How selection of collaborating partners impact on the green performance of global businesses? An empirical study of green sustainability

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Abstract: In recent days, both collaboration and sustainability have become an integral part of many global supply chains to achieve business excellence. Although previous literature and actual practices confirmed the successful implementation of sustainability practices through supply chain collaborations, it is not clear how collaborating partners can support financial and environmental performance, and hence strengthen the partnership performance in the global supply chains. To address this practice-based research question, we test the theoretical underpinning of suppliers and logistics partners in relation to required skills selection. We capture the depth of interdependencies in collaborations for routine operations and sustainability, through empirical evidence. We used case study observations from three global companies to develop a conceptual model and also conducted a questionnaire survey to test the conceptual model. The results of case analysis confirmed two dimensions of collaborations that could strengthen relationship; namely, partners' selection and sustainability team formation. Data analysis strongly support business collaborations having careful choice of supply chain partners and logistics operators who are ready to maintain green operations with transparent information sharing. Results of this study also inform managers about the importance of commitment from collaborating partners to achieve sustainability in their global supply chains. It is clear from the results that both the business and financial performances will be strengthened by environmental positioning (green objectives) of the companies.

Keywords: supply chain collaboration, partners' selection, sustainability, green operations

1. Introduction

While in the past two decades, collaboration has become a buzzword for all businesses (Vachon and Klassen, 2008), in recent days, green objective and environmental sustainability have become the general norm of businesses (Sarkis et al., 2011). Organizations have collaborations with many players such as suppliers, logistics operators, clients and intra- and inter-departmental collaborations for various purposes including the sustainability. In simple terms, collaboration can be any joint effort of two or more business partners to enhance business performance in such a way as to benefit the partners involved (Ramanathan et al., 2014). Here, business performance refers to financial, environmental, social and operational performance. In recent years, a huge number of players in the global supply chain played a great role in paving a collaborative platform and motivated businesses to collaborate with each other to achieve a win-win situation. These collaborations also help businesses each other adhere to local sustainable policies while carrying out business globally. There is a debate within academic literature and within businesses on the effect that collaborating partners has on achieving environmental sustainability performance. However, there is no specific framework that connects environmental performance and business performance through collaborations among supply chains (SCs). One of the main purposes of this paper is to study the role of supply chains collaborating partners in achieving environmental sustainability and business performance. Here, we refer 'sustainability' to green operations practiced in the businesses. We use 'environmental sustainability', 'green sustainability' and 'sustainability' interchangeably within this article with reference to previous literature.

Several supply chain collaboration (SCC) frameworks were suggested in the literature; namely, vendor managed inventory, quick response, continuous replenishment, collaborative planning, forecasting and replenishment (Aviv, 2007; Sari, 2008; Ramanathan and Muyldermans, 2010). However, the success of such collaborations are dependent on three main factors; namely, the explanatory power of the SC partners, the speed of supply side operations and internal services (Aviv, 2007). Here it is important to note that information sharing is one of the keys to the success of business collaborations. In SC collaborative relationships, participating members will share valuable information, physical resources - both tangible - such as transport, warehouse, and manufacturing facilities - and intangible - such as goodwill, patents, knowledge, and experience. In such collaborations, it is well accepted that the strength of collaboration lies in the involvement of collaborative partners in planning, execution, and decision-making (Ramanathan and

Gunasekaran 2014). In this line, we first try to understand the sustainability-oriented collaborative relationship of focal companies through case study observations. Specifically, through these industrial cases, we will study (i) the relationships of the focal companies with their suppliers, buyers, logistics and other business partners (ii) the impact of collaborating partners' selection in the success of collaboration.

Nyaga et al. (2010) tested two different perspectives of suppliers and buyers in collaborative relationships. Authors asserted that the collaboration helped to improve the performance. They also found buyers value the outcome of the collaborative relationship while suppliers are maintaining this relationship using information sharing. As an extension to previous research, in this paper, we try to ascertain the impact of such collaborations specific to sustainability, business performance, and partnership performance. We consider information sharing as a baseline of collaborative relationships. Also, due to governmental, stakeholder and organisational pressure, the number of business collaborations aiming to achieve sustainability objectives is on the rise in the recent past (Ramanathan et al., 2014). The success of Amazon's business model is partly related to its business partners and collaboration with logistics providers (Amit and Zott, 2012). Many previous researchers (Aviv, 2007; Nyaga et al., 2010; Ramanathan and Gunasekaran, 2014; Ramanathan et al., 2014) identified the role of collaboration in various dimensions such as operational, financial and environmental performance of the businesses. However, they did not explain how the selection of collaborating partners affected the sustainability performance, financial performance, and collaboration output. In this research, we try to fill this gap using three case study company observations from both developed and developing nations and an industrial survey covering 79 companies operating globally.

We conducted interviews with the case companies' operations/ business managers to explore the SC collaboration arrangement to achieve sustainability objectives. Furthermore, we assimilated the knowledge gained from the case studies and the literature to develop a conceptual model of sustainable SC collaboration with a specific focus on the selection of suppliers. Also, we used country level data collected from 79 global SC partners from four different countries to test this conceptual model. Our research makes two important contributions to the literature. By empirically modelling the SC collaboration, the model relates the supplier's selection with the strength of the collaborative partnership. This model reproduces the importance of inter-relation and sustainable objectives of SC collaborations.

The remainder of the paper is organised as follows. First of all, in the following section, we introduce the research topic using relevant literature and underlying theory. Then, we explain the research design in Section 3 and explain the cases we observed. Further interview protocol and case analysis are discussed briefly in section 4. We also discuss the research hypotheses developed from the case analysis and the conceptual model in this section. In Section 5, data description and data analysis are considered in detail. Findings from the analysis are also discussed in detail. In Section 6, we conclude the paper by discussing results and showing contributions to theory and practice with pathways to future research.

2. Research background and underlying theories

To achieve green objectives, businesses seek support from their stakeholders that strengthens different sustainable operations and also enhances the overall performance (Ramanathan et al., 2014). In 21st century businesses, collaborative relationship can be established with both upstream and downstream players, and with logistics operators. Such collaborations will support green SC objectives of the organisations and evolve some new theories around this area (Sarkis et al., 2011). As we are studying the collaborative relationship based on selection of suppliers, logistics operators and buyers/clients, we review some relevant literature specific to the SCC with these stakeholders for the purpose of achieving green objectives.

2.1. Supply chain collaboration – partners' involvement

Supplier selection is a well-established concept in the domain of SCs. In traditional SCs, the cost, quality, service performance, supplier profile and risk factors are important criteria for supplier selection (Xinyang et al., 2014). Recent research from Igarashi et al. (2013) examined the extant literature to suggest a conceptual model for selecting green suppliers. The authors suggested alignment of supplier selection with the three most important aspects; namely SC context, process, and tools. The power balance in the SC, decision and information sharing, and the green agenda have been considered as important elements in supplier selection.

