Diar, 2020). Participant F (2019) pointed out that sustainable fabrics are a lot more expensive and that makes it more difficult to commercialize clothes. To make sustainable fabrics more affordable for small and micro businesses and enable customers to purchase more products, large businesses need to boost the demand for these fabrics (Lee, 2014). In the context of SA, large retailers such as Woolworths and Mr Price Group must continue their demand for locally produced sustainable fabrics to enable small and medium enterprises to afford these fabrics. All the participants save their fabric off- cuts. Participant A and C revealed that they save fabric off-cuts for monetary reasons. They use their fabric off-cuts to produce accessories. The remaining participants often donate their fabric off-cuts to their employees, local communities, charitable organisations, and businesses that specifically produce garments from fabric off-cuts.

However, the participants reported that they are unable to donate all their fabric off-cuts and they end up in landfills (Mollel-Matodzi, MastametMason, & Moodley-Diar, 2020). Participant D and F reiterated that there is a need for a system that can aid in collecting all the fabric off-cuts. Findings regarding participants current methods with fabric off-cuts firstly indicates that participants are socio-environmentally, and economically responsible on how they deal with fabric off-cuts. Secondly, there must be an effective, readily visible fabric off-cut management system that is readily available to fashion design entrepreneurs.

The section below presents quantitative findings. Thirty three percent of the participants were between the ages 25-31, 32% between the ages 3238. Participants between the ages of 18-24 were in the middle at 14%, followed by ages 45 and above at 11% and ages 39-44 were at 10%. Eighty five percent of the participants were women and 15% were men. Participants were required to indicate the importance they placed on various attributes of sustainable clothes. As seen in **Figure 1**, durability was ranked the highest at 75% while price was the lowest at 53% durability attribute. However, only 46% of the participants as seen in Table 3 strongly agreed that they purchase sustainable clothes for their durability. One of the main clothing attributes that drive mainstream clothing purchases among customers is the look attribute that changes rapidly (Moeng, 2011). **Table 3** shows that 61% of the participants they will most likely purchase sustainable clothes if the look and feel resembled mainstream clothes. It is evident that the current look and feel of sustainable clothes may hinder participants' purchasing behaviour (Mollel- Mollel-Matodzi, MastametMason, & Moodley-Diar, 2022). To encourage and

increase customers' purchases requires fashion design entrepreneurs to improve the look Table 3. Participants purchases based on clothing attribute and feel of sustainable clothes when sourcing textiles and designing the garments.
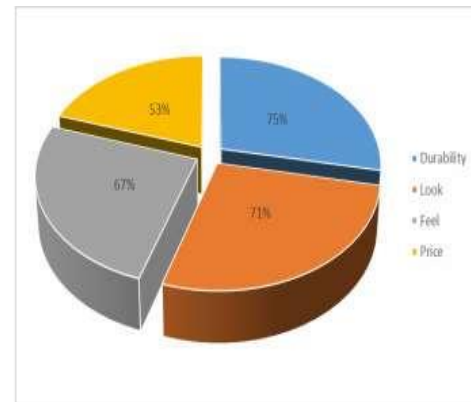
There was a significant association between gender and the importance participants place on the price (0.000 < 0.05), look (0.000 < 0.05), feel (0.000 < 0.05) and durability (0.000 < 0.05) of sustainable clothes. These findings imply that participants' gender influenced the importance they placed on the above-mentioned attributes of sustainable clothes. There was a significant association (0.033 < 0.05) between age and the likelihood of participants purchasing sustainable clothes if the look resembled mainstream clothes. This may suggest that participants' age influenced the likelihood of purchases if the look of the clothes changes. There was no significant association between age and participants purchasing behaviour based on feel, price, and durability attributes. This may suggest that participants' age did not influence their purchasing behavior.

