



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

Journal:	<i>Production Planning &amp; Control</i>
Manuscript ID	SI-TPPC-2018-0330.R1
Manuscript Type:	Research paper for Special Issue
Date Submitted by the Author:	30-Oct-2019
Complete List of Authors:	Ramanathan, Usha; Nottingham Trent University Nottingham Business School, Division of Management Mazzola, Erica; University of Palermo, Mohan, Usha; Indian Institute of Technology Madras, Management Studies Bruccoleri, Manfredi; University of Palermo, Awasthi , Anjali ; Concordia University Garza-Reyes, Jose Arturo; The University of Derby, Centre for Supply Chain Management
Keywords:	collaboration, sustainability, green operations, partners' selection

SCHOLARONE™  
Manuscripts

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

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

1  
2  
3  
4 the partners involved (Ramanathan et al., 2014). Here, business performance refers to  
5 financial, environmental, social and operational performance. In recent years, a huge  
6 number of players in the global supply chain played a great role in paving a collaborative  
7 platform and motivated businesses to collaborate with each other to achieve a win-win  
8 situation. These collaborations also help businesses each other adhere to local sustainable  
9 policies while carrying out business globally. There is a debate within academic literature  
10 and within businesses on the effect that collaborating partners has on achieving  
11 environmental sustainability performance. However, there is no specific framework that  
12 connects environmental performance and business performance through collaborations  
13 among supply chains (SCs). One of the main purposes of this paper is to study the role of  
14 supply chains collaborating partners in achieving environmental sustainability and  
15 business performance. Here, we refer 'sustainability' to green operations practiced in the  
16 businesses. We use 'environmental sustainability', 'green sustainability' and  
17 'sustainability' interchangeably within this article with reference to previous literature.  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27

28  
29 Several supply chain collaboration (SCC) frameworks were suggested in the  
30 literature; namely, vendor managed inventory, quick response, continuous replenishment,  
31 collaborative planning, forecasting and replenishment (Aviv, 2007; Sari, 2008;  
32 Ramanathan and Muyldermans, 2010). However, the success of such collaborations are  
33 dependent on three main factors; namely, the explanatory power of the SC partners, the  
34 speed of supply side operations and internal services (Aviv, 2007). Here it is important to  
35 note that information sharing is one of the keys to the success of business collaborations.  
36 In SC collaborative relationships, participating members will share valuable information,  
37 physical resources - both tangible - such as transport, warehouse, and manufacturing  
38 facilities - and intangible - such as goodwill, patents, knowledge, and experience. In such  
39 collaborations, it is well accepted that the strength of collaboration lies in the involvement  
40 of collaborative partners in planning, execution, and decision-making (Ramanathan and  
41 Gunasekaran 2014). In this line, we first try to understand the sustainability-oriented  
42 collaborative relationship of focal companies through case study observations.  
43 Specifically, through these industrial cases, we will study (i) the relationships of the focal  
44 companies with their suppliers, buyers, logistics and other business partners (ii) the  
45 impact of collaborating partners' selection in the success of collaboration.  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57

58 Nyaga et al. (2010) tested two different perspectives of suppliers and buyers in  
59 collaborative relationships. Authors asserted that the collaboration helped to improve the  
60 performance. They also found buyers value the outcome of the collaborative relationship

1  
2  
3  
4 while suppliers are maintaining this relationship using information sharing. As an  
5 extension to previous research, in this paper, we try to ascertain the impact of such  
6 collaborations specific to sustainability, business performance, and partnership  
7 performance. We consider information sharing as a baseline of collaborative relationships.  
8 Also, due to governmental, stakeholder and organisational pressure, the number of  
9 business collaborations aiming to achieve sustainability objectives is on the rise in the  
10 recent past (Ramanathan et al., 2014). The success of Amazon's business model is partly  
11 related to its business partners and collaboration with logistics providers (Amit and Zott,  
12 2012). Many previous researchers (Aviv, 2007; Nyaga et al., 2010; Ramanathan and  
13 Gunasekaran, 2014; Ramanathan et al., 2014) identified the role of collaboration in  
14 various dimensions such as operational, financial and environmental performance of the  
15 businesses. However, they did not explain how the selection of collaborating partners  
16 affected the sustainability performance, financial performance, and collaboration output.  
17 In this research, we try to fill this gap using three case study company observations from  
18 both developed and developing nations and an industrial survey covering 79 companies  
19 operating globally.  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31

