

Determination of barriers in embedding environmental sustainability practices in the apparel sector of Sri Lanka

Thiwanka Sandaruwan De Fonseka^{1,*}, Mohideen Bawa Mohamed Ismail²

¹ Vern University, Croatia.

² Brittany Université, France.

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Abstract

After oil, apparel is the second most polluting industry in the globe. Therefore, the implementation of environmentally sustainable practices in the apparel industry is a hotly debated topic around the globe. Sri Lanka's principal export revenue generator is the apparel industry, which accounts for more than forty percent of its export revenue.

This research was conducted to identify the barriers that challenge in embedding environmental sustainability practices in Sri Lanka's apparel industry. Using a mixed method approach, quantitative data were collected via an online questionnaire survey (205 respondents) and qualitative data were collected via semi-structured interviews (30 interviews). Using universally accepted scientific methodologies, sample size, and data analysis methods were determined.

The researcher was unable to locate any similar scholarly work on Sri Lanka's apparel industry, despite finding numerous studies on the same topic for other important apparel-producing nations in Asia and Africa. Consequently, five barriers, namely lack of environmental awareness, lack of financial resources, lack of management commitment and leadership, poor organizational culture, and lack of technology were extracted from the extensive literature review conducted using previous scholarly work from other countries and evaluated for the Sri Lankan context using the quantitative and qualitative data mentioned above. All these barriers were found to be pertinent to Sri Lanka's apparel industry, with lack of financial resources being the most challenging and lack of environmental awareness being the least challenging barrier. None of the respondents mentioned any other barriers apart from those listed above.

Keywords: Environmental Sustainability; Barriers; Apparel Sector; Sri Lanka

1. Introduction

The apparel industry is the second biggest consumer of water in the world, accounting for twenty percent of global wastewater (Dehghan and Goyal, 2022). One cotton shirt requires 2700 liters of water, which is the quantity of water a person drinks in 2.5 years (Liu et al., 2021). The apparel industry is responsible for 10% of global carbon emissions (Okafor et al., 2021), and cotton cultivation is responsible for 24% of insecticides and 11% of pesticides despite using only 3% of arable land (Ahirwar & Behera, 2021). In addition, 85% of all clothing is discarded annually, and washing multiple categories of clothing releases thousands of plastic particles into the ocean (Gupta et al., 2022). The apparel industry has become one of the world's largest and most significantly expanding industries. Throughout the value chain of the apparel industry, from textile production to final product finishing, there are numerous processes, including but not limited to dyeing, printing, washing, cutting, sewing, bonding, and packaging. If current consumption trends persist, the demand for natural resources in 2050 will be three times that of 2000 (United Nations, 2019).

* Corresponding author: Thiwanka Sandaruwan De Fonseka

The Sri Lankan apparel industry has championed sustainable manufacturing for many years. This commitment has led to substantial changes in manufacturing processes, sourcing strategies, and product innovation, establishing Sri Lanka as a prominent destination for clothing brands concerned about their environmental impact (AWGNM, 2021). But Sri Lanka is not within top ten apparel suppliers of the world (Lu, 2022). The industry's 2030 vision is for Sri Lanka to become a global apparel hub by that year; an intermediate goal is to increase annual apparel export earnings to \$8 billion by 2025 (Abdulla, 2022). To achieve this milestone by 2030 with the increasing demand on environmentally sustainable fashion, it is inevitable that Sri Lankan apparel sector should thoroughly understand the barriers on embedding environmental sustainability practices in the industry to implement mitigation actions to overcome those barriers. Therefore, this study is conducted to resolve this research gap, as this is a crucial research area to investigate to meet the growing demand for environmentally sustainable fashion and to increase Sri Lanka's apparel industry's market share to reach its 2030 goal.

2. Literature review

Even though there are no studies on the barriers in embedding environmental sustainability practices in Sri Lanka's apparel sector in the available scholarly literature, there are several studies done on this topic in neighbouring apparel giants like Bangladesh and India where apparel industry is an essential part of their respective economies. Both internal and external barriers are discussed in this study which have challenged in incorporating environmental sustainability practices in the apparel sector.

