A FRAMEWORK FOR SELECTING OPTIMAL STRATEGIES TO MITIGATE THE CORPORATE SUSTAINABILITY BARRIERS

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Abstract

This paper develops a framework to prioritize the barriers to corporate sustainability and select the strategies to mitigate those barriers by applying an optimization based analytical hierarchy process integrated quality function deployment framework with multiple case studies. This research has collected data from the textile and clothing industries (six case companies) from an emerging economy, Bangladesh. Contingency theory, resource-based view and stakeholder theory are adopted to explain the sustainability barriers and their mitigation process through optimal use of resources. The study finds that lack of awareness, lack of governance, the utility supply problem and lack of expertise are the main barriers of CS. The findings also indicate that internal and external audits regarding compliance issues and setting policies for sustainability standards are considered as highly important mitigation strategies. Finally, the study identifies the optimal mitigation strategies based on maximising the relative importance while considering savings from the simultaneous implementations of strategies and constrained resources. This study advances existing CS literature by developing a framework to prioritize CS barriers and selects optimal strategies to mitigate those barriers. The developed framework should be of interest to organisations' decision makers (specifically in the case of apparel industry of Bangladesh) in countries which have a similar institutional context.

Keywords: Analytical Hierarchy Process, Corporate Sustainability Barriers, Mitigation Strategies, Optimisation, Quality Function Deployment

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1 Introduction

Corporate sustainability (CS) has appeared as an emerging business strategy for organisations (Atkinson, 2000; Daily and Huang, 2001; Gill et al., 2008) and has been investigated by academic scholars and practitioners from numerous aspects (Gupta and Kumar, 2013; Schaefer, 2004). In this study CS is defined as "meeting the needs of a firm's direct and indirect stakeholders (such as shareholders, employees, clients, pressure groups, communities etc.), without compromising its ability to meet the needs of future stakeholders as well" (Dyllick and Hockerts, 2002 P.131). Dyllick and Hockerts (2002) integrated three key elements in the CS that is economic, social and environmental aspects originally termed as 'triple bottom line' by Elkington (1997). Despite various dimensions of CS, most of the scholars broadly consider economic, ecological and social aspects which make an organisation more sustainable to their stakeholders (Baumgartner and Ebner, 2010). In recent years, many organisations have adopted CS as a proactive tool for value creation and long term survival by managing a balanced growth of social and environmental issues along with the economic bottom line (Gupta and Kumar, 2013; Gupta and Pirsch, 2008).

The literature suggests that increasing stakeholders' pressure, institutional regulations, informal socio economic factors and business objectives to legitimise their operations are the main drivers for CS (Brønn and Vidaver-Cohen, 2009; Ehrgott et al., 2011; Hahn and Scheermesser, 2006). The drivers of CS are well established research area and literature predominantly focused on this issue (Govindan et al., 2014; Linnenluecke and Griffiths, 2010). What receive little attention in academic research are the barriers to CS and the strategies to overcome the barriers. It has been argued that the road to achieve CS is often exposed to different challenges arising from the myriads of sustainability barriers. Therefore, an increasing number of academic scholars argued that the objectives of corporate sustainability cannot be achieved without effectively identifying the barriers (Arevalo and Aravind, 2011; Sciulli, 2013; Setthasakko, 2009) and efficient mitigation strategies. This requires organisations to develop the capability of setting appropriate strategies which address the

barriers to sustainability (Wu et al., 2013). Subsequently, the prioritisation of barriers and mitigation strategies is essential since organisational capacity for CS might differ due to organisations' size, nature, industry and socio-economic context (Faisal, 2013; Imam, 2000). While some scholars (Adams, 2004; Belal, 2009; Khanna and Anton, 2002; Lynes and Andrachuk, 2008; Setthasakko, 2009) have examined the different aspects of CS activities in both developed and developing countries' contexts, a few recent studies focus on barriers to CS (Berik and Rodgers, 2009; Setthasakko, 2009; Shrivastava, 1995). However, there is a scarcity of research that develops a framework for mitigating the CS barriers.

To address the gaps in the literature on modelling the prioritization of the barriers to CS and selecting the corresponding mitigation strategies the objective of this study is two folds: First, this study identifies corporate sustainability barriers and the corresponding mitigation strategies. Well-developed organisational strategies for adopting CS are observed in the present competitive business world but the prioritisation of CS barriers and mitigation approaches have become crucial challenges for management. Existing literature identify that cost/resource shortage is one of the important barriers to sustainability (Ageron et al. 2012; Barve and Muduli (2012); Arevalo and Aravind 2011). Although much of the previous studies investigate CS from different perspectives, they fail to offer any economic approach to CS barrier mitigation that takes into consideration the optimal use of resources. Therefore, the second objective of this research is to determine the optimal strategies for mitigating corporate sustainability barriers in a constrained resource setting.

In line with the research objectives, the study uses quality function deployment (QFD) which is considered to be one of the very effective instruments to incorporate needs into strategies and to achieve goals (Akao, 1990; Chan and Wu, 2002, 2003). The QFD applications have been extended to a wide range of areas, such as, design planning, engineering, management, teamwork, timing and costing, to name a few (Chan and Wu, 2002; Dao et al., 2011). The major purpose of QFD use is to collect and analyse the needs or requirements and then deploy those needs or requirements into design requirements (DRs) or improved products to meet or even exceed the requirements. More specifically, QFD provides a means of translating needs or requirements into appropriate engineering characteristics or technical attributes to reach specific goals (Kuo et al., 2009; Sullivan, 1986). Consistent with previous studies it can be argued that to set strategies corresponding to the corporate sustainability barriers QFD is an effective tool. Thus, QFD can be used as an effective tool to identify the significant barriers of CS and their mitigation approaches.

The study adopts contingency theory (Zeithaml and Zeithaml 1988), the resource-based view (RBV) (Markusen, 1998; Wernerfelt, 1984), and stakeholder theory (Freeman, 1984) as the theoretical foundation to identify the barriers and corresponding mitigation strategies with optimal use of resources. In order to identify and mitigate the barriers, an optimization integrated AHP-QFD approach has been adopted in this study.

Our study makes several vital contributions to the existing literature with regard to methodology, theory and practice. In terms of methodological contribution, our study adopted an AHP integrated QFD approach and optimisation technique to provide a new dimension of methodological use in the field of CS barrier mitigation. Corporate managers will benefit from the findings of our study particularly, in the textile and clothing industry. Although our study used data from a developing country context, the usefulness of our findings is beyond geographical boundaries. In this study, Bangladesh is used as an illustrative case to apply an AHP integrated QFD approach optimization technique for mitigating sustainability barriers.

The rest of the paper is structured as follows: the next section presents the literature review; the following section elucidates the conceptual model development based on the resource-based view (RBV), contingency theory and stakeholder theory. The research methods are then presented in the next section followed by the contextual background of the case studies. The subsequent section presents the results and discussion followed by the research implications. The final section includes the conclusion, limitations of the study and future research directions.

2 Literature Review

The literature review section consists five parts. Initially, the concept of corporate sustainability is discussed followed by sustainability barriers and its mitigation approach. Later, AHP integrated QFD is presented with detailed literature.

2.1 Corporate sustainability

Corporate sustainability (CS) is about business commitment to contribute to sustainable development, more specifically for the environment, society and economic development, and to consider the needs and expectations of all stakeholders. Linnenluecke and Griffiths (2010) argue that the concept of CS formed through a number of political, public and academic forces over time, and these influences integrated social, environmental, ethical, and human rights issue towards the sustainable business practices. Along with the survival of organizations and regulatory requirements, a growing number of organisations are integrating sustainability practices to manage reputation risk, to ensure long-term financial excellence, and to achieve competitive advantage

(Agudo Valiente et al., 2012; Brønn and Vidaver-Cohen, 2009; Lu et al., 2014). Because of the growing importance on CS a handful of research has been undertaken on different aspects of CS. While some scholars have examined the nature and pattern of CS activities in both developed and developing countries' contexts in the name of corporate social responsibility (Adams, 2004; Baumgartner, 2011; Belal, 2009; Terninko, 1995), others have explored managerial motivations and stakeholders' views on CS (Islam and Deegan, 2008; Lynes and Andrachuk, 2008; O'Dwyer, 2002) and have mainly highlighted the positive aspects of CS (Khanna and Anton, 2002; Konar and Cohen, 2001; Setthasakko, 2009). However, there is a paucity of empirical investigation on CS barriers and their mitigation approaches which therefore, is our research agenda.