In this competitive business era, customers are the heart and soul of all businesses. It is not common for all businesses to select their customers; rather customers or clients will have freedom to choose the right business partners. Client or customer selection is widely researched in the domain of the services sector (Yu et al., 2015; Cho et al., 2008).

Some businesses aspiring to have sustainable long-term partnerships with clients may tend to choose their clients based on their business objectives or green objectives (Ramanathan et al., 2014; Govindan et al, 2015). 'Environmental management systems' were considered the most effective way of persuading the supplier to implement greenness in the SCs. Many researchers used fuzzy logic models to select green suppliers (Govindan et al., 2015). Although a few researchers discussed the role of partners' power in collaborative forecasting, selection of SC partners was not discussed beyond information sharing and forecasting (Aviv, 2007; Ramanathan and Muyldermans, 2010). This was due to the fact that today's competitive market makes the SC highly intense with no opportunity to choose their customers. Empirical research on the client selection is not commonly available, and hence in this research, we try to ascertain underlying factors of clients' selection in collaborative relationships using a case study approach.

Logistics partners' selection is another important criterion to ensure reliable on-time delivery in a collaborative relationship. This enhances the long-term partnership. Many researchers discuss the quality of delivery (without damaging the product) as it influences the customer satisfaction (Yu et al., 2015; Ramanathan, 2010). However, what is not well considered in the literature is how this logistics selection plays a key role in the collaborative partnership. In our research, we see the role of logistics (food and fashion) and skills selection (IT projects) in a collaborative set up.

To summarise, we consider the idea of introducing a new partner besides suppliers, customers and logistic providers: we could name this "people and skill providers". This would relate only to service companies, like IT. We also see the outcome of this collaborative partnership in the performance of businesses. Due to a tremendous increase in the technology products and software, the 'skills selection' is currently considered a mandatory procedure in technology projects. For example, if an IT project needs experts in 'Java programming', they need to look for these specific skills to be involved in the project. This term 'skills selection' is used by the IT Company as every project needs different skills and hence partnership selection includes this criterion. We have included this term in our research based on the interviews conducted with the case companies. This has been validated by other IT personnel.

Transparent information sharing and knowledge sharing have been viewed as two of the success factors of forecast accuracy in collaborative SCs (Ramanathan and Muyldermans, 2010; Cai et al., 2013). While the former is very important for improving SC efficiency and responsiveness, the latter is important for innovation and new product

development. In the recent digital era, knowledge sharing with suppliers, buyers, logistics providers is as important as information sharing to improve SC green performance.

Sharing knowledge and SC information such as quality and speed are considered to be essential parts of creating collaborative relationships (Forslund and Jonsson, 2007), while the extent to which the information impacts the routine operations and decision making of the company will dictate the level and type of information sharing (Larsen, et al., 2004; Barratt, 2004). The experience of SC partners will play a great role in deciding what information can be exchanged among other SCs. The greater the benefits, the higher the incentive for information exchange among SC partners (Ramanathan, 2012).

Internal support from employees for collaborative relationships with other SC partners has been shown to be a great influencing factor of business success and green commitment (Ramanathan et al., 2014). Companies with significant support within the organisation do try and implement green strategies in routine SC operations and in all possible processes. This strengthens the green objectives in collaborative SCs. Achieving green objectives in SC collaborations has been proved to be a leading factor for both financial and environmental performance of companies (Ramanathan et al., 2014; Sarkis et al., 2011).

2.2. Operations and economic performance of sustainable supply chain

For measuring the operational and economic performance of sustainable SCs, a variety of measures have been proposed in the literature. Table 1 summarizes these measures. It can be seen that cost, time, quality, delivery, flexibility and technological capability are the most commonly used measures. For example, Beske et al., (2015) report Cost-benefit analysis, Economic input-output analysis, Financial reporting, Risk analysis, SCOR framework and ISO 9001 as the most popularly used techniques and tools for economic performance measurement of sustainable SCs.

Table 1: Operational and economic performance of sustainable supply chains

Author	**Measure**
Gunasekaran, et al. (2004)	Quality; Speed; Cost Dependability; and Flexibility
Shepherd and Gunter (2006)	Cost; Time; Quality; Flexibility; and Innovation
Ashby et al. (2012)	Cost; Quality; and Delivery
Govindan, Khodaverdi, and Jafarian (2013)	Costs, Delivery reliability, Quality, Technology Capability

Brandenburg et al. (2014)	Cost; Profitability Or Revenue; Gross Domestic Product; Growth Rate; Labor Productivity, Market Concentration, Or Import Dependency Overall Macro-Economic Development
Varsei et al. (2014)	Supply Chain Cost; Service Level; Economic total supply chain cost
Beske et al. (2015)	Cost; Time; Quality; Flexibility; Innovation; Turnover Per Year; Cost Reduction Per Product
Ahi and Searcy (2015)	Risk and recoverability; Returning Customers Ratio; Cash Flow provided by Operating Activities; Cooperation Degree; Profit; Market Share; Sales; Existing Efficiency Vs. Cost Of Upgrading; Increased Cost Efficiency; Cost Savings; Operational Performance

2.3. Environmental performance - sustainable supply chain

Table 2 presents the most commonly used indicators for measuring the environmental performance of sustainable SCs. It can be seen that GHG emissions, waste, water, energy conservation, environmental policies, environment-friendly materials and environmental management systems are the most commonly used metrics. For example, Beske et al. (2015) report Life cycle assessment (LCA), Eco-audit, Environmental benchmarking, and Environmental reporting, Design for the environment and Environmental management system (EMS) ISO 14001, EMAS (EMS), ISO 14040 (LCA), and ISO 14064 as most popularly used techniques and tools for environmental performance measurement of sustainable supply chains.

Table 2: Measures of environmental performance

Author	**Measure**
Clemens (2006)	Environmental Policy; Investment In Environmental Responsiveness; Environmental Consciousness
Sarkis (2006)	Water Consumption; Energy Usage; Organics Emitted; Sludge Emitted By Facility
Vachon and Klassen (2008)	Solid Waste Disposal; Air Emission; Water Emissions
Vachon and Mao (2008)	Waste Recycling Rate; Energy Efficiency; GHG Emissions; Environmental Innovation
Ashby et al. (2012)	Environmental Management; Design For The Environment; Green Purchasing; Reverse Logistics; Recycling, Reuse And Remanufacturing
Awasthi, Chauhan and Goyal (2010)	Environment-friendly technology, environment-friendly materials, green market share, partnership with green organizations, management commitment to green practices, adherence to environmental policies, involvement in green projects, staff training, lean process planning, design for environment, environmental certification, and pollution control initiatives