2.1. Lack of environmental awareness

It is very challenging to implement environmental sustainability practices without a proper environmental awareness on the actions need to be taken to mitigate environmental issues, to enhance existing environmental practices to gain more value and what are the consequences of implementing certain environmental sustainability practices on the business and vice versa. Apparel sector entrepreneurs in Bangladesh are notably naive of environmental sustainability practices due to a lack of environmental consciousness. The adoption of environmentally sustainable practices throughout the supply chain is hindered by this lack of environmental awareness of these professionals (Tumpa et al., 2019). Another study done by Karim et al. (2021) has found that lack of eco literacy among the stakeholders in the supply chain is a challenging barrier to implement environmental sustainability practices in Bangladesh apparel sector. A global study pertaining to apparel industry done by Thorisdottir and Johannsdottir (2020) has found the same factor which is lack of environmental awareness as a barrier in embedding environmental sustainability practices in the apparel sector. Based on a study done by Dash et al. (2018) on Barriers and Challenges for Green Garment Factories in India, it was found that the lack of awareness of employees on green manufacturing processes which involved environmental sustainability practices is a major barrier in implementing environmental sustainability practices in Indian apparel sector. Same is found by some of the other studies done in this area by Srivastav and Gaur (2015) and Vishwakarma et al. (2022) pertaining to Indian apparel sector, Govindasamy and Suresh (2018) related to Malaysian apparel sector, Köksal (2019) pertaining to Vietnam and Indonesian apparel sector and Khan et al. (2021) and Mahmood et al. (2021) pertaining to Pakistan apparel sector.

2.2. Lack of financial resources

Financial resources are a key aspect when embedding environmental sustainability practices. There are two types of costs associated with implementing environmental sustainability practices: direct costs and transaction costs. Both types of expenses generally impede the construction of water and energy efficient factories. Invest on renewable energy, technology improvements in energy and water efficient manufacturing processes, environmentally friendly waste disposal methods, purchase less hazardous chemicals, hiring skilled employees, and employee motivation and training will require a substantial initial investment (Dash et al., 2018). On the other hand, the incapability to foresee clear profits or return on investments and demand for lower prices from brands and retailers create more financial constraints for apparel manufacturers (Batoola et al., 2022). Therefore, having a strong financial stability is a must to incorporate environmental sustainability practices in the apparel sector. Dash et al. (2018) has mentioned lack of financial resources as a barrier in Indian apparel sector in embedding environmental sustainability practices. Similar to this study, many other studies have identified lack of financial resources as a main barrier in embedding environmental sustainability practices in the apparel sector of several other countries such as Pakistan, China, Vietnam and other Asian and African countries where apparel sector is a main pillar in their respective economies (Mittal and Sangwan, 2014); (Na and Na, 2015); (Köksal, 2019); (Tumpa et al., 2019); (Karim et al., 2021); (Khan et al., 2021).

2.3. Lack of management commitment and leadership

Adoption and implementation of organizational practices, especially environmental systems, are dependent on management support. Leadership and commitment of the top management affect the success of environmental sustainability initiatives by encouraging empowerment of employees, rewarding employees who innovative and implement environmental sustainability practices, promoting a cultural shift in the organization which focused on environmental sustainability, supporting environmental sustainability related investments such as shifting to renewable energy rather than non-renewable conventional energy sources and providing necessary training to improve technical competencies of employees pertaining to environmental sustainability (Stremlau and Tao, 2016). Therefore, lack of commitment and leadership from top management negatively impacts embedding environmental sustainability practices in the apparel sector. Tumpa et al. (2019) has found that apparel sector entrepreneurs particularly oblivious of environmental policies and practices within their organizations, which indicates that the top management of these Bangladesh apparel sector organizations are not committed in incorporating environmental sustainability practices within their facilities. Therefore, top management commitment and leadership towards environmental sustainability can be identified as a key challenge when implementing environmental sustainability practices in the apparel sector. This has confirmed through several other studies done by Zhu et al. (2011) in Chinese apparel sector, Baig et al. (2020), Abbas and Halog (2021) and Batoola et al. (2022) in Pakistan apparel sector, Peters and Simaens (2020) in Portugal apparel sector and Majumdar and Sinha (2019) in Indian apparel sector.