Table 3: 61% of participants most likely purchase sustainable cloths

|	Strongly agree (%)	Strongly disagree (%)	Undecided (%)	Gender PValue	Age P-Value
I purchase sustainable clothes because they tend to be more durable than mainstream clothes.	46	18	36	0.000	0.066
I would more likely purchase sustainable clothes if their feel were the same as mainstream clothes.	62	16	22	0.000	0.674
I tend to purchase more sustainable clothes when there are sales or special offers on.	56	17	27	0.000	0.405
I would more likely purchase sustainable clothes if their look were the same as main-stream clothes.	60	17	23	0.000	0.033

Socio-environmentally sustainable framework

Based on findings from qualitative and quantitative data, this study suggests an in-depth knowledge and skills development hub as a socio- environmentally sustainable framework for South African fashion design entrepreneurs. The structure of the framework was guided by two existing frameworks. The first framework is the Quintuple Helix innovation model designed by Carayannis, Barth, and Campbell's (2012), the framework emphasises that "the natural environments of society and the economy" must considered as leaders for "knowledge production and innovation" (Carayannis, Barth & Campbell, 2012).

The second framework was designed by a South African scholar Smal (2016) and was also guided by is the Quintuple Helix innovation model. **Figure 2** presents the suggested framework diagram along with the substructures and various and skills that each substructure will communicate. The framework consists of five substructures namely, education, eco-political, natural and continual knowledge generation. environment, fashion consumer and TCI substructure. The first substructure for this framework is an education substructure and

The second substructure is an eco-political substructure and consists of the economic substructure and political substructure as defined by Carayannis, Barth and Campbell (2012). For sustainable operations to be efficient, both the economic and political sector must work together to implement necessary laws, guidelines, and offer funding to empower the textile and clothing industry towards the achievement of a sustainable textile and clothing industry. The third substructure is a natural environment substructure and is firstly important because it is centred on sustaining and promoting the wellbeing of the natural environment through research and projects.

consists of institutes that offer fashion-design and consumer-science-related courses.
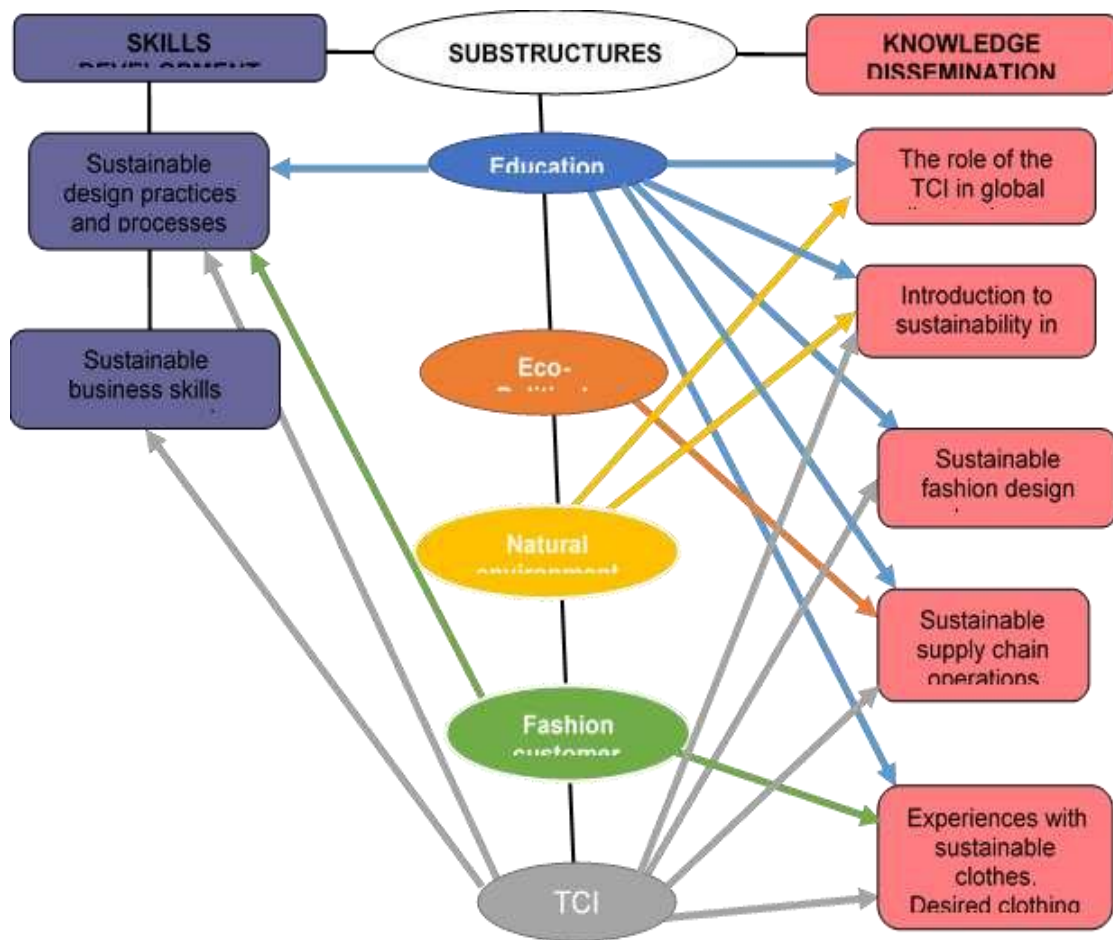
The substructure is important because it provides resources for the textile and clothing industry that enables them to meet the needs of the other substructures (education, eco-political, and fashion customer). In South Africa organisations such as South African Council for Natural Scientific Profession (SACNASP) which consists of disciplines such as agricultural science, atmospheric science, biological science, conservation science, environmental science, soil science, toxicological science, and water resources science (SACNASP, n.d.) form part of this substructure.