32 We conducted interviews with the case companies' operations/ business managers  
33 to explore the SC collaboration arrangement to achieve sustainability objectives.  
34 Furthermore, we assimilated the knowledge gained from the case studies and the literature  
35 to develop a conceptual model of sustainable SC collaboration with a specific focus on  
36 the selection of suppliers. Also, we used country level data collected from 79 global SC  
37 partners from four different countries to test this conceptual model. Our research makes  
38 two important contributions to the literature. By empirically modelling the SC  
39 collaboration, the model relates the supplier's selection with the strength of the  
40 collaborative partnership. This model reproduces the importance of inter-relation and  
41 sustainable objectives of SC collaborations.  
42  
43  
44  
45  
46  
47  
48

49 The remainder of the paper is organised as follows. First of all, in the following  
50 section, we introduce the research topic using relevant literature and underlying theory.  
51 Then, we explain the research design in Section 3 and explain the cases we observed.  
52 Further interview protocol and case analysis are discussed briefly in section 4. We also  
53 discuss the research hypotheses developed from the case analysis and the conceptual  
54 model in this section. In Section 5, data description and data analysis are considered in  
55 detail. Findings from the analysis are also discussed in detail. In Section 6, we conclude  
56  
57  
58  
59  
60

1  
2  
3  
4 the paper by discussing results and showing contributions to theory and practice with  
5 pathways to future research.  
6  
7  
8

## 9 **2. Research background and underlying theories**

10  
11 To achieve green objectives, businesses seek support from their stakeholders that  
12 strengthens different sustainable operations and also enhances the overall performance  
13 (Ramanathan et al., 2014). In 21<sup>st</sup> century businesses, collaborative relationship can be  
14 established with both upstream and downstream players, and with logistics operators.  
15 Such collaborations will support green SC objectives of the organisations and evolve  
16 some new theories around this area (Sarkis et al., 2011). As we are studying the  
17 collaborative relationship based on selection of suppliers, logistics operators and  
18 buyers/clients, we review some relevant literature specific to the SCC with these  
19 stakeholders for the purpose of achieving green objectives.  
20  
21  
22  
23  
24  
25  
26  
27

### 28 **2.1. Supply chain collaboration – partners' involvement**

29  
30 Supplier selection is a well-established concept in the domain of SCs. In  
31 traditional SCs, the cost, quality, service performance, supplier profile and risk factors  
32 are important criteria for supplier selection (Xinyang et al., 2014). Recent research from  
33 Igarashi et al. (2013) examined the extant literature to suggest a conceptual model for  
34 selecting green suppliers. The authors suggested alignment of supplier selection with the  
35 three most important aspects; namely SC context, process, and tools. The power balance  
36 in the SC, decision and information sharing, and the green agenda have been considered  
37 as important elements in supplier selection.  
38  
39  
40  
41  
42  
43

44 In this competitive business era, customers are the heart and soul of all businesses.  
45 It is not common for all businesses to select their customers; rather customers or clients  
46 will have freedom to choose the right business partners. Client or customer selection is  
47 widely researched in the domain of the services sector (Yu et al., 2015; Cho et al., 2008).  
48 Some businesses aspiring to have sustainable long-term partnerships with clients may  
49 tend to choose their clients based on their business objectives or green objectives  
50 (Ramanathan et al., 2014; Govindan et al., 2015). 'Environmental management systems'  
51 were considered the most effective way of persuading the supplier to implement  
52 greenness in the SCs. Many researchers used fuzzy logic models to select green suppliers  
53 (Govindan et al., 2015). Although a few researchers discussed the role of partners' power  
54 in collaborative forecasting, selection of SC partners was not discussed beyond  
55  
56  
57  
58  
59  
60

1  
2  
3  
4 information sharing and forecasting (Aviv, 2007; Ramanathan and Muyldermans, 2010).  
5 This was due to the fact that today's competitive market makes the SC highly intense with  
6 no opportunity to choose their customers. Empirical research on the client selection is not  
7 commonly available, and hence in this research, we try to ascertain underlying factors of  
8 clients' selection in collaborative relationships using a case study approach.  
9  
10  
11  
12

13 Logistics partners' selection is another important criterion to ensure reliable on-  
14 time delivery in a collaborative relationship. This enhances the long-term partnership.  
15 Many researchers discuss the quality of delivery (without damaging the product) as it  
16 influences the customer satisfaction (Yu et al., 2015; Ramanathan, 2010). However, what  
17 is not well considered in the literature is how this logistics selection plays a key role in  
18 the collaborative partnership. In our research, we see the role of logistics (food and  
19 fashion) and skills selection (IT projects) in a collaborative set up.  
20  
21  
22  
23  
24