2.2 Corporate sustainability barriers

Organisations now face many pressures to undertake sustainable behaviour from stakeholders, such as, employees, community groups, non-government organisations (NGOs), environmental activists, governments and regulatory authorities (Setthasakko, 2009). Previous studies explore the drivers and determinants of CS and analyse managerial perceptions on CS and related concepts (See for example, Bansal and Roth, 2000; Belal and Owen, 2007). These studies mainly examine the managerial motivations towards CS. The pressures from internal and external stakeholders (such as, regulators, internal competition within industry, customers and investors) contribute to CS practice in organisations (Haigh and Jones, 2006; Ranängen and Zobel, 2014). International buyers also create pressure on companies to comply with sustainability standards (Belal and Owen, 2007; Islam and Deegan, 2008). Scholars have emphasised the contextual factors of sustainability, such as, country of origin, political environment and economic, social, cultural, ethical, media and NGO pressures towards sustainability (Sobhani et al., 2011).

While there are abundant studies on CS, to date, very little research has been done concentrating on identifying the barriers of CS. Setthasakko (2009) conducted an exploratory in-depth analysis which identified three key barriers towards CS: lack of a sustainable framework, absence of top management commitment and cultural diversity. A recent study by Hossain et al. (2012) explores the barriers of corporate, social, and environmental practices within the developing countries' context. They report that lack of a regulatory framework, socio-economic problems, lack of awareness and education on sustainability, lack of initiative from government, resource constraints and the tendency to disobey laws are the main barriers perceived by senior managers. Dunphy et al., (2003) explore the organisational barriers to CS and noticed that lack of strategy restrict organisations to move toward sustainable business practices. Similarly Benn et al., (2006) argue that social and environmental compliance through framework and understanding of eco-efficiency need to be understood for sustainable business operations. Lozano's work further provides contemporary evidence and asserts that both organisational and managerial level barriers such as lack of strategy and organisational commitment and lack of framework are the barriers that organisations are facing toward sustainability (Lozano, 2012; Lozano, 2013a). However, these studies mainly concentrate on developed countries where context are different from developing countries.

Though adoption of CS by developing countries' firms becomes common practice, there are a number of problems for CS reported by Arevalo and Aravind (2011) in their recent study on India. The authors argue that lack of resources, difficulties in implementing CSR, lack of management support and clear awareness are most significant obstacle. Maximiano (2005) finds that lack of resources is the main barrier for CS followed by lack of a linkage between sustainability and business strategy, and lack of awareness among employees. A literature review on sustainability barriers is presented in Table 1. Although a few scholars have emphasised the barriers of CS, attempts to prioritise these barriers in order to offset them are very rare. The prioritisation of CS barriers is important because organisations' capability and resources vary according to their size and nature of business. Moreover, by prioritising the most important barriers, organisations can select appropriate mitigation approaches based on their capability. This study identifies the barriers of CS and determines their level of importance by applying AHP.

2.3 Corporate sustainability Barrier Mitigation

The mitigation of sustainability barriers plays a crucial role in achieving long-term business goals for a sustainable organisation. The organisation as a social product needs to ensure social, environmental, and economic sustainability for its own existence as well as for the greater benefits of society. Corporate management strategy taking into consideration social, environmental, and economic aspects can contribute to mitigating the gap of sustainability barriers. A number of researchers argue that a strategic sustainability policy and standard can help an organisation towards sustainable business practice (See for example, Aragón-Correa and Sharma, 2003; Kuasirikun, 2005; Maas and Reniers, 2014). There are some countries which have strong regulations for social and environmental compliance that business needs to follow (Schaltegger and Burritt, 2005). These regulations force managers to consider sustainability management. To mitigate the sustainability barriers,

organisations now show their social and environmental performance through achieving certificates from different standard setting bodies, such as, ISO 14001, membership of the United Nations (UN) Global Compact, etc. (Adams and Narayanan, 2007; Prado, 2013). In the challenging and competitive global business arena, organisations focus on social and environmental compliance, and ensure sustainable working conditions including occupational health, safety and hygiene matters to meet the requirements of customers (Chowdhury et al., 2012a; Islam and Deegan, 2008). Having a sustainable supply chain and the strategies undertaken by organisations to meet suppliers' requirements are the existing key challenging issues (Darnall et al., 2008). However, the prior literature argued that continuous training for employees, management and other stakeholders can help the organisation to achieve its sustainable objectives (Hossain et al., 2012). Internal stakeholders require more training and education which fulfils management's desire of achieving higher environmental, social and sustainability standards (Seuring et al., 2008). To maintain and mitigate the barriers of sustainability, technological advancement, particularly achieving efficiency through the use of technology, is important. The efficiency of machinery and technology can reduce costs, the required inputs and emissions (Dewulf et al., 2000). Therefore, efficiency is one of the major aspects of sustainable development.

Table 1. A review of the literature on corporate sustainability barriers

Barriers of corporate sustainability	Literature
Lack of regulatory framework and governance	Rowe and Guthrie, (2010); Lodhia, (2003); Kamal and Deegan, (2013), Benn et al., (2006)
Lack of awareness and knowledge	Belal and Cooper,2011; Dobers and Halme, (2009); Jamali, (2008); Marrewijk, (2003), Arevalo and Aravind (2011)
Lack of education on sustainability	
Lack of written policy	Naeem and Welford, (2009); Lo and Sheu, (2007) Dunphy et al., (2003)
Lack of sustainability strategy	
Lack of resources/cost	Hahn and Scheermesser, (2006); Welford and Frost, (2006), Arevalo and Aravind (2011).
Social and environmental factors	Belal and Owen, 2007; Adams, 2004; Orlitzky et al., (2011)

Table 2. A review of the literature on sustainability barrier mitigation approaches

Mitigation Approach	Literature
Social and environmental reporting practice	(Goyal et al., 2013; Gray et al., 1995; Sumiani and Lehman, 2007)
Supplier selection and evaluation	Foerstl et al., (1997), Kuo et al., (2010)
Setting policies for sustainability standard	Islam and Deegan (2008); Belal and Owen (2007); Wallage (2000); Seuring et al. (2008)
Managing resource efficiency	Daily and Huang (2001); Haugh and Talwar (2010)
Product life cycle management	Ageron et al., (2012)
Developing backward linkage	Fortanier and Kolk (2007); Chowdhury et al.(2012b) Lee and Kim (2000)
Establishing sustainability management unit	Darnall et al., (2008)
Establishing buy-in	Carter and Dresner, (2001); Walker et al., (2008)
Implementing social and environmental practices (waste management and pollution control)	Qian et al.(2010);UN (2010)
Improving workers' satisfaction level and working environment	Belal (2001); Newell and Frynas (2007)
Lean management	Ageron et al., (2012)
Internal and external audit	Wallage, (2000)
Building relationships and cooperation with supply chain partners	Handfield et al. (2004); Welford and Frost (2006)
Skill development training	Haugh and Talwar, (2010)
Using efficient machinery and technology	Princen (2003)
Training and counselling regarding social and environmental issues (awareness)	Jacobs and Stott (1992)
Back-up facilities and alternatives	Schneider et al. (2010)
Reverse logistics	Ageron et al., (2012)

Although a few researchers mentioned some of the ways and means to mitigate sustainability barriers (see Table 2 for detail), a comprehensive and integrated study on mitigation of different types of sustainability barriers has not yet been conducted. Furthermore, among the approaches, studies with regard to the identification of an effective and efficient mitigation approach are quite absent. With such a void in the literature, this study identifies the sustainability barrier mitigation processes and determines the important mitigation processes by using QFD to design optimal strategies.