Govindan, Khodaverdi, and Jafarian (2013)	Pollution production, Resource consumption, Eco-design, Environmental management system
Varsei et al. (2014)	Environmental GHG emissions, water usage, energy consumption, waste generation, the use of hazardous and toxic substances
Brandenburg et al. (2014)	Renewable Energy Sources; Natural Resources, Water And Energy Consumption, Water Quality, Factors Focus On Waste And Pollution Impacts
Ahi and Searcy (2015)	Environmental Costs; Buying Environmentally Friendly Materials; Environmental Social Concerns; Cooperation with Customers for Green Packaging; Risk of Severe Accidents; Environmental Risks; LCA; Cumulative Energy Demand; Energy Requirement Per Unit; Global Warming Contribution Per Unit; Energy Efficiency; Recycling Efficiency; Process Optimization For Waste Reduction; Optimization of Process To Reduce Air Emissions
Beske et al. (2015)	Air Emissions; Energy Use; GHG Emission; Energy Consumption; Recycling; Solid Waste; Flexibility; Environmental Management System; Carbon Footprint; LCA; Water Consumption; Waste Production Per Unit Output; CO2 Emissions Per Ton; Land Use In Hectares

2.4. Collaborative/partnership performance- sustainable supply chain

The positive impact of collaboration on sustainable SC performance has been reported by several authors (Soosay and Hyland 2015; Theißen et al., 2014; Van Hoof and Thiell 2014; Albino et al., 2012; Green et al. 2012; Vachon 2007; Skjoett-Larsen and Andresen, 2003; Yan, Chien and Yang 2016; Chin, Tat and Sulaiman 2015; Vachon and Klassen, 2006; 2008; Verdecho, Alfaro-Saiz and Rodríguez-Rodríguez, 2010; Nanako and Hirao, 2011; Ramanathan, et al., 2014). Beske and Seuring (2014) identify four key elements of collaboration that can affect sustainability as enhanced communication, logistic integration, technological integration, and joint development. Burgess et al., (2006), Bowen, et al., (2001), Koufteros et al., (2007) emphasize the effect of joint product design on sustainability. Skjoett-Larsen, Thernøe and Andresen (2003), Carter and Carter (1998), Yan, Chien and Yang (2016) emphasize on direct involvement of a company with its suppliers and customers in planning and forecasting. Vachon and Klassen, (2008a) and Chin et al. (2015) focus on "environmental collaboration" or the direct involvement of an organization with its suppliers and customers in planning jointly for environmental solutions. Bowen, et al. (2001), Koufteros, Cheng, and Lai (2007), Carter and Carter (1998) emphasize on environmental collaboration to reduce

the environmental impact associated with material flows in the SC. Benjaafar, Li and Daskin (2013) investigated the incentives and SC collaboration impacts on cost and CO_2 emissions. Collectively, it is possible to say that collaboration and sustainability are two-well researched topics but not many research studies combined these two concepts using empirical evidence from global companies.

2.5. Underpinning theories supporting supply chain collaboration

In the literature, there are many theories used in the context of SCC. Especially, Resource Based View (Wernerfelt, 1984) and Resource Dependency Theory (Harland, 1996) have been considered widely to explain the collaborative arrangements among the partners in case of sharing their tangible and intangible resources (Sarkis et al., 2011). In this research, we are using the Agency Theory (Eisenhardt, 1989) to support our research objective. This theory considers the risks involved in collaborative relationships and involvement of agents to resolve the issues (Jensen and Meckling, 1976; Fama and Jensen, 1983). It is clear from the literature that the strength of the collaborative relationship is based on the selection of agents; namely, suppliers, clients and logistics partners. It is also believed that these agents can help to improve the overall performance of the company. However, it is not clear from the literature how the selection of SC partners (agents) improves the strength of collaborative relationship to achieve financial and environmental performance.

Our study addresses this gap in the literature using the context of triple bottom line. Triple bottom line is a three-dimensional performance measure for companies in the 21st century to measure social, environmental and financial performance. By measuring triple bottom line, businesses can decide whether they need to consider all of these three seriously. Our research probes this aspect of triple bottom line in the context of collaborative SCs that strive to achieve sustainability.

3. Research design

In this research, to understand sustainability-oriented collaboration better, we use a qualitative research method. First, we use semi-structured interviews with established businesses to understand the current status of the collaboration. We considered interviewing CEOs, Operations managers and Business Relationship managers of the companies. Information from the companies is instrumental in developing the initial conceptual model. And we use case company background and excerpts of interviews to

build our conceptual model on sustainable SC collaboration in the next stage of our research.

For the purpose of interview, we have contacted businesses from different industries from the UK, India, Italy and Canada. This approach has helped us to understand the role of collaboration in businesses around the globe. Some companies collaborate mainly to improve overall performance with primary focus on profit earning; while other companies show interests in sustainable operations. We have chosen two individual companies and one SC from a list of six, who seek collaborating partners with focus on sustainable operations to maintain sustainable SCs within their businesses (see Table 3). These cases represent three main industries, namely Fresh Food, Fashion (includes Fast fashion) and IT. All these three industries have very different SC networks due to their varied nature of carrying out business. All three companies considered in this research paper are different in their operations but they all are having a common objective to achieve sustainability goals set by their global partners.

Table 3 reports the focus of collaboration of the selected case companies. Fast fashion represents companies with very short lead-times and short product life cycles. As Fisher (1997) correctly identified, the fashion industry is highly innovative and hence their product life cycles are very short compared to many basic products. It is interesting to note that sustainable operations are one of the key focuses when selecting collaborating partners, but all operations are not included in this process. For example, timely delivery of goods needs collaborative partners' support of fashion companies, but this is not the case for IT companies dealing with software developers. Although forecast accuracy has been claimed as an important reason for collaboration in the food industry (Ramanathan and Muyldermans, 2010), it is not found as the main focus of collaboration for most the companies that we interviewed, except the fashion company.

Table 3: Case companies' focus of collaboration

	Purpose of collaboration									
Case companies	Sustainable operations	General operations	Technology	Cost	Timely delivery	Quality	Performance	New opportunities	Forecast accuracy	Market positioning
Case-1 Fast fashion	Co-ordinated delivery and waste reduction	Order and delivery	Technology for orders and tracking	Control cost	Get market information for new product planning	Meeting market standard	Follow market trend	Joint ventures and new products	Predict the market for new trend	Create brand image
Case-2 IT	Recyclable accessories	Only projects delivery	Highly technology dependent	Control cost	---	Meeting clients' expectations	Balance time, quality and cost	Find new clients	---	High number of projects with reputed clients
Case-3 Fresh food supply chains	Food waste avoidance and handling	Sales and distribution	Minimum technology use for orders	Control cost	Sell before value erosion	Sell quality products and avoid waste	Sell all products before it loses value	Find new channels to sell	Avoid supply-demand mismatch	Product availability

Also, we have searched through extant academic literature and business magazines to develop a better understanding of the current forms of collaborative partnerships in various industries. From the extant literature review and current practices of the collaboration prevailing in the industry, we first plan to develop a conceptual model of 21st century collaboration for enhancing sustainability in business organizations. Furthermore, we will validate our conceptual model through the data collected from the case companies (both interviews and public data) and content analysis of interviews. A brief case description of three of the case companies is given below. Primary purposes of these cases are to understand the current practices of collaboration to maintain sustainability within their routine operations and SCs.