25 To summarise, we consider the idea of introducing a new partner besides suppliers,  
26 customers and logistic providers: we could name this "people and skill providers". This  
27 would relate only to service companies, like IT. We also see the outcome of this  
28 collaborative partnership in the performance of businesses. Due to a tremendous increase  
29 in the technology products and software, the 'skills selection' is currently considered a  
30 mandatory procedure in technology projects. For example, if an IT project needs experts  
31 in 'Java programming', they need to look for these specific skills to be involved in the  
32 project. This term 'skills selection' is used by the IT Company as every project needs  
33 different skills and hence partnership selection includes this criterion. We have included  
34 this term in our research based on the interviews conducted with the case companies. This  
35 has been validated by other IT personnel.  
36  
37  
38  
39  
40  
41  
42  
43

44 Transparent information sharing and knowledge sharing have been viewed as two  
45 of the success factors of forecast accuracy in collaborative SCs (Ramanathan and  
46 Muyldermans, 2010; Cai et al., 2013). While the former is very important for improving  
47 SC efficiency and responsiveness, the latter is important for innovation and new product  
48 development. In the recent digital era, knowledge sharing with suppliers, buyers, logistics  
49 providers is as important as information sharing to improve SC green performance.  
50  
51  
52  
53

54 Sharing knowledge and SC information such as quality and speed are considered  
55 to be essential parts of creating collaborative relationships (Forslund and Jonsson, 2007),  
56 while the extent to which the information impacts the routine operations and decision  
57 making of the company will dictate the level and type of information sharing (Larsen, et  
58 al., 2004; Barratt, 2004). The experience of SC partners will play a great role in deciding  
59  
60

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<sub>2</sub> 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 21<sup>st</sup> 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;

1  
2  
3  
4 while other companies show interests in sustainable operations. We have chosen two  
5 individual companies and one SC from a list of six, who seek collaborating partners with  
6 focus on sustainable operations to maintain sustainable SCs within their businesses (see  
7 Table 3). These cases represent three main industries, namely Fresh Food, Fashion  
8 (includes Fast fashion) and IT. All these three industries have very different SC networks  
9 due to their varied nature of carrying out business. All three companies considered in this  
10 research paper are different in their operations but they all are having a common objective  
11 to achieve sustainability goals set by their global partners.  
12  
13  
14  
15  
16  
17

18 Table 3 reports the focus of collaboration of the selected case companies. Fast  
19 fashion represents companies with very short lead-times and short product life cycles. As  
20 Fisher (1997) correctly identified, the fashion industry is highly innovative and hence  
21 their product life cycles are very short compared to many basic products. It is interesting  
22 to note that sustainable operations are one of the key focuses when selecting collaborating  
23 partners, but all operations are not included in this process. For example, timely delivery  
24 of goods needs collaborative partners' support of fashion companies, but this is not the  
25 case for IT companies dealing with software developers. Although forecast accuracy has  
26 been claimed as an important reason for collaboration in the food industry (Ramanathan  
27 and Muyldermans, 2010), it is not found as the main focus of collaboration for most the  
28 companies that we interviewed, except the fashion company.  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

Table 3: Case companies' focus of collaboration

Case companies	Purpose of collaboration									
	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

1  
2  
3  
4 Also, we have searched through extant academic literature and business magazines to  
5 develop a better understanding of the current forms of collaborative partnerships in  
6 various industries. From the extant literature review and current practices of the  
7 collaboration prevailing in the industry, we first plan to develop a conceptual model of  
8 21<sup>st</sup> century collaboration for enhancing sustainability in business organizations.  
9 Furthermore, we will validate our conceptual model through the data collected from the  
10 case companies (both interviews and public data) and content analysis of interviews. A  
11 brief case description of three of the case companies is given below. Primary purposes of  
12 these cases are to understand the current practices of collaboration to maintain  
13 sustainability within their routine operations and SCs.  
14  
15  
16  
17  
18  
19  
20  
21  
22

### 23 **3.1. Case descriptions**

#### 24 ***Case 1: Fashion Company***

25 Fashion SME Company operating from the United Kingdom is an established Jeweller  
26 with 38 years' experience in the industry. The company has just ten full time employees  
27 with an annual turnover of about 2 million pounds. This Fashion SME Company is  
28 classified mainly as a retail manufacturer for special customised jewellery. The term retail  
29 manufacturing represents production for retail market. Fashion Company also sells  
30 through their franchise companies.  
31  
32  
33  
34  
35  
36  
37  
38