2.4. Poor organizational culture

China is the world's biggest producer of apparel. China's exports of apparel were \$291 billion in 2020 or around 35% of the global market (Rodil-Marzábal et al., 2022). But as per a study done on barriers which challenge in embedding environmental sustainability practices in Chinese apparel sector has found that lack of environmental missions in the organizational culture is a key barrier when implementing environmental sustainability practices in the apparel sector (Zhu et al., 2005). Similar study done by Koberg and Longoni (2019) have mentioned that lack of effective collaboration among relevant departments is a key barrier among most of South Asian apparel sector. Employees in all departments of organizations create the organizational culture. A company's organizational culture is a set of ingrained practices. In other words, organizational culture is a set of fundamental beliefs and assumptions held by the employees of an organization, which are then established and transmitted to address external adaptation and internal integration issues (Limaj and Bernroider, 2019). A study done by Isensee et al. (2020) has emphasized that the role of organizational culture has a crucial role pertaining in implementing environmental sustainability practices in organizations. Therefore, poor organizational cultures which environmental sustainability concepts and practices are not considered as a part of the "core" is a main challenge in embedding environmental sustainability practices in the apparel sector. Dash et al. (2018) has confirmed this poor organizational culture as a salient barrier to implement environmental sustainability practices in his study on "Barriers and Challenges for Green Garment Factory: India". Desore and Narula (2018), Tumpa et al. (2019) and Thorisdottir and Johannsdottir (2020) have also confirmed poor organizational culture as a key barrier which challenge in embedding environmental sustainability practices in apparel sector organizations through their studies.

2.5. Lack of technology

Technology is key to implement environmental sustainability practices in any industry including apparels. Environmental sustainability practices in apparel sector such as utilization of energy efficient machinery, installation of water efficient fittings, waterless dyeing using super critical carbon dioxide, value enhancement of non-hazardous waste and hazardous waste, recycling, and upcycling of fabric waste (waste to fiber circularity), utilization of non-hazardous chemicals, chemical leasing projects etc. need proper technology to implement. Without proper technology, these environmental sustainability practices cannot be implemented. But because of market competition and cost considerations (Gaur, 2015), many apparel sector organizations in countries with emerging economies such as Sri Lanka, India, and Bangladesh, try to adopt low-cost technologies to implement environmental sustainability practices which become a barrier in implementing those. Vishwakarma et al. (2022) has mentioned that lack of low-cost technologies for wastewater treatment is one of the big barriers to overcome in the apparel industry of India. Guo (2022) has found that lack of proper recycling technologies and energy efficient machineries are technological concerns when implementing green manufacturing processes in the apparel industry. Sometimes, modern technologies which may be available in developed countries do not reach these developing countries and outsourcing them is not practical. Therefore, studies of Zhu et al. (2011), Dash et al. (2018), Karim et al. (2021) and Khan et al. (2021) have identified that the lack of technology is a prominent barrier which challenge in embedding environmental sustainability practices in the apparel sector.

Based on all the above referred literature on barriers which challenge in embedding environmental sustainability practices in the apparel sector, it was found that lack of environmental awareness, lack of financial resources, lack of management commitment and leadership, poor organizational culture and lack of technology are the main barriers. Thus, the researcher has used the same factors in this study to determine the barriers which are challenged to incorporate environmental sustainability practices in the apparel sector of Sri Lanka.



Figure 1 Barriers which challenge in embedding environmental sustainability practices in the apparel sector of Sri Lanka (Researcher, 2023)

3. Methodology

Creswell (2014) explains four fundamental mixed methods designs. This consists of convergent parallel design, explanatory sequential design, exploratory sequential design, and embedded design. The convergent parallel design occurs when the researcher uses simultaneous timing to implement quantitative and qualitative segments during the same phase of the research process, prioritizes the methods equally, and maintains the segments' independence during analysis prior to combining the findings during the study's overall interpretation. In this research, convergent parallel design was chosen as the mixed methods research design because both quantitative and qualitative data were used concurrently and equally prioritized during analysis prior to combining the findings to interpret the overall research objectives (Creswell, 2014). The diagram below explains this research's convergent parallel mixed methods design.

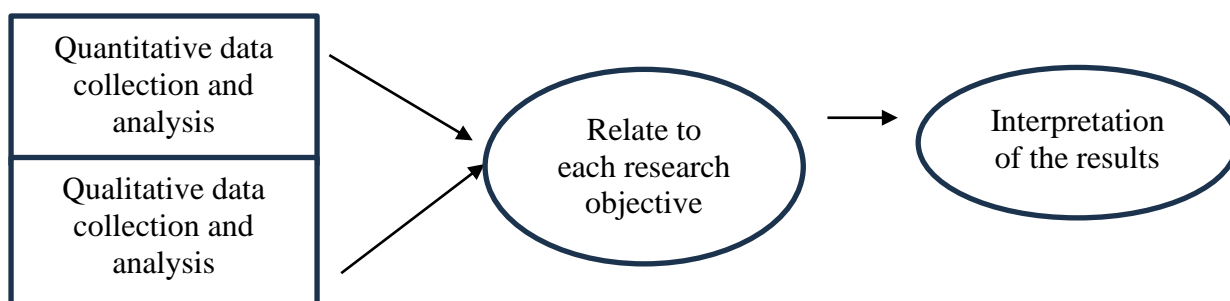


Figure 2 Convergent parallel mixed methods design (Creswell, 2014)