The fourth substructure is a fashion customer substructure and is like the fashion consumer substructure in Smal (2016) framework. Fashion customers have an important role in sustainability. Customers' participation or lack thereof has the potential to promote or hinder sustainability efforts made by the other substructures. Fashion customers from various socio-economic backgrounds have first-hand experience with clothes produced by the textile and clothing industry, and their experience is important in producing socio-environmentally friendly clothes. The fifth and final substructure is the TCI and is inspired by Smal's (2016) support substructure. In Smal's framework, the

support substructure is limited to organisations such as Southern African Sustainable Textile and Apparel Cluster (SASTAC). In this study, the TCI first includes a grouping of both mainstream and sustainable professionals in the industry, such as fashion design entrepreneurs, trend forecasters, merchandisers, and journalists. The second grouping in this substructure are organisations involved with the TCI such as SASTAC, Sustainable Cotton Cluster, fabric suppliers, textile manufacturers and textile recycling companies. All members of the textile and clothing industry are important in building a sustainable TCI. This is because both large organisations and individual businesses have a wealth of unique experiences that when combined, can enrich, and empower micro-tosmall fashion design entrepreneurs towards socio-environmentally sustainable supply-chain operations. This substructure is monumental in implementing the theory and decisions of all the other substructures. The five substructures will take the role of communicator depending on the various topics presented by the hub. The content of the framework will be based on the findings of the study, and the review of literature. Both the in-depth knowledge seminar and skills development workshops require a platform for the hub to go into operation. Some of the platforms that bring together all the substructures are national platforms such as fashion shows, tradeshows, and exhibitions, such as South African Fashion Week, African Fashion International (AFI), Textile and Footwear Trade Exhibition, Source Africa, Wedding Expo, and Design Indaba. Increased involvement and initiatives from other leading textile and clothing industry organisations will foster a socio- environmentally friendly supplychain culture among South African fashion design entrepreneurs.

CONCLUSION

In conclusion, findings of this study revealed the necessity of a socio-environmentally sustainable framework that provides in-depth knowledge and skills training for fashion design entrepreneurs. The sustainability of the TCI requires collaboration, and empowerment from internal and external members of the TCI including higher education institutes and various public and private sectors. Fashion design entrepreneurs cannot fully integrate sustainable practices and processes into their supply chain without adequate knowledge and skills training and interventions from various stakeholders. It is important to note that integrating sustainable practices and processes into the business is a gradual process that requires innovation and refinement to adapt to each business identity. It emerged from this study that participants valued durability in sustainable clothes. However, they preferred the look and feel of mainstream clothes. Therefore, sustainable clothes are clothes that exceed the look and feel attributes of mainstream clothes and are manufactured under sustainable supply-chain operations.

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