3.1. Case descriptions

Case 1*: *Fashion Company

Fashion SME Company operating from the United Kingdom is an established Jeweller with 38 years' experience in the industry. The company has just ten full time employees with an annual turnover of about 2 million pounds. This Fashion SME Company is classified mainly as a retail manufacturer for special customised jewellery. The term retail manufacturing represents production for retail market. Fashion Company also sells through their franchise companies.

The current collaborative arrangement with their suppliers is mainly for raw-material supply and design development. For every new order from the customer, the company contacts their suppliers for the unique materials and design. The designers are treated as part-time employees and are paid for each project. Fashion SME maintains a collaboration with several designers and dedicate specialised jobs to the right design supplier in response to their orders. To maintain the collaborative relationship a specific minimum number of jobs (as low as 5) are allocated to each designer throughout the year. The company uses the suppliers' logistics operators to get the items delivered from the suppliers. The final finished product is either collected by the customers from the production plant or the same is delivered to the customer's address upon their choice of delivery.

The Fashion SME Company sells the product directly to customers on online orders placed in store and over the phone. Also, the company gets support from the marketing

of Franchise companies. Space at highly reputed local jewellers is being used by the Fashion Company to display their products. The attracted customers will place their orders through the Franchise companies. Here, it is crucial for the Fashion Company to maintain a high level of collaboration with the clients to foster a high volume of orders. To achieve an increase in sales the company introduces new designs very frequently with support from the suppliers.

Case 2: Information Technology Company

Information Technology (IT) Company is operating from various European countries namely Italy, Germany, Switzerland, Norway, Spain, Finland and the UK. IT Company provides services as products for its clients and has done so for the past 12 years. It operates with 75 employees for an annual turnover of 35 million pounds. IT Company produces bespoke products and services for their clients. Sometimes, IT Company also works with their Franchise companies for new business projects. Unlike other industries, IT Company does not need much support from logistics operators but it requires a high level of involvement from IT skill workers at other companies. This company feels that the collaboration will help them to achieve sustainable IT performance in a competitive market. Accordingly, most of their projects involve two to three companies specialising in different programming skills such as Java, C++ and others. For IT company collaboration is perceived as a tool for sustainable business in terms of a financial, rather than green, approach. However, the company is also conscious of its carbon emission and energy usage. For example, in printing, use of cartridge, disposable of cartridge and ink are responsibly handled by the company management. The company is also encouraging its customers to sensibly use resources such as papers and printing. Waste disposal of the company also includes the disposal of used computers and other related electronic products. All collaborating partners follow the company's set of practices to dispose of their electrical and electronic equipment waste.

Case 3: Sustainability of fresh food supply chains (involving two different supply chains) – As correctly mentioned by Kleijnen and Van der Vorst (2005) food SC network managing the fresh food SC faces a transition to markets endangering sustainability and the waste. Lack of SC coordination between local growers, wholesalers, and retailers is one of the fundamental causes of wastage and calls for a redesign of SCs that would result in a sustainable reduction of wastage. India is the second largest producer of fruits and

vegetables in the world, and the Indian Government is extremely aggressive in supporting fresh produce as they view this as a way out of poverty and is positively promoting advances in the food SC areas such as cold chain management. The products in fruits and vegetables (F&V) SC are highly perishable with the lifetime of the fresh produce ranging from a few days to weeks.

The F&V SCs in India face many structural challenges. The SC is fragmented and has multiple intermediaries – mainly independent entrepreneurs – which makes the composition of the SC extremely fragile wherein, if one of them fails, the SC does not earn money. Hence there has to be a perfect alignment of incentives. The inefficient food SCs that result in low returns to the farmer, higher consumer prices, limited quantity and low quality, in turn result in increased malnutrition (William Thomson, 2012). Rolle (2006) estimated the post-harvest loss of vegetables and fruits in India at 40% annually. In reality, it has crossed 60% in some places in Chennai, which is a major consumer market in India and hub of organised retail, where we conducted our study. Arivazhagan et al., (2012) confirm this estimate through a focused study on a centralized hub - vegetable wholesale market in a leading metropolitan city in India. They estimated the daily loss of vegetables and fruits at 5-10%.

In our case study we focus on two companies who have adopted the "farm-to-fork" business model to overcome challenges faced by the fresh fruit and vegetable (F & V) SC in India ensuring higher returns to the farmer, competitive prices to the consumer and overall reduced wastage across the SC.

Company 1 is a fruit and vegetable distribution company, currently focussed on fresh produce that employs a hybrid model of directly sourcing (currently at 65%-70% near farm sourced) from farmers with small-holdings and partnering with produce-specific value chain companies. This company sources fruits and vegetables from farmers and aggregators and sells through multiple distribution channels which include small local shops and retail outlets through their brand. They also partner with hotels, restaurants, and catering establishments to deliver quality fresh produce. The company has entered into partnerships with the government and private organisations to add value to the farming fraternity by sharing information on cleaner cultivation practices, achieving better grade and higher yields, and extending financial support whenever and wherever

necessary. The company also partners with small-scale entrepreneurs, who are operationally well networked by investing in working capital, helping them create a brand and selling the product through their retail outlets. The company views themselves as a modern version of intermediaries where there is re-intermediation of material, financial and information flows, a model which is similar to that of Henry Ford in manufacturing cars several decades ago. The success of this model is attributed to careful partner selection, collaborative arrangements and alignment of sustainable goals through alignment of incentives and value.

Company 2 is a very young (founded in 2014) social enterprise. The retail format is predominantly an online grocery with an objective to deliver fresh farm vegetables to consumers. They source local vegetables directly from farmers and non-local vegetables from the local marketplace. They have partnered with a small IT solutions firm in developing software, which enables consumers to place orders online, thus providing greater transparency and increasing efficiency of the SC. The business logistics model adopted by the company is a hub-and-spoke model. Directly sourced vegetables (farm fresh) in the hub village come to a hub located in the city and are delivered to other areas in the city. As there are no intermediaries, the farmer's margins are higher, and at the consumer end, they are not only able to ensure competitive prices but also ensure good quality. The company employs part-time delivery personnel who wish to augment their day job income. This model contributes to their economic goals through increasing margins for farmers and reduced prices for consumers; environmental goals by promoting organic produce and reducing wastage at retailers end; and finally social goals by viewing the business as a social venture and aligning the same to the corporate social responsibility objectives of the company. With regards to sustainability, the company follows low-food mileage, and uses sustainable packaging material.