3.1. Quantitative Data Collection and Analysis

Although the use of a questionnaire survey has advantages and disadvantages, it is believed that the advantages outweigh the disadvantages (Nayak and Narayan, 2019), and so an online questionnaire survey instrument was used to collect quantitative data in this study. The questionnaire variables, which served as the study's independent variables (five barriers), were derived from the preliminary literature review. Focus was placed on the response process, the utility of individual questions, and the overall structure and aesthetic appeal of the questionnaire when developing

specific questions. Since the focus of the research is on the barriers that challenge in incorporating environmental sustainability practices in Sri Lanka's apparel industry, it makes sense to select a population from within the same industry. Therefore, the selected population consists of Sri Lankan apparel industry executives and above who have participated in environmental sustainability-related decision making. 440 executives and above (board members, directors, and managers) operate as environmental sustainability professionals in Sri Lanka's apparel industry, according to data from over 300 apparel manufacturing facilities. The population size considered for this investigation is therefore 440. Krejcie and Morgan (1970) developed a method for determining the optimal sample size from a population with a 95% confidence interval. According to the results stated in the preceding procedure, a sample of 205 executive and above-grade employees were selected using purposive sampling from the population of 440, and the questionnaire survey was emailed to them. In the questionnaire, a four-point Likert scale was used. On a four-point Likert scale ranging from "Not at all important" (1), "Fairly important" (2), "Important" (3), and "Very Important" (4), respondents were asked to designate the level of significance of the five barriers derived from the literature review. "The Statistical Package for the Social Sciences" (SPSS 28.0) was used to perform data analysis and generate descriptive statistics.

All 205 questionnaires sent to respondents were received in their entirety. Consequently, the aggregate response rate was 100 percent. According to Saunders et al. (2016), a minimum of thirty valid responses is necessary for statistical analysis. Consequently, the statistical analysis of the 205 responses gathered for this study is regarded suitable and effective for data interpretation.

3.2. Qualitative Data Collection and Analysis

Interviews with a semi-structured format were used to collect qualitative data for this study. According to the database of Sri Lanka's export development board, approximately 300 apparel manufacturing facilities are operated by 40+ organizations. Murry and Hammons (1995) estimated that ten to thirty subject matter experts may be required for qualitative decision-making. Purposive sampling was utilized to enhance reliability and transferability (Creswell, 2014). Information saturation is a crucial aspect of sample size in qualitative research. (Braun and Clarke, 2021) Saturation refers to the point at which the inclusion of additional data yields no new insights or range of ideas. This investigation gathered information until no further environmental sustainability-related barriers were discovered. Before the twenty-sixth interview, data saturation occurred in this investigation. As a result, only thirty interviews were conducted. Each of these thirty interviewees was the director of an environmental sustainability division at one of thirty organizations in the apparel industry. These interviews were conducted using the "Microsoft Teams" online platform. The duration of the interviews ranged from 20 to 30 minutes. Evaluation of the interviews was conducted using content analysis. After conducting interviews, the researcher solicited participant input on the data analysis. By transmitting significant theme codes to the original interviewee and requesting confirmation of the codes' accuracy, participants were validated.

4. Results and Discussion

4.1. Quantitative Analysis

Since the purpose of this research is not to validate hypotheses through data analysis, mean value analysis was utilized to interpret the data. Mean value analysis is a straightforward, precise, and practical technique for interpreting and comparing data to discover answers to any study's research questions (Calzon, 2023).