2.4 Quality Function Deployment (QFD)

Recently, companies are successfully using QFD as a powerful tool to address strategic and operational decisions in businesses (Mehrjerdi, 2010). This tool is used in various fields for determining customer needs (Stratton, 1989); developing priorities (Han et al., 1998); formulating annual policies (Philips et al., 1994); manufacturing strategies (Crowe and Cheng, 1996; Jugulum and Sefik, 1998); and environmental decision making (Berglund, 1993). Chan and Wu (2002) and Mehrjerdi (2010) provide a long list of areas where QFD has been applied successfully. According to Vinod and Cintha (2011), QFD enables the organisation to identify the areas for improvement thereby enabling improvement in sustainability. Further, QFD provides a means of translating needs or requirements into suitable strategies to reach specific goals (Kuo et al., 2009; Sullivan, 1986). Consistent with this it can be argued that to set strategies corresponding to the corporate sustainability barriers QFD is an effective tool.

Along with QFD, to deal with the barriers to CS and selecting strategies to mitigate those barriers other techniques, such as multiple-objective linear programming and statistical methods can be used. However, a major limitation of relying exclusively on mathematical model is its weakness to consider the qualitative factors. Qualitative factors are very essential in dealing with sustainability issues (Dai and Blackhurst 2012). QFD is an effective tool to handle the qualitative aspects of sustainability issues (Dai and Blackhurst 2012). Therefore, QFD approach is suitable for dealing with barriers to corporate sustainability. Integration of AHP with QFD is quite popular and easy to use (Ho, Dey and Lockstorm 2011; Das and Mukherjee (2008). Therefore, this study used AHP integrated QFD in determining the weights of the Corporate sustainability barriers.

In this study, therefore, QFD is used to identify the important sustainability barriers and to develop DRs corresponding to these barriers. QFD is applied as the main tool to analyse the sustainability barrier mitigation processes based on organisations' capability for sustainability. In QFD modelling, 'requirements' are referred to as 'WHATs' and 'how to fulfil the requirements' are referred to as 'HOWs' (see Figure 1).

The process of using appropriate HOWs to meet the given WHATs is represented as a matrix. Five sets of input information are required in a basic QFD model: (i) WHATs; (ii) importance of WHATs; (iii) HOWs; (iv) correlation matrix; and (v) relationship matrix (Mukherjee, 2011) which are shown systematically in the research methodology section.

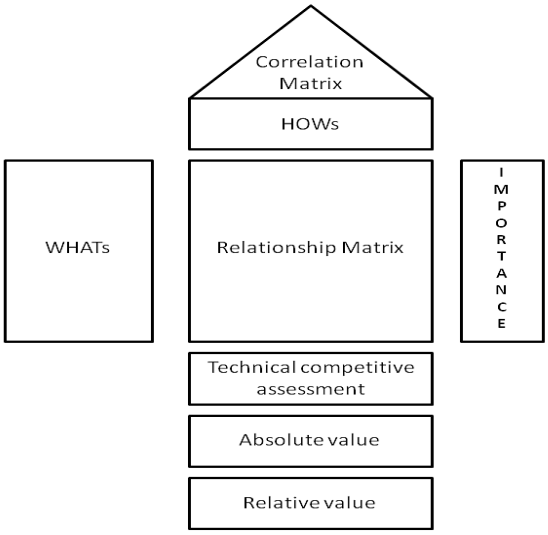


Figure 1. QFD layout

2.5 Analytical Hierarchy Process (AHP)

The analytic hierarchy process (AHP), originally developed by Saaty (1980), is an established multi-criteria decision-making approach and employs a unique method of hierarchical structuring of a problem and subsequent ranking of alternative solutions by a paired comparison technique. A typical pairwise comparison matrix is shown in Figure 2. AHP is frequently used in the QFD process (See for

example, Georgiou et al. (2008); Han et al. (2001) ; Das and Mukherjee (2008), Bhattacharya et al. (2005)). In the current study's approach, AHP is used to prioritise sustainability barriers before developing DRs in the QFD process.

$$\mathbf{A} = \begin{array}{c|cccc} & A_1 & A_2 & \dots & A_n \\ \hline A_1 & W_1/W_1 & W_1/W_2 & \dots & W_1/W_n \\ A_2 & W_2/W_1 & W_2/W_2 & \dots & W_2/W_n \\ \vdots & & & & \\ A_n & W_n/W_1 & W_n/W_2 & \dots & W_n/W_n \end{array}$$

Figure 2. Weighting of WHATs using AHP

3 Conceptual Model Development from Theoretical Framework

The contingency approach (Zeithaml and Zeithaml, 1988) expounds the concept of 'situational influences'. Based on 'general systems theory' and 'open systems perspective', the contingency approach involves building three types of variables: contingency variables – represent situational characteristics and are usually exogenous; response variables – represent organisational actions undertaken in response to contingency factors; and performance variables – represent the dependent variables. Lyndenberg (2012) summarises that sustainability norms and standards are industry specific in which relevant stakeholders play a significant role in shaping the material requirements of sustainability. Similarly, barriers to sustainability and corresponding mitigating strategies are dependent on industry specific forces and the requirements of the stakeholders. The outcome of the mitigation strategies also depends on strategic choices of the firms based on the magnitude of situation specific barriers and environmental uncertainties. Therefore, contingency theory provides a theoretical ground to explain the nature of sustainability barriers and the strategic choices to mitigate those. Consistent with contingency theory, the list of sustainability barriers comprises the contingency variables; the mitigation processes/strategic choices are response variables; and the contributions/impacts of mitigation processes to corporate sustainability are performance variables.

Stakeholder theory has gained continuous research attention in corporate sustainability and supply chain sustainability research stream as a number of studies (Belal, 2002; Park-Poaps and Rees, 2010; Pagell et al., 2010; Liu et al., 2011; Wu and Pagell, 2011) use stakeholder theory to explain different aspects of sustainability. According to stakeholder theory, organisations have responsibilities to their shareholders and other interested groups (Freeman, 1984). Freeman (1984) emphasizes that the task of the management is to maintain a balance among the conflicting interests and claims of stakeholders (Freeman 1984). If a balance cannot be ensured, organisational sustainability will be questioned. Organisations are experiencing different types of environmental uncertainties and challenges from environment customers, suppliers, governments, competitors, pressure groups, etc. (Freeman, 1984). Stakeholder theory posits that organizations need to overcome the challenges and select strategies to meet the requirements of the stakeholders and to sustain in the long run. Aligned with this, in this research, it is argued that managers shall identify the barriers/challenges to corporate sustainability and select suitable strategies to overcome the challenges and to meet sustainability requirements of the stakeholders. It can also be contended that selection of strategies that maintain a balance among the conflicting interest of the stakeholders helps the organizations and their supply chains to sustain in the long run. Therefore, the importance of identifying sustainability barriers and setting mitigation strategies are grounded on stakeholder theory. However, implementing the strategies to mitigate the barriers to sustainability needs organizational processes and resources.

The resource-based view (RBV) argues that firms deploy bundle of resources and capabilities which are unique and inimitable to get sustainable competitive advantage (Wernerfelt 1984, Barney 1991). Resource means anything that can be considered as strength of the firm. It may be tangible, such as, financial reserves, plant and machinery, equipment, stocks of raw materials and other physical assets, or intangible, such as, brand names, in-house knowledge of technology, skilled and trained human resources, managerial capabilities, organisational culture, social relationships, reputation, trade contacts, effective and efficient processes, etc. (Grant, 1991; Markusen, 1998; Wernerfelt, 1984). Based on RBV, it

can be argued that organisations need to develop such tangible and intangible resources and capabilities to mitigate the existing sustainability barriers to meet the requirements of stakeholders. Such capabilities are unique and inimitable which facilitate organizations to build competitive advantage sustain in the long run.

Based on the contingency approach, stakeholder theory and RBV, the structure of our conceptual research model is shown in Figure 3. Our proposed research model, based on the conceptual research model, is presented in Figure 4.