3.2. Questionnaire survey

We have used the findings of the case studies in the next stage of the research to develop a questionnaire survey**.** This questionnaire has been distributed via online platform in four different countries. We have restricted the number of responses from each business organisation to avoid any bias. We have allowed only one response from each organisation. We have obtained 79 usable responses. Data description and data analysis are further explained in section 5.

4. Cases analysis and development of hypotheses

In this research, we use a qualitative semi-structured interview approach to understand various green operations in practice. This approach is mainly used to enhance understanding of sustainability in different industrial set-ups under the lens of collaboration. We have conducted in-depth interviews with three global companies operating in food, fashion and technology areas. A brief description of three companies has been provided in the previous section.

Our interview questions focused on nine main criteria; namely, supplier relationship, client/buyer relationship, logistics/skills partnerships, internal support within the organisation, external pressure, information-sharing, impact of collaboration in business performance, partnership performance and overall performance. These nine criteria considered from the interview transcript analysis, were further analysed to understand the common practices of selecting collaborating partners (supply-side, buyers-side and logistics) to achieve sustainable performance. We thematically coded these transcripts. Based on Kappa statistics, one of these criteria (client relationship) was dropped from the further analysis due to its non-significant role within the current research objectives. Internal and external pressures have also been considered as a single theme as suggested by the case companies. Table 4 represents the final seven themes considered for further research and the same was adopted to develop the questionnaire.

Table 4: Research themes emerging from case studies

Theme 1- Partner selection	Supplier selection; Client/Buyer selection; Logistics partner selection
Theme 2 - Support	Inter and intra- organisation; Partners – suppliers, buyers and logistics; Local and central government; Other stakeholders
Theme 3 - Pressure	Internal pressure; External pressure; Local and central government; Other stakeholders
Theme 4 – Decision making	Information quality; transparency; speed; forecast accuracy
Theme 5 - Business performance	Economic, social and environmental performance

Theme 6 - Partnership performance	Long-term, new collaborations, achieving green objectives, new businesses plans
Theme 7 – Green partnership	Investment, commitment, incentives, and control

From the analysis of interview data, we understand the basic differences between green operations specific to the fashion industry, IT and food. While both fashion and technology companies are highly dynamic in nature, they have a separate set of green operations based on clients' expectations. For example, fashion jewellers use latest manufacturing technology in production process to reduce waste and increase precision, IT manufacturing company uses tight control in the supply side of operations, to reduce waste and increase sustainability. From the focal company studies, we could clearly understand the input of collaboration strength and expected outputs in SC collaboration for sustainability.

Input - Supplier, buyers, logistics and skills selection in collaboration

Product quality, service quality, sustainable operations and reliability of suppliers are main criteria used by both IT and Fashion Companies while selecting suppliers for collaborative partnership. Interestingly, in global operations the location of suppliers has not been considered seriously by both the companies. Although cost is one of the minor criteria for supplier selection in IT Company, this is not considered seriously by both IT and Fashion Companies. It is argued that reliability of supplier will guarantee the cost of supply and hence there is no need for further cost negotiations in collaborative partnership.

"Cost is not a big issue while selecting our suppliers. We give immense importance for reliability, quality and trust-worthiness of the suppliers. 60% percent of our suppliers are doing business with us for more than five years."

In any business, buyers or clients are considered the soul of success. In dynamic business environment, it is also possible to target some special buyers who can take the business further to different heights. This dynamism is evident from both IT and Fashion companies that buyers are normally chosen based on the location of operations, price they are ready to pay, demand and number of orders. Another important criterion of buyer/client selection in collaborative relationships is loyalty of the buyers and their retention rate (Ramanathan and Muyldermans, 2010). It is important to note that buyers'

interest in sustainability has a great impact on core operations of the focal companies (both IT and Fashion Companies).

Logistical and skilled partner selection is another important feature in a dynamic business environment. Logistical collaborating partners guarantee service quality and 'on-time' delivery with added cost effectiveness. For example, the skilled partners in food SCs use the latest technologies to maintain sustainable operations keeping fruits and vegetables fresh. Also, the skilled partners help developing trust among SCs, hence increasing mutual dependability for developing new products.

Output – Business partnership, economic and environmental performance

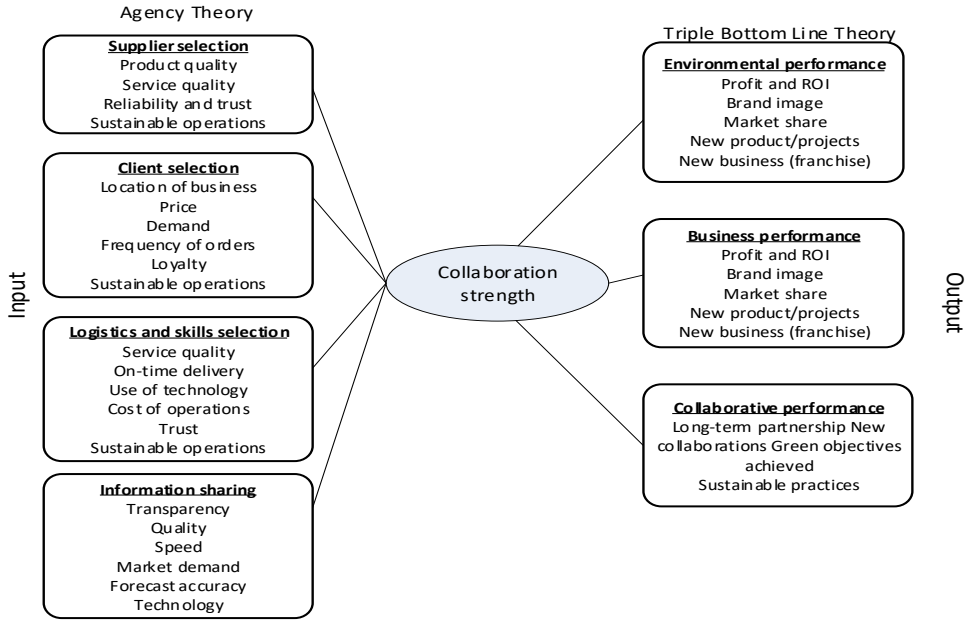
Collaboration benefits the parties involved in many ways. Transparency, quality and speed of information sharing are found useful attributes of many collaborative relationships (Ramanathan and Muyldermans, 2010; Forslund and Jonsson, 2007). Fashion Company claims that open information exchange under a collaborative relationship helps them to be dynamic in view of changing customers' expectations. For IT company, knowledge of latest trends in customer demand and technology advancement are vital to be viable in the market. This is achieved through information from partners that help the company to be sustainable and trendy. In the case of Fashion Company, partnership performance and business performance are almost the same concept as most of their business is happening in franchise and retail stores. For IT Company, clients' growth brings in many new projects and hence partnership strength is increased. For food company collaboration among supply chain network partners is essential to sell products as quickly as possible in the market before they lose perishability and value. In general, SC with long-term partners earn higher profit and achieve win-win opportunity.