Table 1 The degree of importance of barriers for challenging in embedding environmental sustainability practices. (S=205) (Researcher, 2023)

Barriers for challenging in embedding environmental sustainability practices in the apparel sector of Sri Lanka	Degree of importance
Lack of financial resources	3.8
Lack of technology	3.7
Lack of management commitment and leadership	3.5
Poor organizational culture	3.4
Lack of environmental awareness	3.3

4.2. Lack of financial resources

Lack of financial resources has become the most influential barrier which challenged in incorporating environmental sustainability practices in the apparel sector of Sri Lanka with a mean value of 3.8. As mentioned in the literature review, majority of the apparel manufacturing facilities in Sri Lanka are medium scale to small scale organizations. They have very limited financial resources to allocate to embed environmental sustainability practices since environmental sustainability is not the core of the business. This challenge has affected in many initiatives related to all aspects of environmental sustainability such as water and wastewater, energy and emissions, waste, chemicals, and product. For an example, factories need initial capital investments in the implementation of almost all environmental sustainability practices such as simple LED light conversion to complex air condition centralization. Many of the high energy saving projects such as solar renewable energy installation, chiller installation for central air conditioning and energy efficient manufacturing machinery purchasing require a considerable capital investment and take some 4-5 years to gain the return of investment. Similar projection applicable for high water saving projects as well such as purchasing dyeing machines with low material to liquor ratio, purchasing laser and ozonation machines to replace conventional water used washing machines at laundries and installation of sensor taps to replace conventional taps. Same applicable for purchasing of some of the ZDHC approved chemicals as well. Purchasing of sophisticated software to monitor energy and water consumptions and conducting third party verification audits to measure the environmental sustainability performances of facilities such as Higg FEM and ISO 14001:2015 also hindered in some medium and small-scale facilities due to lack of financial resources. Thus, factories are hesitant to invest in some of these environmental sustainability related projects due to lack of financial resources and maintain only the minimum viable requirements requested by the brands and retailers. Therefore, lack of financial resources has become the main challenging barrier in embedding environmental sustainability practices in the apparel sector of Sri Lanka.

4.3. Lack of technology

Lack of technology has become the second most challenging barrier with a mean value of 3.7 just behind the mean value of most challenging barrier, lack of financial resources. As a third world developing country, Sri Lanka doesn't have many sophisticated technologies to implement some of the key environmental sustainability practices such as using recycled materials to manufacture fabric, fabric waste recycling, energy reduction and water reduction. In many other countries, energy reduction practices are done through industry 4.0 processes such as digitization and high level of automation (Ahmad et al., 2020). For an example, automation of machines such as sewing machines, binding machines, dyeing machines, and printing machines used in the industry could save lots of energy by reducing operation and retention time of these machines. Another example is smart building management systems to optimize energy consumption of utilities of apparel factories such as compressors, generators, boilers, and chillers. Also, technologies such as waterless dyeing where dyeing process is done without using water but using other substances such as super critical CO₂ (Lee et al., 2019) support to reduce water consumption in manufacturing facilities are not available in Sri Lanka. Similar waterless dyeing technologies such as airflow dyeing technology where air is used instead of water for dyeing is not available in Sri Lanka. Airflow dyeing is a variety of jet dyeing in which textiles are dyed in a closed tubular system in the form of ropes. This technology reduces both chemical and water consumption in the dyeing process (Abate and Tadesse, 2021). There are three main technologies used in fabric waste recycling. Those are mechanical recycling, thermal recycling, and chemical recycling. Typically, mechanical recycling begins with shredding to convert fabric waste into powdered form, which can be utilized as a substitute thermal insulation material for the insulation of buildings (Echeverria et al., 2019). Thermal recycling refers to the combustion, incineration, etc. of waste products that produce heat and electricity. Thermal recycling is sometimes utilized alongside mechanical recycling to produce Polyethylene Terephthalate (PET) fibres from flakes, granules, or fragments by melt extrusion (Yousef et al., 2020). Only thermal recycling is available in Sri Lanka. Because of this lack of technology, most of the apparel sector organizations are struggling to recycle especially its polyester fabric waste. Therefore, it is obvious that lack of technology has become the second most challenging barrier in embedding environmental sustainability practices in the apparel sector of Sri Lanka.

4.4. Lack of management commitment and leadership

Lack of management commitment and leadership has been emerged as the third most challenging barrier in embedding environmental sustainability practices in the apparel sector of Sri Lanka with a mean value of 3.5. Commitment and leadership from management are essential elements in any organization's success in implementing multiple initiatives, including environmental sustainability initiatives. The way apparel sector leaders demonstrate their dedication to the organization's environmental sustainability mission, values, and objectives has a significant impact on the incorporation of environmental sustainability practices in the Sri Lankan apparel industry. Effective leaders demonstrate their dedication to the organization through their proactive approach to solving issues and implementing new initiatives. They are unafraid to confront challenging issues head-on and have the courage to make difficult decisions when necessary. This type of leadership encourages employees to take challenges and be creative in their approach to work