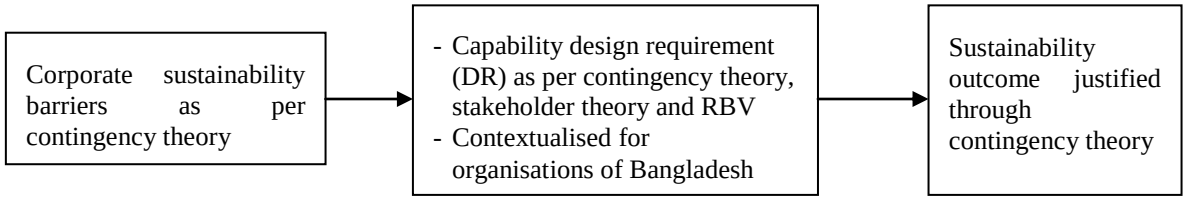


Figure 3. Conceptual research model

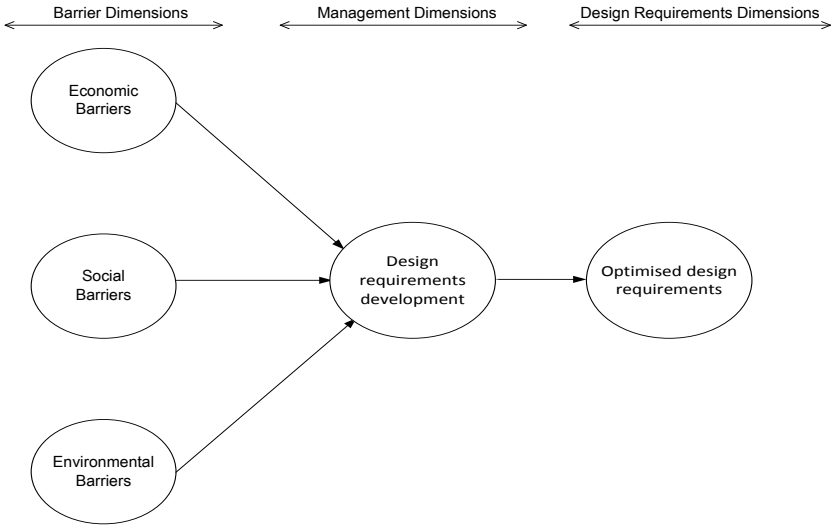


Figure 4. Sustainability barrier mitigation model

4 Research Methods

Research by adopting a mixed method, a combination of qualitative and quantitative methods, has gained popularity in the current research stream (Bryman, 2006), because it assists in increasing the quality, accuracy, validity and reliability of data (Babbie, 2007; Creswell and Clark, 2007). In line with the research objectives, this study is conducted in three phases using both qualitative and quantitative methods. Table 3 presents the summary of research design in three phases.

Table 3. Summary of research design

Research Objectives	Data collection	Data analysis
- Identifying the sustainability barriers in the textile and clothing industry of Bangladesh - Prioritising sustainability barriers	- Literature review regarding sustainability barriers. - Semi-structured interview to identify sustainability barriers. - Pairwise comparison between barriers for AHP analysis	- Content analysis of literature search and analysis of data from field study - AHP analysis
- Prioritising design requirements to mitigate sustainability barriers	- Literature review regarding mitigation design requirements (strategies). - Semi-structured interview to select mitigation design requirements - Structured questionnaire to develop relationship matrix.	- Content analysis of literature search - QFD analysis
- Determining the optimal design requirement	- Outcome from QFD analysis - Semi-structured interview for budget, cost, and cost-savings information of design requirements implementation	- Optimisation process based non-linear quadratic integer programming.

Population for project: textile and clothing industry of Bangladesh.

Sample: Six manufacturers from textile and clothing industry.

Details about the three phases of this research are presented below:

In Phase 1, the study identifies the sustainability barriers (WHATs) and the corresponding DRs (HOWs) to mitigate these barriers in the context of the textile and clothing industry of Bangladesh. This phase is mainly exploratory and qualitative in nature. Data were collected through semi-structured interviews with six managers who are responsible to oversee the sustainability issues in their respective organisation. A field study is conducted to identify the sustainability barriers of the textile and clothing industry in Bangladesh. Factors and variables from the literature as shown in Table 1 are used in identifying the barriers. An extensive literature survey is conducted with respect to sustainability, sustainability barriers and mitigation of sustainability barriers to come up with a range of factors and variables. In this regard, data are collected from four textile and clothing manufacturing units and two textile mills. As suggested by O' Reilly and Parker (2013) Data has been collected until saturation point when additional interviews does not produce any new data. This is an acceptable number of respondents because four to eight participants can be considered acceptable for qualitative interviews (Perry, 1998). The average interview time is around 60 to 80 minutes. Respondents are basically the decision makers of the firms. The demography of respondents is shown in Table 5. Respondents are asked to describe the sustainability barriers existing in the textile and clothing industry of Bangladesh. Based on the particular context, the barriers are subject to addition or subtraction. After determining the barriers, the decision makers of the case companies are asked about careful selection of corresponding mitigation DRs.

The data analyses are conducted via content analysis of the collected literature and the interview scripts. Based on the content analysis, a number of sustainability barriers are extracted and among those, the barriers supported by most of the respondents are considered for further analysis. The corresponding mitigation capabilities are then extracted from the content analysis. The extracted barriers and mitigation capabilities are compared with the literature and necessary amendments are made. The interview findings validate the initial research model developed from the literature.

In Phase 2, the importance of sustainability barriers and corresponding DRs were identified by applying a quantitative research approach. In this phase, data were collected from the senior managers of a single case company within the sample companies involved in this study. The respondents are asked to compare the importance of sustainability barriers under social, economic and environmental dimensions. AHP is used to determine the importance of the barriers under each dimension. The scale, developed by Saaty (1980), is used for the pairwise comparison process in determining the importance of CS barriers.

For the purpose of data analysis, comparison ratings of the respondents are averaged (geometric mean) to derive the weights. The weight of each sustainability barrier is later adjusted to derive the final synthesised weight. Finally, the synthesised weights of the sustainability barriers are considered as the basis for QFD (Akao, 1990). In QFD modelling, as previously mentioned, customer 'requirements' are referred to as 'WHATs' and 'how to fulfil the requirements' are referred to as "HOWs" (see Figure 1). Once the degree of importance of the barriers (WHATs) is determined from the synthesised weights, data regarding the importance of the DRs to mitigate these barriers are measured by QFD analysis. For this, respondents are asked about the contribution of each DR (HOWs) to mitigate the barriers (WHATs). The relationship between the barriers (WHATs) and corresponding DRs (HOWs) is measured as 'strong', 'moderate', 'little' or 'no' relationship which is later replaced by the scale 9, 3, 1 or 0. These weights are used to represent the degree of importance attributed to the relationship. Thus, as shown in Table 4, the importance of each DR can be determined by the following equation:

$$AI_d = \sum_{i=1}^{n} A_{ijk}\, D_w \forall_w, \quad w = 1, \ldots\ldots, m \qquad (1)$$

Where,

D_w = relationship value between the ***i***th barrier and ***w***th design requirement (DR);

A_{ijk} = weight of the sustainability barriers which are derived from AHP calculation;

m = number of design requirements (DRs);

n = number of sustainability barriers.