39 The current collaborative arrangement with their suppliers is mainly for raw-material  
40 supply and design development. For every new order from the customer, the company  
41 contacts their suppliers for the unique materials and design. The designers are treated as  
42 part-time employees and are paid for each project. Fashion SME maintains a collaboration  
43 with several designers and dedicate specialised jobs to the right design supplier in  
44 response to their orders. To maintain the collaborative relationship a specific minimum  
45 number of jobs (as low as 5) are allocated to each designer throughout the year. The  
46 company uses the suppliers' logistics operators to get the items delivered from the  
47 suppliers. The final finished product is either collected by the customers from the  
48 production plant or the same is delivered to the customer's address upon their choice of  
49 delivery.  
50  
51  
52  
53  
54  
55  
56  
57  
58

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

1  
2  
3  
4 of Franchise companies. Space at highly reputed local jewellers is being used by the  
5 Fashion Company to display their products. The attracted customers will place their  
6 orders through the Franchise companies. Here, it is crucial for the Fashion Company to  
7 maintain a high level of collaboration with the clients to foster a high volume of orders.  
8 To achieve an increase in sales the company introduces new designs very frequently with  
9 support from the suppliers.  
10  
11  
12  
13  
14  
15

### 16 ***Case 2: Information Technology Company***

17 Information Technology (IT) Company is operating from various European countries  
18 namely Italy, Germany, Switzerland, Norway, Spain, Finland and the UK. IT Company  
19 provides services as products for its clients and has done so for the past 12 years. It  
20 operates with 75 employees for an annual turnover of 35 million pounds. IT Company  
21 produces bespoke products and services for their clients. Sometimes, IT Company also  
22 works with their Franchise companies for new business projects. Unlike other industries,  
23 IT Company does not need much support from logistics operators but it requires a high  
24 level of involvement from IT skill workers at other companies. This company feels that  
25 the collaboration will help them to achieve sustainable IT performance in a competitive  
26 market. Accordingly, most of their projects involve two to three companies specialising  
27 in different programming skills such as Java, C++ and others. For IT company  
28 collaboration is perceived as a tool for sustainable business in terms of a financial, rather  
29 than green, approach. However, the company is also conscious of its carbon emission and  
30 energy usage. For example, in printing, use of cartridge, disposable of cartridge and ink  
31 are responsibly handled by the company management. The company is also encouraging  
32 its customers to sensibly use resources such as papers and printing. Waste disposal of the  
33 company also includes the disposal of used computers and other related electronic  
34 products. All collaborating partners follow the company's set of practices to dispose of  
35 their electrical and electronic equipment waste.  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51

52 ***Case 3: Sustainability of fresh food supply chains (involving two different supply***  
53 ***chains)*** – As correctly mentioned by Kleijnen and Van der Vorst (2005) food SC network  
54 managing the fresh food SC faces a transition to markets endangering sustainability and  
55 the waste. Lack of SC coordination between local growers, wholesalers, and retailers is  
56 one of the fundamental causes of wastage and calls for a redesign of SCs that would result  
57 in a sustainable reduction of wastage. India is the second largest producer of fruits and  
58  
59  
60

1  
2  
3  
4 vegetables in the world, and the Indian Government is extremely aggressive in supporting  
5 fresh produce as they view this as a way out of poverty and is positively promoting  
6 advances in the food SC areas such as cold chain management. The products in fruits and  
7 vegetables (F&V) SC are highly perishable with the lifetime of the fresh produce ranging  
8 from a few days to weeks.  
9  
10  
11  
12

13  
14 The F&V SCs in India face many structural challenges. The SC is fragmented and has  
15 multiple intermediaries – mainly independent entrepreneurs – which makes the  
16 composition of the SC extremely fragile wherein, if one of them fails, the SC does not  
17 earn money. Hence there has to be a perfect alignment of incentives. The inefficient food  
18 SCs that result in low returns to the farmer, higher consumer prices, limited quantity and  
19 low quality, in turn result in increased malnutrition (William Thomson, 2012). Rolle  
20 (2006) estimated the post-harvest loss of vegetables and fruits in India at 40% annually.  
21 In reality, it has crossed 60% in some places in Chennai, which is a major consumer  
22 market in India and hub of organised retail, where we conducted our study. Arivazhagan  
23 et al., (2012) confirm this estimate through a focused study on a centralized hub -  
24 vegetable wholesale market in a leading metropolitan city in India. They estimated the  
25 daily loss of vegetables and fruits at 5-10%.  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36

37 In our case study we focus on two companies who have adopted the “farm-to-fork”  
38 business model to overcome challenges faced by the fresh fruit and vegetable (F & V) SC  
39 in India ensuring higher returns to the farmer, competitive prices to the consumer and  
40 overall reduced wastage across the SC.  
41  
42  
43  
44