4.1. Hypothesis development and Conceptual model

In order to achieve our research objective – the impact of collaboration in businesses - we employ the theoretical lens of Agency Theory and the Triple Bottom Line Theory. We use these two theories to develop our proposed conceptual model depicted in Figure 1, and to develop research hypotheses. This is mainly because all collaborating partners (agents) are instrumental in improving and achieving sustainable SC with the given financial constraints. In recent days with green awareness, all stakeholders (principles) of the company give pressure to exercise sustainability. These sustainability objectives are

directing the focal company in selecting the partners, namely from suppliers, buyers and logistical operators. This concept of partners' selection has become a main notion of our conceptual model. Further background of the case companies has helped us to relate Agency Theory with the conceptual model.

Figure 1: Initial Conceptual model - Collaboration for sustainability



The success of business collaboration is dependent on the parties involved (for example, SC partners and investors) (Ramanathan and Gunasekaran, 2014). We have interviewed companies' high-level officers responsible for sustainable operations. This approach has helped us understand sustainable practices specific to industries and hence strengthen our research framework. Furthermore, this research will indicate the level of collaboration required from each SC player and also within an organisation to achieve the best performance. This result indeed is a new concept that will help the companies to make decisions on collaborative investments, specific to sustainability. Also, this approach will help to choose the right SC partner having similar initiative and interests in sustainability practices (Ramanathan et al., 2014). Here, sustainability practices represent triple bottom line that is one of the focus of suppliers' selection in collaborative relationships.

Based on the above discussions from literature and case studies, we posit two research hypotheses as follows:

H1: Strength of supply chain collaborations will be based on the partners' selection.

H2: Strength of supply chain collaborations will be dependent on the green activities of SC partners.

We will test these hypotheses using the data obtained from various industries from three different countries.

Using content analysis of the interview discussions, we have developed a specific framework to conceptualise our idea of collaborations for sustainability. As given in Figure 2, if a company is interested in achieving sustainability through collaboration, it needs to select suppliers for collaboration based on the previous experience of trust and reliability. It is also important to make sure that the suppliers' product quality and service quality are adequately matched with the expectation of the company. This finding is very much in line with the previous findings that all collaborative relationships will have trust and reliability as underlying principles (Cao and Zhang, 2011; Nyaga et al., 2010). It shows that some factors, such as quality, cost, trust, and reliability, are common in all collaborations with various focuses. Also, for collaborations with focus of sustainability, it is imperative for the companies to focus on sustainable operations. Collaborating companies' sustainable business objectives and current operations will help to choose the right partners (Figure 2).

Buyers' selection for sustainable operations can be done through careful selection based on their location of operations. Frequent placing of orders, demand for the product/service and price paid by the buyers are three main criteria to be considered by collaborating partners. Also, the focal company will need to consider sustainable operations of the buyers. In case of logistics or any other special skills selection, the importance of selection criteria depends on service quality, on-time delivery, use of technology and cost of operations. In all cases, trust and sustainable operations will act as the backbone of selection of suppliers, buyers and logistics/skills operators.

It is interesting to note that the companies are not specifically looking at the level of greenness or sustainability in each of their operations. Partner of Fashion Company correctly mentions:

"*We do not look for sustainability in each of our production operations. We know that the right operation will help us to be sustainable*" (Operations manager).

Both IT and Fashion Companies consider sustainability as an integral part of all operations wherever it is possible. To our surprise, both these companies claim that the

cost of operations is not a very important criterion in selecting collaborating suppliers. It is insisted that:

"*Cost is guaranteed as a basic norm of collaborative relationship. And hence we do not need to negotiate with our suppliers".*

It is clear from the cases analysed that the collaborating partners working as agents for the focal company can help achieve a sustainable collaborative relationship in order to see benefits in terms of transparent information sharing, higher level of business performance and successful collaborative performance. It is also good to know that the level of the outcome of collaboration strength is based on the right choice of collaborating partners. Careful selection of collaborating partners is the key to successful collaboration as the strength of the collaboration is reflected through these three selections - suppliers, buyers and logistics/skills operators.

Another important finding from the case study data analysis is that companies are collaborating with their upstream and downstream partners mainly to improve performance of various functional areas in order to maximise the profit. However, sustainable operations are a basic minimum expectation in any new collaborative relationships to achieve a sustainable SC or to reduce carbon emissions. Especially in this, the 21st century, more and more companies are environmentally conscious. Hence, the sustainable operations are rather a routine and integral part of operations, than being an optional criterion. In turn, many collaborative relationships include sustainability with high priority in the list of criteria for partners' selection. Also, the sustainable operations are increasingly becoming a phenomenal attitude of corporate social responsibility (Ramanathan et al., 2014). Based on the above arguments we posit our next three research hypotheses

H3: Collaboration strength will have a direct impact on environmental performance

H4: Collaboration strength will have a direct impact on financial performance

H5: The higher the environmental and financial performance, the higher the partnership performance

5. Data description and data analysis

We developed the questionnaire based on the case study and conceptual model. Our questionnaire included 50 questions. Each question was devised to make a choice from

five options. We used the five-point Likert scale, representing the choices from strongly disagree to strongly agree. This questionnaire also included a few questions on company and respondents' details. The fully developed questionnaire was further peer reviewed by six academics and professionals. We used an online survey tool called '*Qualtrics*' to distribute our survey questionnaire. The data collected through Qualtrics has been used for our analysis. With support from the Charted Institute of Logistics and Transport (CILT) and other business networks, we obtained business contacts. Accordingly, the survey questionnaire was sent to 350 respondents via email links. Ther number of usable responses was 79 (response rate of 22.5%). As the respondents are top level managers – Associate General Manager, Project Managers, Operations Manager and Retail Manager, from industries such as Fashion, Packaging, IT and Retail, this sample represents the actual population of the study (Kruskal, and Mosteller, 1980). Only one response was allowed from each company to avoid bias. To check non-response bias we used a chi-square difference test on some of the characteristics of early and late respondents (Armstrong and Overton, 1977). If a non-significant difference between the two types of respondents existed, we concluded that there was no systematic bias in the data. We conducted a t-test to compare the early (first 25%) and late respondents (last 25%) with regard to environmental performance, supplier selection, and information sharing. The results of the t-tests showed no statistically significant differences (p values ranged from 0.18 to 0.96).