Table 3. QFD matrix

Sustainability barriers		DR_1	DR_2	.....	DR_m
SCs	A_{i1}	$A_{i1}D_{w1}$	$A_{i1}D_{w2}$	.....	$A_{i1}D_{wm}$
	A_{i2}	$A_{i2}D_{w1}$	$A_{i2}D_{w2}$	.....	$A_{i2}D_{wm}$
	⋮	⋮	⋮	⋮	⋮
	A_{in}	$A_{in}D_{w1}$	$A_{in}D_{w2}$	.....	$A_{in}D_{wm}$
ENs	A_{j1}	$A_{j1}D_{w1}$	$A_{j1}D_{w2}$	.....	$A_{j1}D_{wm}$
	A_{j2}	$A_{j2}D_{w1}$	$A_{j2}D_{w2}$	.....	$A_{j2}D_{wm}$
	⋮	⋮	⋮	⋮	⋮
	A_{jn}	$A_{jn}D_{w1}$	$A_{jn}D_{w2}$	.....	$A_{jn}D_{wm}$
ECs	A_{k1}	$A_{k1}D_{w1}$	$A_{k1}D_{w2}$	.....	$A_{k1}D_{wm}$
	A_{k2}	$A_{k2}D_{w1}$	$A_{k2}D_{w2}$	.....	$A_{k2}D_{wm}$
	⋮	⋮	⋮	⋮	⋮
	A_{kn}	$A_{kn}D_{w1}$	$A_{kn}D_{w2}$	.....	$A_{kn}D_{wm}$
A.I.		AI_{d1}	AI_{d2}	….	AI_{dm}
R.I.		RI_{d1}	RI_{d2}	….	RI_{dm}

Note: A.I. = Absolute importance; R.I. = Relative importance; DR = Design requirement; SC = Social sustainability barriers; EN = Environmental sustainability barriers; EC = Economic sustainability barriers; = Weights of sustainability barriers.

Therefore, the absolute value for the first design requirement (will be:

$$AI_{d1} = A_{i1}D_{w1} + A_{i2}D_{w1} + \ldots\ldots + A_{j1}D_{w1} + A_{j2}D_{w1} + \ldots\ldots + A_{k1}D_{w1} + A_{k2}D_{w1} + \ldots\ldots\ldots\ldots + A_{in}D_{w1} \quad (2)$$

Similarly, the relative importance of the first design requirement (DR) can be determined by the following equation:

$$RI_{d1} = \frac{AI_{d1}}{\sum_{d=1}^{n} AI_d} \quad (3)$$

where, AI = Absolute importance;
RI = Relative importance.

In Phase 3, the study identifies the most efficient design requirement (DR) to mitigate the barriers to achieve the optimum utilisation of resources through quantitative analysis. In this phase, the study investigates to find the most suitable one among the mitigation processes. Respondents are asked about the contribution of each design requirement (DR) in reducing the impact of barriers. Data regarding the implementation costs of DRs are then collected. Since three respondents are asked about three different estimates (high, medium and low) for each DR implementation, the cost data are classified as optimistic (Co – the lowest cost), pessimistic (Cp – the highest cost) and most likely (Cm –medium cost) estimates. Therefore, the monetary cost estimation of implementing the DRs are calculated by converting the optimistic, pessimistic, and most likely estimates to expected cost (Ce). The respondents are then asked about cost savings if the DRs are implemented simultaneously. In this regard, the relationships among the DRs in the roof matrix are useful.

For the data analysis, this study evaluates the DRs with respect to mitigation of barriers. Later beta-distribution technique (Paige, 1963) were used to derive expected implementation cost of DRs by using the formula Ce = (4Cm+ Co+ Cp)/6. Based on the data regarding the DRs' implementation cost and the contribution of DRs to mitigating barriers (Ri), the optimal DR can be selected. The goal of the optimal solution is to maximise the contribution of DRs, subject to the constrained budget. Non-linear quadratic integer programming has been used for this purpose. In addition, cost savings from the simultaneous implementation of the DRs (shown in the roof matrix) are determined. The roof matrix shows the interrelationships among the DRs in terms of cost savings from the simultaneous implementation of DRs. In the roof matrix, the symbols represent the degree of cost savings; for example, by joint implementation of DR1 and DR6, the total cost savings would reach optimum level which is 45 million BDT (Bangladeshi Taka).

Table 5. Interviewee profile

Participant	Position	Name of the company	Company size (number of employees)	Age of the company
P1	Assistant Manager	Company A	2000-3000	10-15 years
P2	General Manager	Company B	1000-2000	Less than 5 years
P3	Manager Merchandising	Company C	More than 4000	5-10 years
P4	General Manager	Company D	Less than 1000	5-10 years
P5	General Manager	Company E	1000-2000	10-15 years
P6	Manager Merchandising	Company F	3000-4000	20-25 years

5 Background of Case Studies

The research is conducted on the textile and clothing industry of Bangladesh. Bangladesh, a small country of South Asia, is one of the largest manufacturers and exporters of the global apparel industry. The textile and clothing industry is an economic propeller of Bangladesh and accounts for 76% of total export earnings and employment of over 3.5 million people of which 80% are women. Moreover, the industry has grown from a US$31.57 million business in 1983 to US$10,699.8 million in 2008 as reported in the BGMEA Report 2007-2008 (BGMEA, 2009). However, sustainability in the textile and clothing industry is facing a critical situation owing to social, environmental and economic challenges. These challenges are inhibiting the industry's sustainability. Most companies are found to fail to comply with aspects of corporate social and environmental responsibility (Naeem and Welford, 2009). Bangladeshi organisations, especially textile and clothing companies, are accused of poor working conditions, inadequate factory health and safety measures, violation of human rights, environmental pollution and the use of child labour (Islam and Deegan, 2008). Moreover, political instability; disruption in the utility supply, especially power shortages; inefficiency in customs and port management; exchange rate fluctuation; disruption in timely supply of raw material; increased competition; inefficiency in operation; intensive competitive pressure from China and India; and failure to comply with social and environmental issues as demanded by buyers are highlighted barriers in the industry's route to sustainability (Haider, 2007; Islam and Deegan, 2008; Paul-Majumder, 2001). The prevalence of such barriers to sustainability as well as the existence of the gap in the theory regarding mitigation of sustainability barriers have motivated the researchers to conduct this study with a focus on the textile and clothing industry of Bangladesh.

6 Results and Discussion

The findings from the content analysis of the interviews reveal that the textile and clothing manufacturers of Bangladesh often face a number of sustainability barriers. These barriers impede the process of achieving social, economic and environmental sustainability (Orlitzky et al., 2011). For example, concerning the social sustainability barrier, Participant 2 commented on the lack of awareness and interest of the owners: to him "if we train our employees and provide them with good facilities, we may expect better output, but our owners always stress on productivity without providing much effort for that." These findings are consistent with the prior study by Haugh and Talwar (2010). In contrary, it was also observed that some companies provide more benefits to employees to achieve smooth production and better quality products. This was supported by the statement of participant 6 "it's a labour intensive business and we must keep our employees satisfied to find good quality products". The findings of Belal (2001) and Newell and Frynas (2007) also echo the importance of employee satisfaction for achieving sustainability.

One of the participants (Participant 1) is highly concerned about the cost of ensuring environmentally friendly production which he indicated by stating: "We need to spend huge money for controlling air and water pollution. Our buyers always talk about social and environmental compliance but want cheaper product which is difficult." The prior studies argue that the implementation of a sustainability program is one of the vital problems in organisations (see, e.g. Steger, 2007; Welford and Frost, 2006). Regarding economic sustainability barriers, a number of respondents mentioned dependence on imported material; for example, Participant 2 stated that "we are dependent on material from China which takes more time and money". This finding echoes the findings of Chowdhury et al. (2012).

The respondents of this study argue that organisations need to develop some strategies and capabilities to mitigate barriers towards sustainability, for example: "we have our own accessory plant so that we can source products in due time and at cheaper cost" (Participant 5). This statement indicates the importance of establishing a backward linkage facility. For export-oriented firms, a backward linkage facility is very important to reduce lead time and supply uncertainties (Lee and Kim, 2000; Titko and Lace, 2010). The extracted factors and variables with a high response rate concerning sustainability barriers and corresponding mitigation processes are summarised in Table 6.