45 **Company 1** is a fruit and vegetable distribution company, currently focussed on fresh  
46 produce that employs a hybrid model of directly sourcing (currently at 65%-70% near  
47 farm sourced) from farmers with small-holdings and partnering with produce-specific  
48 value chain companies. This company sources fruits and vegetables from farmers and  
49 aggregators and sells through multiple distribution channels which include small local  
50 shops and retail outlets through their brand. They also partner with hotels, restaurants,  
51 and catering establishments to deliver quality fresh produce. The company has entered  
52 into partnerships with the government and private organisations to add value to the  
53 farming fraternity by sharing information on cleaner cultivation practices, achieving  
54 better grade and higher yields, and extending financial support whenever and wherever  
55  
56  
57  
58  
59  
60

1  
2  
3  
4 necessary. The company also partners with small-scale entrepreneurs, who are  
5 operationally well networked by investing in working capital, helping them create a brand  
6 and selling the product through their retail outlets. The company views themselves as a  
7 modern version of intermediaries where there is re-intermediation of material, financial  
8 and information flows, a model which is similar to that of Henry Ford in manufacturing  
9 cars several decades ago. The success of this model is attributed to careful partner  
10 selection, collaborative arrangements and alignment of sustainable goals through  
11 alignment of incentives and value.  
12  
13  
14  
15  
16  
17  
18  
19

20 **Company 2** is a very young (founded in 2014) social enterprise. The retail format is  
21 predominantly an online grocery with an objective to deliver fresh farm vegetables to  
22 consumers. They source local vegetables directly from farmers and non-local vegetables  
23 from the local marketplace. They have partnered with a small IT solutions firm in  
24 developing software, which enables consumers to place orders online, thus providing  
25 greater transparency and increasing efficiency of the SC. The business logistics model  
26 adopted by the company is a hub-and-spoke model. Directly sourced vegetables (farm  
27 fresh) in the hub village come to a hub located in the city and are delivered to other areas  
28 in the city. As there are no intermediaries, the farmer's margins are higher, and at the  
29 consumer end, they are not only able to ensure competitive prices but also ensure good  
30 quality. The company employs part-time delivery personnel who wish to augment their  
31 day job income. This model contributes to their economic goals through increasing  
32 margins for farmers and reduced prices for consumers; environmental goals by promoting  
33 organic produce and reducing wastage at retailers end; and finally social goals by viewing  
34 the business as a social venture and aligning the same to the corporate social responsibility  
35 objectives of the company. With regards to sustainability, the company follows low-food  
36 mileage, and uses sustainable packaging material.  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50

#### 51 **4. Cases analysis and development of hypotheses**

52 In this research, we use a qualitative semi-structured interview approach to understand  
53 various green operations in practice. This approach is mainly used to enhance  
54 understanding of sustainability in different industrial set-ups under the lens of  
55 collaboration. We have conducted in-depth interviews with three global companies  
56 operating in food, fashion and technology areas. A brief description of three companies  
57 has been provided in the previous section.  
58  
59  
60



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

1  
2  
3  
4 technology companies are highly dynamic in nature, they have a separate set of green  
5 operations based on clients' expectations. For example, fashion jewellers use latest  
6 manufacturing technology in production process to reduce waste and increase precision,  
7 IT manufacturing company uses tight control in the supply side of operations, to reduce  
8 waste and increase sustainability. From the focal company studies, we could clearly  
9 understand the input of collaboration strength and expected outputs in SC collaboration  
10 for sustainability.  
11  
12  
13  
14  
15  
16  
17

#### 18 *Input - Supplier, buyers, logistics and skills selection in collaboration*

19 Product quality, service quality, sustainable operations and reliability of suppliers are  
20 main criteria used by both IT and Fashion Companies while selecting suppliers for  
21 collaborative partnership. Interestingly, in global operations the location of suppliers has  
22 not been considered seriously by both the companies. Although cost is one of the minor  
23 criteria for supplier selection in IT Company, this is not considered seriously by both IT  
24 and Fashion Companies. It is argued that reliability of supplier will guarantee the cost of  
25 supply and hence there is no need for further cost negotiations in collaborative partnership.  
26  
27  
28  
29  
30  
31  
32 *“Cost is not a big issue while selecting our suppliers. We give immense importance for*  
33 *reliability, quality and trust-worthiness of the suppliers. 60% percent of our suppliers are*  
34 *doing business with us for more than five years.”*  
35  
36