(Alvesson, 2019). Thus, if the management are lethargic to get decisions and leadership in incorporating environmental sustainability practices in their organizations, subordinates would hesitate to embed them in their facility operations. Also, leadership and management commitment are essential for establishing and sustaining strong relationships with stakeholders. Leaders who are committed to the success of their organization recognize the significance of cultivating relationships with key constituents, such as customers, suppliers, and employees. They acknowledge the importance of these relationships to the organization's prosperity and endeavour to nurture them continuously (Samimi et al., 2022). When these relationships are not established properly by the management with relevant stakeholders, they don't know the environmental sustainability requirements of these stakeholders to incorporate them within their organizations to prosper the business. Therefore, all these lack of commitments from the management and the leadership have become a challenging barrier in embedding environmental sustainability practices in the apparel sector of Sri Lanka.

4.5. Poor organizational culture

Poor organizational culture is the next most challenging barrier in incorporating environmental sustainability practices in the apparel sector of Sri Lanka with a mean value of 3.4. The shared values, beliefs, customs, behaviours, and practices that define an organization are referred to as its culture which is common for apparel sector organizations as well. It plays a crucial role in shaping the identity of an organization, moulding employee behaviour, and propelling its success. The importance of organizational culture stems from the fact that it fosters a sense of belonging and meaning within an organization. It offers employees with a shared set of values and beliefs that influence their behaviour and decisions. When employees have a shared comprehension of the mission and values of the organization, they are inclined to be involved and dedicated to its success (Paais and Pattiruhu, 2020). Thus, it is certain that if the organizational culture is poor, then the employees will not properly understand the objectives of the organization including environmental sustainability objectives and do not dedicate to drive them which has become a challenge in embedding environmental sustainability initiatives. In addition to influencing employee behaviour, organizational culture shapes the expectations and standards within an organization. When employees comprehend the desired conduct and performance, they are inclined to meet those standards. This can aid in establishing a sense of predictability and consistency within an organization, which can be essential for sustaining efficiency and productivity. Organizational ethos can also impact organizational performance in many aspects including performance in environmental sustainability. A positive organizational culture can aid in the attraction and retention of top talent, boost employee engagement, and stimulate innovation and creativity. Additionally, it can enhance interaction and cooperation within the organization, resulting in improved decision-making and resolving issues. When employees perceive that their organization's culture corresponds to their own principles and convictions, they are more inspired and dedicated to attaining the organization's objectives (Isensee et al., 2020). Thus, a negative corporate culture will create the opposite effect. It can result in high levels of employee turnover, low morale, and decreased productivity which will eliminate skilled and motivated sustainability professionals in the industry. It can also create a toxic workplace, which can have negative effects on employees' mental and physical health which is essential to investigate the solutions to environmental sustainability related concerns within the organizations. This can subsequently result in decreased performance in many aspects including the implementation of environmental sustainability practices. Therefore, poor organizational culture has become a challenging barrier in many apparel sector organizations in embedding environmental sustainability practices.

4.6. Lack of environmental awareness

Lack of environmental awareness has found out to be the last challenging barrier in incorporating environmental sustainability practices in the apparel sector of Sri Lanka with a mean value of 3.3. Environmental awareness is the comprehension and appreciation of the natural environment and the influence of humans on it. One of the most essential reasons for environmental awareness is that it fosters sustainability. People well as organizations can minimize their environmental footprint when they comprehend the effect of their actions on the environment. For instance, people may choose to conserve energy, reduce waste, and utilize eco-friendly products. These actions can contribute to the reduction of greenhouse gas emissions, the conservation of natural resources, and the protection of the environment. Additionally, environmental consciousness can foster a sense of obligation and accountability. Individuals are more likely to take responsibility for their actions and account for their environmental footprint when they comprehend the effect of their behaviour on the environment. This can result in a greater sense of accountability and an obligation to create positive changes in the way one lives and, in the community, at large. Another reason that environmental awareness is crucial is that it can aid in the preservation of the natural world. When people comprehend the value of biodiversity and the significance of conserving ecological systems, they are more inclined to conserve them. They may, for instance, choose to support initiatives to protect the environment, minimize the consumption of harmful chemicals, and refrain from activities that damage biotic and abiotic species and their habitats. These measures can aid in minimizing the impact of activities of humans on the environment and preserving it for future generations (Handayani et al., 2021). Thus, if the employees in the apparel sector organizations don't have this environmental awareness, they will not implement any environmental sustainability practices to reduce their environmental footprint to conserve the

biotic and abiotic species in the environment. Therefore, it is evident that lack of environmental awareness has become a challenging barrier to some apparel sector organizations in Sri Lanka to embed environmental sustainability practices.