Table 6. Extracted factors and variables with corresponding mitigation processes

Sustainability barriers		Enterprises						AHP weight	Synthesi-sed weight	Ranking
Social Factors (weight: 35.461)		1	2	3	4	5	6			
Lack of awareness and knowledge of the employees (SC1)		y	y	y		y	y	.100	0.036	5
Lack of awareness and interest of management (SC2)		y	y	y	y	y	y	.344	0.122	1
Non-compliance of some social issues in organisation (SC3)		y	y		y	y		.134	0.048	3
Absence of sustainability strategy (SC4)		y	y	y		y	y	.128	0.045	4
Absence of adequate governance (social) (SC5)		y	y	y	y		y	.162	0.057	2
Lack of written policies and reporting practice (SC6)				y		y				
Cost and resource constraints to comply with social issues (SC7)		y					y			
Lack of regulatory framework and enforcement of law (SC8)			y		y					
Environmental Factors (weight: 20.316)										
Lack of awareness and knowledge of the employees (EN1)		y	y		y	y	y	.099	.020	5
Absence of pollution control measures (EN2)		y		y	y	y	y	.144	.029	3
Lack of awareness and interest of management (EN3)		y	y	y	y	y	y	.232	.047	1
Absence of sustainability strategy (EN4)		y	y	y		y	y	.114	.023	4
Absence of adequate governance (environmental) (EN5)		y	y	y	y		y	.196	.040	2
Lack of written policies and reporting practice (EN6)				y		y				
Cost and resource constraints to comply with environmental issues (EN7)		y					y			
Lack of regulatory framework and enforcement of law (EN8)			y		y					
Lack of government incentives (EN9)			y							
Economic Factors (weight: 44.237)										
Utility supply problem (EC1)		y	y	y	y	y	y	.115		1
Dependence on imported material (EC2)		y	y	y	y	y	y	.061		3
Supply disruptions (EC3)		y		y		y	y	.057		4
Lack of efficiency of employees (EC4)		y	y	y	y	y	y	.084		2
Infrastructure problem (port, customs, transportation) (EC5)			Y				y			
Shortage and high cost of funds (EC6)		y		y		y				
Political instability (EC7)			y	y	y		y			
Operational disruptions (EC8)		y	y		y	y				
Fluctuation of raw material price and currency price (EC9)			y		y		y			
Design requirements	Social and environmental reporting practice (DR1)	y		y	y		y			
	Setting policies for sustainability standard (DR2)		y		y	y				
	Managing resource efficiency (DR3)	y	y	y		y	y			
	Developing backward linkage (DR4)	y	y	y	y	y	y			
	Establishing sustainability management unit (DR5)		y		y					
	Implementing social and environmental practices (waste management and pollution control) (DR6)			y		y				
	Improving workers' satisfaction level and working environment (DR7)		y		y	y				
	Internal and external audits (DR8)	y				y				
	Building relationships and cooperation with supply chain partners (DR9)	y	y	y	y		y			
	Skill development training (DR10)	y	y	y	y	y	y			
	Using efficient machinery and technology (DR11)		y		y	y	y			
	Training and counselling regarding social and environmental issues (awareness) (DR12)	y		y			y			
	Back-up facilities and alternatives (DR13)	y	y	y	y	y	y			

The analysis of field study identifies eight social, nine environmental and nine economic sustainability barriers (see Table 6). The factors and variables mentioned in Table 6 are consistent with the factors derived from the literature according to Tables 1 and 2. It should be noted that the factors with low importance weights (see Figures 6, 7 and 8) have not been considered for QFD analysis due to their minimal institutional impacts on sustainability.

The findings of our study are furnished in line with the research objectives. Firstly, in accordance with research objective 1 (see Table 3), the weights of sustainability barriers under each category are determined as shown in Table 6. It is evident that among the eight social sustainability barriers, five barriers are identified as being of higher importance (see Figure 6). Of these five highly important barriers, lack of awareness and interest of management has the highest importance score of 34.4% followed by absence of adequate governance (16.2%) and non-compliance of some social issues in organisation (13.4%) as the second and third most important factors. Likewise, among the nine environmental sustainability barriers, five barriers are identified as being of higher importance (see Figure 7). Among those five highly important barriers, lack of awareness and interest of management has the highest importance score of 23.2% followed by absence of adequate governance (19.6%) and absence of pollution control measures (14.4%) as the second and third most important factors. Therefore, textile and clothing companies should pay due attention to creating awareness about the importance of social and environmental sustainability and its positive impact on organisational performance in the long run. Furthermore, among the nine economic sustainability barriers, four barriers are identified as being of higher importance (see Figure 8). Of those four highly important barriers, utility supply problem has the highest importance score of 25.9% followed by lack of efficiency of employees (19.1%) and dependence on imported material (13.7%) as the second and third most important economic sustainability barriers. Therefore, keeping an alternative energy source to overcome the utility supply problem seems important.

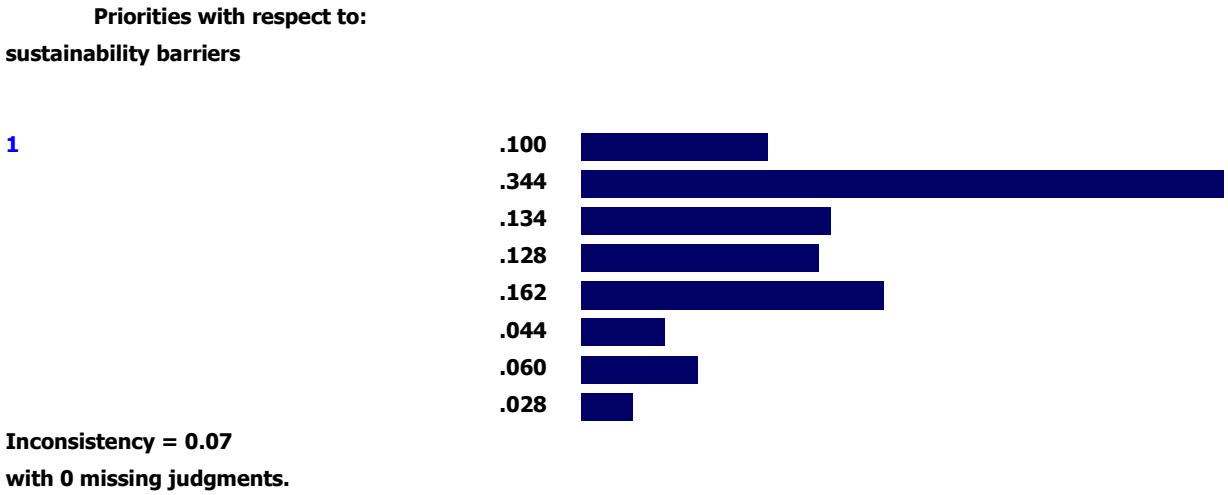


Figure 6. Prioritisation of social sustainability barriers

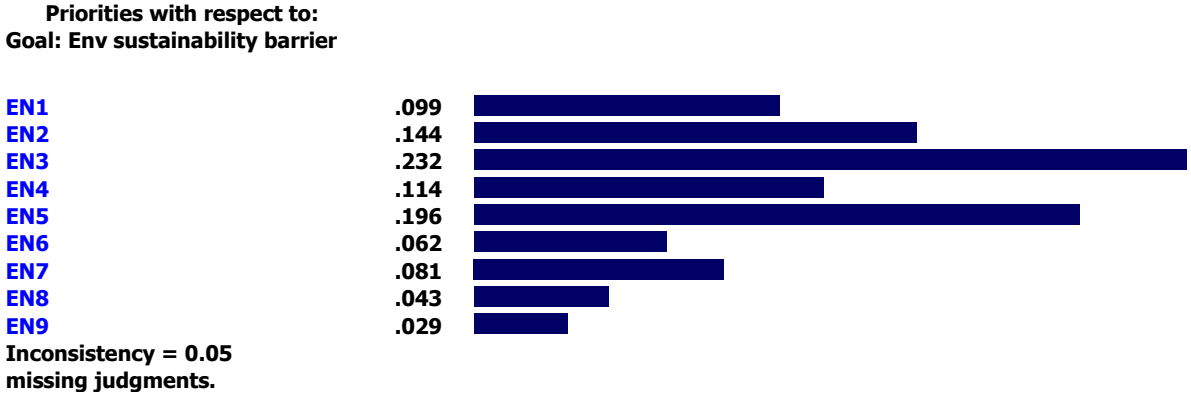


Figure 7. Prioritisation of environmental sustainability barriers

Secondly, in accordance with research objective 2, the important DRs are determined by using the QFD technique. The QFD matrix as shown in Figure 9 reveals that with regard to the most important social sustainability barrier, lack of awareness and interest of management (SC2) and capability DRs, such as, managing resource efficiency (DR3) and establishing sustainability management unit (DR5) are more important. These are also emphasised by prior studies (see e.g. Darnall et al., 2008; Belal and Cooper, 2011). Similarly, in terms of the most important environmental sustainability barrier, lack of awareness and interest of management (EN3) and managing resource efficiency (DR3) are considered of higher importance by the respondents. Previous studies (BEXIMCO, 2013; Pagell and WU, 2009) indicate that inefficient use of resources impedes environmental sustainability which is consistent with our findings. With regard to the most important economic sustainability barrier, utility supply problem (EC1) and development of back-up facilities and alternatives (DR13) are considered the most important DRs.