37 In any business, buyers or clients are considered the soul of success. In dynamic  
38 business environment, it is also possible to target some special buyers who can take the  
39 business further to different heights. This dynamism is evident from both IT and Fashion  
40 companies that buyers are normally chosen based on the location of operations, price they  
41 are ready to pay, demand and number of orders. Another important criterion of  
42 buyer/client selection in collaborative relationships is loyalty of the buyers and their  
43 retention rate (Ramanathan and Muyltermans, 2010). It is important to note that buyers'  
44 interest in sustainability has a great impact on core operations of the focal companies  
45 (both IT and Fashion Companies).  
46  
47  
48  
49  
50  
51

52 Logistical and skilled partner selection is another important feature in a dynamic  
53 business environment. Logistical collaborating partners guarantee service quality and 'on-  
54 time' delivery with added cost effectiveness. For example, the skilled partners in food  
55 SCs use the latest technologies to maintain sustainable operations keeping fruits and  
56 vegetables fresh. Also, the skilled partners help developing trust among SCs, hence  
57 increasing mutual dependability for developing new products.  
58  
59  
60

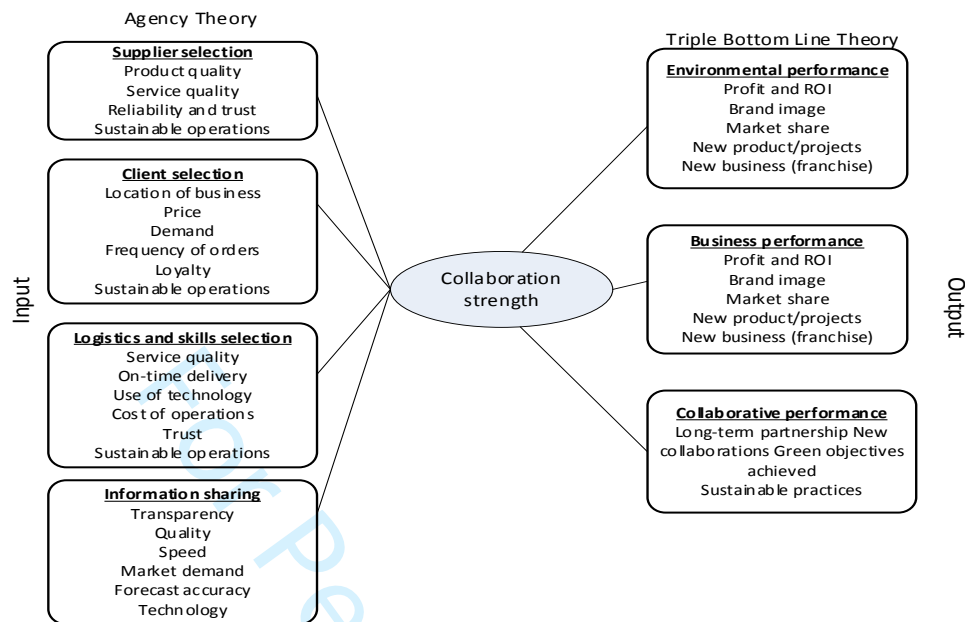
### *Output – Business partnership, economic and environmental performance*

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.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

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

1  
2  
3  
4 to see benefits in terms of transparent information sharing, higher level of business  
5 performance and successful collaborative performance. It is also good to know that the  
6 level of the outcome of collaboration strength is based on the right choice of collaborating  
7 partners. Careful selection of collaborating partners is the key to successful collaboration  
8 as the strength of the collaboration is reflected through these three selections - suppliers,  
9 buyers and logistics/skills operators.  
10  
11  
12  
13

14  
15 Another important finding from the case study data analysis is that companies are  
16 collaborating with their upstream and downstream partners mainly to improve  
17 performance of various functional areas in order to maximise the profit. However,  
18 sustainable operations are a basic minimum expectation in any new collaborative  
19 relationships to achieve a sustainable SC or to reduce carbon emissions. Especially in  
20 this, the 21<sup>st</sup> century, more and more companies are environmentally conscious. Hence,  
21 the sustainable operations are rather a routine and integral part of operations, than being  
22 an optional criterion. In turn, many collaborative relationships include sustainability with  
23 high priority in the list of criteria for partners' selection. Also, the sustainable operations  
24 are increasingly becoming a phenomenal attitude of corporate social responsibility  
25 (Ramanathan et al., 2014). Based on the above arguments we posit our next three research  
26 hypotheses  
27  
28  
29  
30  
31  
32  
33  
34

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

37  
38 **H4: Collaboration strength will have a direct impact on financial**  
39 **performance**

40  
41  
42 **H5: The higher the environmental and financial performance, the higher the**  
43 **partnership performance**  
44  
45  
46  
47