4.7. Qualitative Analysis

All barriers cited by interviewees in the semi-structured interviews are identical to those extracted from the literature review and included in the questionnaire for the quantitative analysis, namely lack of environmental awareness, lack of financial resources, lack of management commitment and leadership, poor organizational culture, and lack of technology.

In response to an open-ended query posed during semi-structured interviews, none of the interviewees mentioned any other challenging barrier besides the five mentioned above.

Table 2 Key barriers that challenge the apparel sector organizations to embed environmental sustainability practices (n=30) (Researcher, 2023)

Key barrier that challenged the apparel sector organizations to embed environmental sustainability practices	Total number of interviewees mentioned (n=30)
Lack of financial resources	97%
Lack of technology	93%
Lack of management commitment and leadership	90%
Poor organizational culture	83%
Lack of environmental awareness	77%

As per the above results, lack of financial resources has become the most significant barrier followed by lack of technology, lack of management commitment and leadership, poor organizational culture, and lack of environmental awareness. It should be acknowledged that the significant barriers for some apparel sector organizations may consist of all or a combination of these barriers.

In this study, 97 percent of interviewees (29 out of 30) believed that lack of financial resources is the most significant barrier in embedding environmental sustainability practices in the apparel sector of Sri Lanka. One of the interviewees stated that they were unable to install a central chiller system to replace their split and package air conditions at the facility to reduce their energy consumption due to lack of financial resources. At some cases, this has directly impacted on the expansion of business volumes with some brands and retailers. One such scenario as per an interviewee is that they were unable to install solar panels to generate renewable energy replacing conventional non-renewable energy sources such as diesel and furnace oil. This has directly impacted in their business with one of the key Europe brands since that brand has mandated them to utilize renewable energy to produce that brand's apparels. Since the solar panel installation was not completed within the given time due to lack of capital, that apparel order was cancelled by the brand.

93 percent of interviewees (28/30) has mentioned that lack of technology is another key barrier. One of the interviewees noted that they didn't find any commercially viable technology to reuse their dyebath for all colours. They can reuse only black colour dye baths as per the existing technology, but not all colours to reduce their water and chemical consumption. Another interviewee has faced a challenge to reduce their material to liquor ratio in the dyeing process due to lack of technology. Material to liquor ratio is a term frequently utilized in the apparel industry to define the proportion of water to textile material used in a specific process. It is represented as a ratio of the material's mass to the liquid's mass. For instance, if 10 kilograms of cotton are processed with 100 liters of water, the material-to-liquor ratio is 1:10, implying that for each kilogram of cotton, 10 liters of water are utilized. In this interviewee's instance, their requirement was to reduce the material to liquor from 1:12 to 1:6. But due to lack of technology, this was not possible. There are few instances that same interviewee has mentioned both lack of financial resources and lack of technology as barriers in embedding environmental sustainability practices in their respective organizations. One such case as per an interviewee is recycling of fabric waste. The apparel organization this interviewee works is a mid-scale factory which manufacture apparels using both cotton and nylon fabric. Due to lack of technology in Sri Lanka to recycle cotton and nylon fabric off cuts, they were unable to recycle this fabric off cuts which has become a major environmental sustainability attribute of the brands and retailers they cater. Recycling technologies of cotton fabric off cuts are available in India and nylon fabric off cuts are available in China. Due to lack of financial resources, this organization

only work with Indian recyclers to recycle cotton fabric off cuts. Nylon fabric off cuts are landfilled since it was not financially viable to send them to China for recycling.