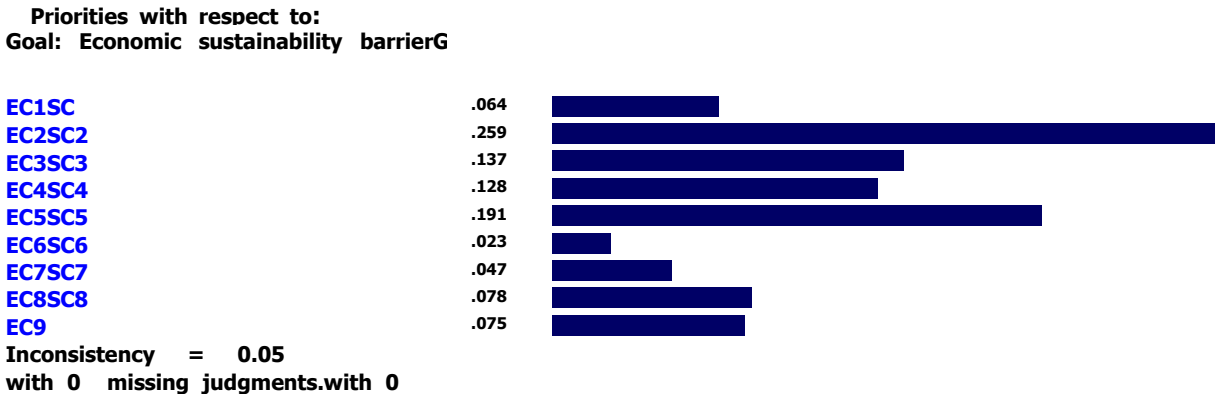
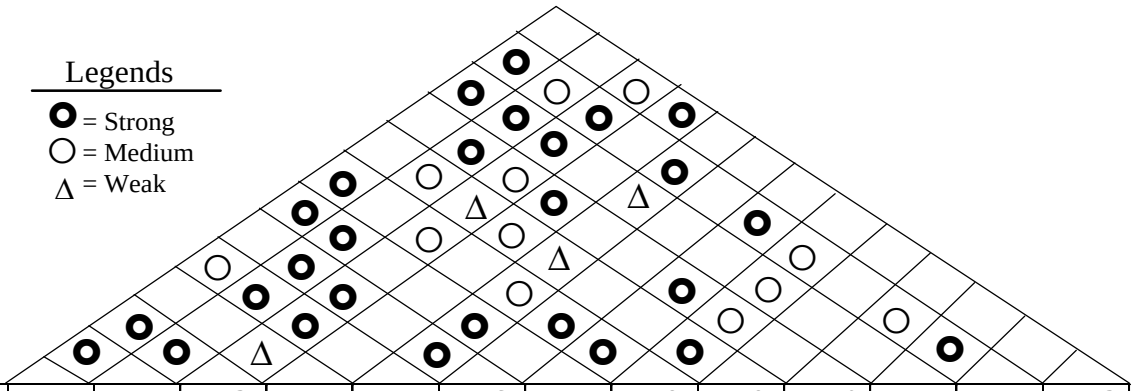


Figure 8. Prioritisation of economic barriers

Apart from the specific DRs corresponding to the individual sustainability barriers, internal and external audits regarding compliance issues (DR8), setting policies for sustainability standard (DR2) and building relationships and cooperation with supply chain partners (DR9) are considered as highly important DRs as a whole. These DRs have higher absolute and relative importance in comparison to the other DRs. These findings are also validated by prior studies (See e.g. Wallage, 2000; Belal and Owen, 2007; Welford and Frost, 2006) as presented in Table 2.

Thirdly, the roof matrix (see Figure 9) shows the relationships among DRs with respect to cost savings. Some cells in the pay-off matrix show high cost savings, some cells represent low cost savings and some represent no cost savings. The results of the correlation matrix are shown in Figure 9.

Fourthly, the optimal design requirements (DRs) are selected. The selection of DRs needs to be supported by organisations' budgets. This emphasises the importance of implementing the optimal DRs within the limited budget. The evaluation of the optimal outcome of the sustainability barrier mitigation processes/design requirements (DRs) can be affirmed by the cost and importance of the DRs. In this regard, by adopting 0-1 non-linear integer programming, the importance of each DR are maximised subject to budget constraint. The cost savings from the simultaneous implementation of the DRs are considered during optimization process.



	DR1	DR2	DR3	DR4	DR5	DR6	DR7	DR8	DR9	DR10	DR11	DR12	DR13
SC1	0.035	0.035	0.319	0	0.035	0.106	0.035	0.035	0.106	0.035	0	0.319	0
SC2	0.122	0.366	0.366	0	0.366	0.122	0.122	1.1	1.1	0.122	0.122	0.366	0
SC3	0.428	0.428	0	0	0.428	0.428	0.143	0.428	0.143	0.048	0.048	0.143	0
SC4	0.409	0.121	0.409	0	0.121	0.121	0.121	0.409	0.121	0.045	0.045	0.409	0
SC5	0.057	0.517	0	0.057	0.057	0	0	0.517	0.057	0	0	0	0
EN1	0.020	0.020	0.181	0	0.020	0.020	0.020	0.060	0.060	0.020	0	0.181	0
EN2	0.263	0.263	0.263	0	0.263	0.088	0	0	0.263	0.029	0.088	0.088	0
EN3	0.141	0.424	0.141	0	0.047	0.047	0.047	0.424	0.141	0	0.047	0.141	0
EN4	0.208	0.208	0.208	0	0.069	0.208	0.023	0.208	0.069	0.023	0.069	0.208	0
EN5	0.04	0.358	0	0.04	0.04	0	0	0.358	0.04	0	0	0	0
EC1	0	0	0	0	0	0	0	0	0	0.115	0.115	0	1.031
EC2	0	0	0	0.545	0	0	0	0	0	0	0	0	0.545
EC3	0	0	0	0.51	0	0	0	0	0	0	0	0	0.51
EC4	0	0	0.085	0	0.085	0	0.253	0	0	0.76	0.253	0.085	0
A.I	1.724	2.742	1.97	1.15	1.53	1.141	0.77	3.538	2.1	1.2	0.787	1.94	2.086
R.I	0.076	0.121	0.087	0.051	0.068	0.050	0.034	0.156	0.093	0.053	0.035	0.086	0.092
Rank	7	2	5	10	8	11	13	1	3	9	12	6	4

Figure 9. Correlation and relationship matrix

The objective function, cost of the DRs, savings from the simultaneous implementation of DRs, and the limited budget can be obtained from the following functional notations and their explanation.

$$Max\ (Z) = \int (R_i, x) = \sum_{i=1}^{n} (R_i x_i)$$

Subject to,

$c_1x_1+c_2x_2+c_3x_3+c_4x_4+c_5x_5+c_6x_6+c_7x_7+c_8x_8+c_9x_9+ c_{10}x_{10}+c_{11}x_{11}+c_{12}x_{12}+c_{13}x_{13}-S_{1,5}x_1x_5-S_{1,8}x_1x_8- S_{2,5}x_2x_5S_{3,5}x_3x_5-S_{3,6}x_3x_6-S_{3,10}x_3x_{10}-S_{4,13}x_4x_{13}- S_{5,8}x_5x_8-S_{5,12}x_5x_{12}-S_{6,11}x_6x_{11}-S_{7,10}x_7x_{10}- S_{7,12}x_7x_{12}-S_{9,13}x_9x_{13}-S_{10,11}x_{10}x_{11}-S_{10,12}x_{10}x_{12} \leq 25$

where, x_1, x_2, … $x_n \geq 0$ (non-negativity constraint) and x_1, x_2, … x_n = binary numbers which can select randomly either 0 or 1. c_1x_1, c_2x_2, … $c_{13}x_{13}$ are the cost of implementing design requirements DR1, DR2, … DR13. $S_{1,5}x_1x_5$ = savings from the simultaneous implementation of DR1 and DR5 and the remaining are similar cost saving functions. The limited budget is 25 million BDT. The result of the optimisation is shown in Table 7.