Confirmatory factor analysis (CFA) was used to test the reliability and validity of the measures. Iterative modifications were undertaken by dropping items with loadings less than 0.6 (Beheregarai Finger et al., 2014; Cao and Zhang, 2011). In all cases where dropping was indicated, items were deleted if such exclusion did not affect the underlying meaning of the measure and the deletions were undertaken one at each step (Hair et al., 2006). Model modifications were continued until all parameter estimates and model fits were judged to be satisfactory. Table 5 shows the standardised factor loadings for the retained items. The measurement validation was ascertained by evaluating unidimensionality, reliability, and validity (both convergent and discriminant).

Tests for unidimensionality indicated that the standardised factor loadings associated with the constructs were statistically significant (for all items of Table 5 the $p < .001$) (Devaraj et al., 2007). As shown in Table 5, all the included items had standardised factor loadings

between 0.60 and 0.92. This provides evidence for the reliability of the individual items (Rosenzweig, 2009). Moreover, all the constructs exceeded the acceptable minimum for Cronbach's alpha of 0.60, implying that they were internally consistent (Hair et al., 2006). We offer evidence of convergent validity in three ways. First, all items shown in Table 5 load positively and significantly on their respective constructs (for all items $p<.001$) (Rosenzweig, 2009). Second, as also reported in Table 5, all the constructs exhibit a composite reliability index (CR) of 0.75 or higher, thus exceeding the threshold value of 0.7 (Hair et al., 2006). Finally, the average variance extracted (AVE) of all the constructs easily exceeded the threshold value of 0.5 (Chin, 1998). Moreover, the AVE was also used to evaluate discriminant validity (Chin, 1998; Rosenzweig, 2009). The square root of the AVE for each construct is greater than all other cross-correlations (Table 6); this provides evidence for the distinctiveness of the constructs.

Finally, we checked for the existence of the systematic error variance because this study used perceptual data obtained from a single respondent within a single company (Rosenzweig, 2009). In fact, the reported data for both independent (*supplier selection, logistics selection, information sharing, organisation support, green commitment, green awareness*) and dependent (*environmental performance, financial performance and partnership performance*) constructs from a single respondent may have common method bias that inflates the observed relationships among constructs (Kim, 2014). We conducted a post hoc test of the data, *Harman's single-factor* test (Podsakoff et al., 2003), in order to evaluate whether common method influences our empirical findings. Harman's one-factor test is used to determine whether a model with a single factor that includes all the items accounts for the majority of the variance (McFarlin and Sweeney, 1992). The test reports very poor fit with the data, thus indicating that common method bias is not a serious threat to our findings.

Table 5: Descriptive analysis

Factors and items	**Std. Load.**	**AVE**	**CR**	**Cronbach's alpha**
Supplier selection		0.64	0.87	0.814
Product/service quality	.799			
Timely service	.905			
Cost of product/service	.687			
Reliability	.815			
Logistics selection		0.66	0.89	0.716
intact delivery of goods	.929			
on-time delivery	.897			
latest technology	.601			

Information sharing Quality of information Speed of information Transparent information	 .729 .852 .837	0.65	0.88	0.733
Organisation support sustainable operations sustainable business objectives NBD follow sustainable practices set of environmental policies	 .767 .829 .829 .863	0.67	0.81	0.839
Green commitment Sustainable operations need investment We get incentive in terms of profit Control over other SC partners in greenness is difficult	 .765 .764 .759	0.58	0.76	0.631
Green awareness Our firm chooses suppliers with environmentally sustainable operations Our firm is interested in clients/buyers who practice sustainable operations Our firm chooses logistics who practice green/sustainable operations	 .893 .881 .885	0.78	0.91	0.862
Environmental performance Increased orders from customers with green awareness Showcase social awareness for green Achieving green objectives	 0.777 0.809 0.854	0.66	0.89	0.745
Financial performance Our profit has increased in the last five years Our operational cost has reduced in the last five years We have increased our return on investment (ROI) in the last five years Our market share has increased over the last five years We get increased numbers of orders in the last five years	 .813 .739 .859 .831 .792	0.65	0.88	0.865
Partnership performance Our firm makes accurate forecasts Our organisation has improved in (NPD) We gained reputation We will have long-term partnership with current partners We will have new collaborative plans We get new businesses through collaboration	 .625 .819 .804 .713 .819 .780	0.58	0.75	0.854

Table 6: Correlation matrix

	SSelection	LSelection	InfSharing	Intsupport	Greenteam	Greencommitt	EcoPerf	Envrperf	Partperf
SSelection	**0.80**[a]								
LSelection	.669**[b]	**0.81**							
InfSharing	.548**	.470**	**0.80**						
Intsupport	.434**	.555**	.422**	**0.82**					
Greenaware	.322**	.444**	.433**	.675**	**0.77**				
Greencommitt	.294**	.371**	.457**	.418**	.316**	**0.88**			
EcoPerf	.391**	.461**	.516**	.496**	.379**	.440**	**0.81**		
Envrperf	.420**	.500**	.495**	.699**	.668**	.419**	.499**	**0.80**	
Partperf	.545**	.657**	.605**	.673**	.541**	.515**	.616**	.667**	**0.76**

[a] The square root of the AVE is shown in bold in the diagonal

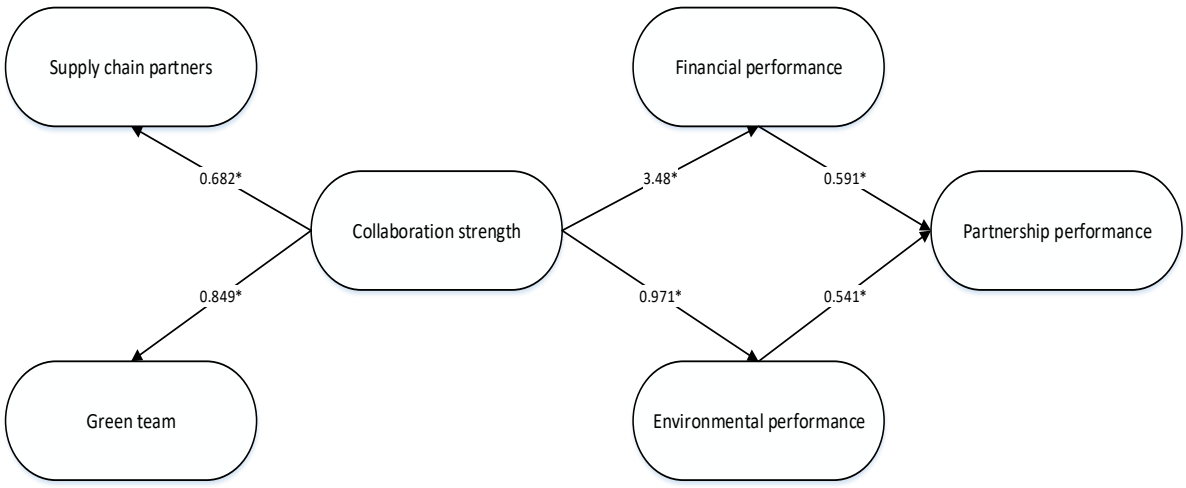
[b] The correlations and descriptive statistics refer to the average of the items reflecting each construct

**Correlation is significant at the 0.01 level (2-tailed)

We follow Anderson and Gerbing's (1988) two stage model approach. We used Amos version 23 for path analysis and developing the structural model. Accordingly, we first developed a measurement model to confirm the factors and their covariance relationships. The overall model shows good fit indices ($\chi 2/df$ = 1.70; CFI = 0.91; NNFI = 0.93; RMSEA = 0.064: RMR standardised 0.068) according to the recommendations provided by the literature (Byrne and Stewart, 2006; Hair et al., 2006; Hu et al., 1992). The path coefficient between collaboration strength and partner selection was significant with value 0.682 and path-coefficient between collaboration strength and green partners was also significant with value 0.844. These two significant paths prove the first two research hypotheses (H1 and H2) that collaboration strength is based on partners' selection and green team.