93% of interviewees (28/30) were noted that lack of management commitment and leadership has become the next most challenging barrier in embedding environmental sustainability practices in the apparel sector of Sri Lanka. As per one interviewee their top management were not avid practitioners of environmental sustainability initiatives even though they get many environmental sustainability requirements from brands. Top management and leadership just wanted to incorporate these sustainability requirements only for name's sake rather than actual result oriented. This has become the major challenge for the sustainability team to implement environmental sustainability initiatives. As per another interviewee, their top management did not permit them to gather employees for environmental sustainability related trainings and community projects. Thus, it was very difficult for the sustainability team to engage with employees on several environmental sustainability projects and trainings. Incorporating environmental sustainability initiatives into the organization's core strategies should involve consultation with the sustainability team, which is comprised of experts from a community within the organization or a knowledge network who are most capable of analyzing, debating, and helping to agree upon a course of action. As a result, the decision-making process becomes much more well-informed and well-balanced, with contributions from people who understand the significance of environmental sustainability practices, from experts who have dealt with similar events, from those who can provide guidance on potential scenarios and resolution strategies, and from the decision-makers themselves (Almenhali, 2019). Many interviewees have mentioned that this decision-making process from the top management was not implemented in decision making relating to the incorporation of environmental sustainability practices at their respective organizations which has become a significant barrier.

In this research, 83% (25/30 interviewees) have acclaimed that poor organizational culture has become a notable barrier in embedding environmental sustainability practices in the apparel sector of Sri Lanka. Organisational culture is a complex and relatively novel concept; the development of sustainable concepts within an organization's culture is an essential requirement for the achievement of its sustainability objectives (Srisathan et al., 2020). As per one of the interviewees, environmental sustainability practices cannot be incorporated solely, those should be imposed in the culture of the organization to implement them successfully in each level of an organization from chief executive officer to machine operator. Therefore, it is necessary that the organization should have a strong culture to incorporate these practices where everyone gets the ownership of execution. This interviewee's organization does not support such a culture and due to that employees think that it is the sole responsibility of the sustainability team to incorporate environmental sustainability practices. Thus, cross functional teams do not support in embedding any environmental sustainability practices within the organization which has become a huge barrier for them. Another interviewee came up with a nice example of this poor organizational culture. Her organization wanted to replace the conventional taps in the canteen and washrooms with peddle taps to reduce water consumption. Pedal taps, also known as foot-operated taps, are a form of tap that is activated by pressing a foot pedal. Usually, a foot pedal controls a valve that modulates the water flow in pedal faucets. When the pedal is depressed, the valve will open, allowing water to run from the faucet. When the foot is removed from the lever, the valve shuts and water flow ceases. This is a very simple technology that could be implemented by the maintenance teams of factories. The project budget was approved, and the sustainability team has discussed with the maintenance team to implement this project. But the response of the maintenance team was that it was not a task of maintenance team to reduce water consumption and existing tap system provide adequate water which accomplished their task of providing the water to the employees of the organization. Poor organizational culture has impacted on this decision since the maintenance team hadn't that ownership of implementing water saving initiatives going beyond their habitual tasks and they thought that was only a responsibility of the sustainability team where they could complete that task without the support of the maintenance team. Due to this challenge, this project was postponed until they found a third-party contractor to complete this project at an extra cost.

Last but not least, lack of environmental awareness has become a significant challenge with the responses of 77% of the interviewees (23/30) in embedding environmental sustainability practices in the apparel sector of Sri Lanka. Environmental awareness is not a rocket science, it is just common sense about the impacts of our habits and lifestyle on the environment. Many people think that this awareness is lack in illiterate or less educated employees such as machine operators. But many of the interviewees have different impressions. One interviewee has acclaimed that their chief operational officer has advised the sustainability team to open dump some of their hazardous waste such as tube lights due to the cost of recycling. Another interviewee has mentioned that their finance director refused to approve the budget to upgrade their effluent treatment facility to align with ZDHC conventional parameter achievement even it was a requirement of their major brands and requested them to discharge their wastewater through the existing ETP even though it did not meet the threshold limits of ZDHC conventional parameters. Some interviewees have mentioned that whatever awareness campaigns they do on energy savings, many managers never switched off their lights and air conditions when they go for meetings, lunch or even back to home after work to save energy. These concerns are totally

due to lack of environmental awareness which has become a salient barrier in incorporating environmental sustainability initiatives in the apparel sector of Sri Lanka.

As an open-ended question, no other challenging barriers apart from the above mentioned five barriers were mentioned by any of the interviewees.

5. Conclusion

Based on both qualitative and quantitative analysis, it was determined that all the aforementioned barriers are relevant to the apparel industry of Sri Lanka, with lack of financial resources having the greatest significance and lack of environmental awareness having the least. In addition, it is evident that none of the respondents who participated in the semi-structured interviews mentioned any additional barriers in embedding environmental sustainability practices in the apparel sector of Sri Lanka.

Compliance with ethical standards

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Disclosure of conflict of interest

Both authors declare that they have no conflicts of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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