## 48 **5. Data description and data analysis**

49 We developed the questionnaire based on the case study and conceptual model. Our  
50 questionnaire included 50 questions. Each question was devised to make a choice from  
51 five options. We used the five-point Likert scale, representing the choices from strongly  
52 disagree to strongly agree. This questionnaire also included a few questions on company  
53 and respondents' details. The fully developed questionnaire was further peer reviewed by  
54 six academics and professionals. We used an online survey tool called 'Qualtrics' to  
55 distribute our survey questionnaire. The data collected through Qualtrics has been used  
56 for our analysis. With support from the Chartered Institute of Logistics and Transport (CILT)  
57  
58  
59  
60

1  
2  
3  
4 and other business networks, we obtained business contacts. Accordingly, the survey  
5 questionnaire was sent to 350 respondents via email links. The number of usable  
6 responses was 79 (response rate of 22.5%). As the respondents are top level managers –  
7 Associate General Manager, Project Managers, Operations Manager and Retail Manager,  
8 from industries such as Fashion, Packaging, IT and Retail, this sample represents the  
9 actual population of the study (Kruskal, and Mosteller, 1980). Only one response was  
10 allowed from each company to avoid bias. To check non-response bias we used a chi-  
11 square difference test on some of the characteristics of early and late respondents  
12 (Armstrong and Overton, 1977). If a non-significant difference between the two types of  
13 respondents existed, we concluded that there was no systematic bias in the data. We  
14 conducted a t-test to compare the early (first 25%) and late respondents (last 25%) with  
15 regard to environmental performance, supplier selection, and information sharing. The  
16 results of the t-tests showed no statistically significant differences (p values ranged from  
17 0.18 to 0.96).

18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30 Confirmatory factor analysis (CFA) was used to test the reliability and validity of the  
31 measures. Iterative modifications were undertaken by dropping items with loadings less  
32 than 0.6 (Beheregarai Finger et al., 2014; Cao and Zhang, 2011). In all cases where  
33 dropping was indicated, items were deleted if such exclusion did not affect the underlying  
34 meaning of the measure and the deletions were undertaken one at each step (Hair et al.,  
35 2006). Model modifications were continued until all parameter estimates and model fits  
36 were judged to be satisfactory. Table 5 shows the standardised factor loadings for the  
37 retained items. The measurement validation was ascertained by evaluating  
38 unidimensionality, reliability, and validity (both convergent and discriminant).

39  
40  
41  
42  
43  
44  
45  
46  
47 Tests for unidimensionality indicated that the standardised factor loadings associated with  
48 the constructs were statistically significant (for all items of Table 5 the  $p < .001$ ) (Devaraj  
49 et al., 2007). As shown in Table 5, all the included items had standardised factor loadings  
50 between 0.60 and 0.92. This provides evidence for the reliability of the individual items  
51 (Rosenzweig, 2009). Moreover, all the constructs exceeded the acceptable minimum for  
52 Cronbach's alpha of 0.60, implying that they were internally consistent (Hair et al., 2006).  
53 We offer evidence of convergent validity in three ways. First, all items shown in Table 5  
54 load positively and significantly on their respective constructs (for all items  $p < .001$ )  
55 (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
<i>Supplier selection</i>		0.64	0.87	0.814
Product/service quality	.799			
Timely service	.905			
Cost of product/service	.687			
Reliability	.815			
<i>Logistics selection</i>		0.66	0.89	0.716
intact delivery of goods	.929			
on-time delivery	.897			
latest technology	.601			
<i>Information sharing</i>		0.65	0.88	0.733
Quality of information	.729			
Speed of information	.852			
Transparent information	.837			
<i>Organisation support</i>		0.67	0.81	0.839
sustainable operations	.767			
sustainable business objectives	.829			



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

Table 6: Correlation matrix

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

<sup>a</sup> The square root of the AVE is shown in bold in the diagonal

<sup>b</sup> The correlations and descriptive statistics refer to the average of the items reflecting each construct