Similarly, the path coefficient of all other paths defined in the hypothesized model are significant and positive. It confirms that the collaborative strength of the SC decides the environmental and economic performances of the SCs significantly and positively. This proves our next two hypotheses H3 and H4. The final hypotheses H5 expresses the partnership performance as positive and as a significant cause of good environmental and economic performance of the collaborating partners. Figure 2 represents the structural equation model with coefficient values of the paths we tested.

Figure 2: Complete structural model of green collaboration



* represents p < 0.01

6. Discussions

Recently many researchers have discussed collaborative relationships (mainly trust and long-term partnership) and their impact on performance mainly focusing on those factors of collaboration which impact the businesses success (Ramanathan and Gunasekaran, 2014; Cao and Zhang, 2011; Nyaga et al., 2010; Ramanathan and Muyldermans, 2010). Our study is an extension of previous research, since we focus on the other side of collaboration, namely partners' selection. We investigate the suppliers' involvement in collaborative partnerships for green sustainability. Moreover, we see how this collaboration is impacting three main areas; financial performance, environmental performance and overall partnership performance, both directly and indirectly. By using case study observations from three global companies and also data from the questionnaire survey, we found three main results. Firstly, our results pointed out that collaboration strength, for innovative and sustainable operations, is based on partners' selection and green team. This finding suggests that choosing the right SC partners that have similar initiatives and interests in sustainability practices increases the strength of the collaboration. Secondly, we found that the collaborative strength of the SC positively affected the environmental and economic performances of the SC. This result supports the idea that companies collaborate with their partners (both upstream and downstream) mainly to improve performance by maximising their profit. Moreover, collaborating with the supplier allows companies to achieve green objectives, thus, improving their environmental performance. Finally, our results showed that having good environmental and economic performance increases the partnership performance.

Through the aforementioned findings, our paper contributes to the literature that studies SC collaboration for environmental sustainability purpose in several ways. Firstly, SCC for green sustainability is an emerging area of research and although collaboration is highly encouraged in global SCs, understanding of the importance of green operations in production and distribution are not valued by all SC partners in the same way. This requires a great level of support or internal commitment (Ramanathan and Gunasekaran, 2014) and mainly green awareness among participating members. In this study, we based our argument of collaboration strength on these points and further developed the collaboration strength in different areas such as financial and environmental performance. As our findings showed, if participating members are helping with the current performance, then future partnership will be envisioned. Moreover, the SC partners' selection plays a great role in achieving sustainability; if all SC partners are part of the sustainability, then the performance can be multiplied in a different arena.

Secondly, we developed our research hypotheses and the conceptual model based on the Agency theory and the Triple Bottom Line theory. It is evident from the case studies that both these theories support each other in sustainable SC collaborations. Achieving environmental sustainability in SCs especially with global players, requires involvement of all stakeholders and their commitment (Ramanathan and Gunasekaran, 2014). The SC partners are taking the role of agents in operationalising the sustainability practices to ensure satisfactory overall performance. However, the SC partners' selection is the main ingredient of success in SC collaborations focusing on sustainability. The suppliers who understand the triple bottom line approach of the operations in their business will make a perfect match for collaboration with sustainability on the agenda. Specifically, the businesses operating on a global platform need to consider their SC partners and their commitment towards sustainability seriously. For example, many suppliers of Nike brand are not located in the USA but they are part of product development, manufacturing and sales. This very basic concept of globalisation puts pressure on global companies to consider sustainable suppliers' selection in their strategic decision-making process alongside other attributes such as quality and cost. The traditional way of classifying companies based on cost, quality and responsiveness may no longer be sufficient and it is also equally important to consider the companies' involvement in environmental sustainability. This is one of the important contributions of this paper.

Finally, according to our research findings, it is clear that support and collaboration from carefully chosen green SC partners will support overall performance. Here, performance represents both business performance (in terms of projects and profits) and environmental performance (in terms of environmental sustainability). This result is in line with other previous research (Ramanathan and Gunasekaran, 2014; Cao and Zhang, 2011). But, additional insights from our research insist that appropriate partners' selection, such as suppliers and logistics providers willing to facilitate transparent information, will increase the strength of the collaboration to achieve sustainable operations. If the partners get organisation support, their involvement in green operations will be a highly inclusive approach with commitment. However, it is important for the companies to have awareness in green operations and technologies to support operationalising the green objectives. A successful collaboration can help enhance three positive outcomes; namely, transparency in relationship, business performance and collaborative performance. As Agency Theory suggests that all collaborating partners

will support each other in handling issues, provided the partners' selection is carefully done to support the core objective of partnerships. In summary, it is possible to say that the success of any collaborative partnership (with sustainable focus) will be expressed through improved performances in both business and environmental areas.

7. Conclusion, limitation and future research

The results of this study present some implications for managers who engage in SC collaborations within the scope of sustainability. Firstly, any company planning to achieve sustainability will need careful consideration of partners' selection. Our research model will guide them through this process and will also highlight the important areas to be considered seriously before making any future collaborative plans. Moreover, based on the collaborative partners' suitability and their criticality in collaboration formation, organizations can invest resources wisely to improve the sustainability performance of all involved bodies. The strategies for duration of collaboration can also be accordingly decided. Additionally, managers aware in sustainable operations have to consider that a collaborative partnership with environmental sustainable focus succeeds through improving of both business and environmental performances.

Previous results should be considered in line with the following limitations. Our research is built on case study interviews and surveys with a few companies operating in three main industries. We have considered only these three global companies for collecting qualitative data. This can be extended to many companies working in the same industry or different industries. Generalising the current research findings will be possible if this research can be extended for many companies operating in a variety of industrial setups. Moreover, multi-group analysis with country specific data will add value to the existing literature. However, our research also has a quantitative survey and we are positive that our findings will support other researchers in testing and validating the conceptual model for different industries. Future research can investigate the social aspects of sustainability in different sectors in the global setting.

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