Table 7. Optimisation

Design Requirements (*DRj*):	**DR1** (x1)	**DR2** (x2)	**DR3** (x3)	**DR4** (x4)	**DR5** (x5)	**DR6** (x6)	**DR7** (x7)	**DR8** (x8)	**DR9** (x9)	**DR10** (x10)	**DR11** (x11)	**DR12** (x12)	**DR13** (x13)
Importance weights (*AIj*):	0.076	0.121	0.087	0.051	0.068	0.05	0.034	0.156	0.093	0.053	0.035	0.086	0.092
Costs (*Cj*):	0.8	0.3	0.3	6	0.8	0.3	8	0.6	22	2	40	1.2	30
Decision variable:	1	1	1	1	1	1	1	1	0	1	0	1	0

From the outcome of the optimisation, it is evident that, at the constrained budget of 25 million BDT, the optimal R_i for the company is 0.782. In that case, the company can implement all DRs except DR9, DR11 and DR13. In this regard, it is interesting to analyse what happens if the company increases its budget? Therefore, a sensitivity analysis is performed to evaluate the results at a different budget level. The result of the sensitivity analysis is shown in Table 8.

Table 8. Sensitivity analysis

x1	**x2**	**x3**	**x4**	**x5**	**x6**	**x7**	**x8**	**x9**	**x10**	**x11**	**x12**	**x13**	**Ri**	**Budget**
1	1	1	1	1	1	0	1	0	1	0	1	0	0.748	15
1	1	1	1	1	1	1	1	0	1	0	1	0	0.782	25
1	1	1	1	1	1	0	1	1	1	0	1	0	0.841	35
1	1	1	1	1	1	1	1	1	1	0	1	0	0.875	45
1	1	1	1	1	1	1	1	1	1	0	1	0	0.875	55

It is evident from the sensitivity analysis that, at 15 million BDT, the total value is .748 and the company can implement nine design requirements (DR1, DR2, DR3, DR4, DR5, DR6, DR8, DR10 and DR12) out of the 13 DRs. At 25 million BDT, it can implement 10 DRs (all except DR9, DR11 and DR13) and, at 35 million BDT, it can implement 11 DRs and the total value is .841. It is observed that there is no increase after the total budget reaches 45 million BDT. Therefore, the company should determine the cut-off point carefully when it wants to increase investment for design requirements implementations.

It is not unlikely that the company may consider some DRs to be top priority while implementing DRs, for example, in the fashion industry, lead time is very important due to the shorter life cycle of products. Therefore, any DR that is important for reducing the vulnerability to lead-time failure is highly preferable. In this regard, it is noteworthy to analyse and see the result of optimisation with some fixed DRs. In our future research, data will be collected and analysed regarding fixed DRs.

7 Research Implications

The results of this study have both theoretical and managerial implications. The following sub-sections present implications of this study which is significant for policy makers for their sustainability strategy formulation.

7.1 Theoretical Implications

This study establishes a model of sustainability barrier mitigation by integrating contingency theory, the resource-based view (RBV) and stakeholder theory. The findings of this study contribute to the body of knowledge on CS and determine optimal DRs for mitigating sustainability barriers based on organisational resource constraints. Developing optimal capability in a condition of constrained resources is one of the major contributions of this study which has been supported by the resource-based view (RBV). Stakeholder theory suggests organisational action to mitigate the barriers to meet stakeholders' expectations. In this regard Deegan (2014) notes that management should equally consider all stakeholders interests, and failure to ensuring their interests might raise conflict, and hence, businesses have true responsibility to society, community and the environment. Furthermore, the design requirements i.e. organisational actions are justified by the sustainability outcome based on contingency theory. Based on the relevant theories, a unique model is developed that identifies important social, environmental and economic sustainability barriers and their corresponding optimal mitigation strategies by applying the non-linear quadratic integer programming-based AHP integrated QFD. Therefore, our study is an important addition to the repository of theoretical and methodological knowledge on CS.

7.2 Managerial relevance

In terms of managerial implications, the sustainability barrier mitigation model determines the important barriers and optimal design requirements/organizational strategies for ensuring

sustainability in the textile and clothing industry of Bangladesh. Therefore, it will help managers of this industry to identify and to overcome the existing challenges effectively and efficiently. Our findings suggest that prioritization of sustainability barriers is crucial for any organization. The policy makers should, therefore, be aware about the significance of individual barrier which need to be prioritized to ensure efficient allocation of resources in mitigating barriers. According to our results of QFD analysis, the barrier mitigation model presents optimal DRs towards sustainability which is a significant input for the organizational policy makers. The sensitivity analysis technique shows the process of selecting different optimal strategies in different budgets. Such approach will offer substantial utility to the managers to set a trade-off between targeted sustainable performance and the allocated budget. In the current financial crisis, most of the firms in the world might be more interested for their operating performance rather than investing more money for sustainability, however, the findings of this study is vital for policy makers to decide optimal mitigation processes within the limited budget of their organisations. This study considers Bangladesh as a case, particularly the textile and clothing industry; however, the study's implications are significant for other countries in a similar institutional context.

8 Conclusion, limitations and future research directions

The objectives of this study were to explore corporate sustainability barriers and mitigation strategies through optimal use of resources. The study has considered four case studies from textile and clothing companies in a rapidly growing emerging country, such as Bangladesh. This study has advanced existing CS literature by developing a framework to Prioritize CS barriers and selected suitable strategies to mitigate those barriers through introducing optimization integrated AHP-QFD approach. The developed framework should be of interest to organisations' decision makers to select optimal strategies for mitigating the CS barriers using limited resources. More particularly, this study identifies the critical sustainability barriers of businesses and suggests best strategies to mitigate the barriers. Using QFD analysis, the study prioritised DRs based on their relative importance and then selected most suitable strategies using non-linear 0-1 integer programming.

The findings of the study suggest that all sustainability barriers are not equally important to organisations. By prioritizing the sustainability barriers and selecting proper mitigation strategy an organisation can save its cost in a constraint budget. Prior studies have predominantly investigated drivers and motivations to corporate sustainability (Gill et al., 2008; Lantos, 2001; Lozano, 2013b). Whilst social and environmental accounting researchers have provided more focus on corporate sustainability reporting, management and other business researchers explored sustainability with strategic point of views and supply chain aspects (Baumgartner, 2011; Lodhia, 2014; Seuring et al., 2008). However, these studies largely ignored area of identifying the barriers to corporate sustainability and their relative importance as well as strategic choice to mitigate such barriers. In this theoretical lacuna this study provides empirical evidence through both qualitative and quantitative analysis to offer a framework for resolving corporate sustainability barriers.

The results of this study are subject to few limitations which open opportunities for further research. The study considers small sample size which needs empirical verification by questionnaire survey to prove the external validity of the research outcome. The interviewees were selected on a voluntary basis that could produce statement which goes in favour with their organisation. The case studies used in this research drawn from textile and clothing industry which might create generalizability problem of findings. Future study might consider organisations from other industry with bigger sample size. Finally, the study opens the window for future research based on a larger sample size for survey research to test the relationship between sustainability barriers and mitigation processes with CS in a wider industry but not limited to developing countries.

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