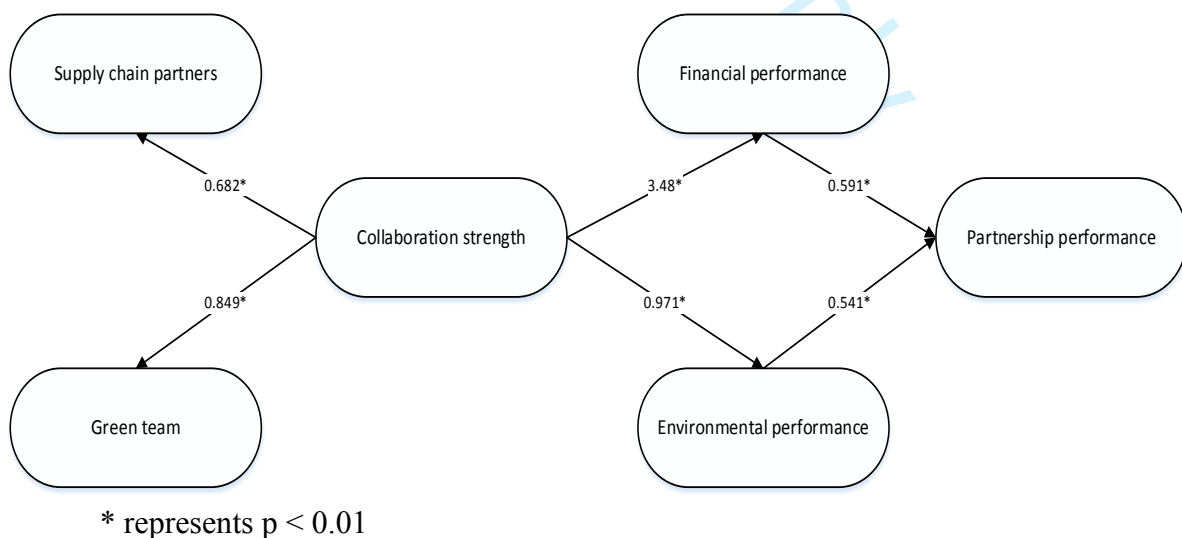
<sup>\*\*</sup>Correlation is significant at the 0.01 level (2-tailed)

Review Only

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



## 6. Discussions

1  
2  
3  
4 Recently many researchers have discussed collaborative relationships (mainly trust and  
5 long-term partnership) and their impact on performance mainly focusing on those factors  
6 of collaboration which impact the businesses success (Ramanathan and Gunasekaran,  
7 2014; Cao and Zhang, 2011; Nyaga et al., 2010; Ramanathan and Muyltermans, 2010).  
8 Our study is an extension of previous research, since we focus on the other side of  
9 collaboration, namely partners' selection. We investigate the suppliers' involvement in  
10 collaborative partnerships for green sustainability. Moreover, we see how this  
11 collaboration is impacting three main areas; financial performance, environmental  
12 performance and overall partnership performance, both directly and indirectly. By using  
13 case study observations from three global companies and also data from the questionnaire  
14 survey, we found three main results. Firstly, our results pointed out that collaboration  
15 strength, for innovative and sustainable operations, is based on partners' selection and  
16 green team. This finding suggests that choosing the right SC partners that have similar  
17 initiatives and interests in sustainability practices increases the strength of the  
18 collaboration. Secondly, we found that the collaborative strength of the SC positively  
19 affected the environmental and economic performances of the SC. This result supports  
20 the idea that companies collaborate with their partners (both upstream and downstream)  
21 mainly to improve performance by maximising their profit. Moreover, collaborating with  
22 the supplier allows companies to achieve green objectives, thus, improving their  
23 environmental performance. Finally, our results showed that having good environmental  
24 and economic performance increases the partnership performance.

25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41 Through the aforementioned findings, our paper contributes to the literature that  
42 studies SC collaboration for environmental sustainability purpose in several ways. Firstly,  
43 SCC for green sustainability is an emerging area of research and although collaboration  
44 is highly encouraged in global SCs, understanding of the importance of green operations  
45 in production and distribution are not valued by all SC partners in the same way. This  
46 requires a great level of support or internal commitment (Ramanathan and Gunasekaran,  
47 2014) and mainly green awareness among participating members. In this study, we based  
48 our argument of collaboration strength on these points and further developed the  
49 collaboration strength in different areas such as financial and environmental performance.  
50 As our findings showed, if participating members are helping with the current  
51 performance, then future partnership will be envisioned. Moreover, the SC partners'  
52 selection plays a great role in achieving sustainability; if all SC partners are part of the  
53 sustainability, then the performance can be multiplied in a different arena.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38

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.

39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

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

1  
2  
3  
4 issues, provided the partners' selection is carefully done to support the core objective of  
5 partnerships. In summary, it is possible to say that the success of any collaborative  
6 partnership (with sustainable focus) will be expressed through improved performances in  
7 both business and environmental areas.  
8  
9  
10

## 11 12 13 **7. Conclusion, limitation and future research**

14  
15 The results of this study present some implications for managers who engage in  
16 SC collaborations within the scope of sustainability. Firstly, any company planning to  
17 achieve sustainability will need careful consideration of partners' selection. Our research  
18 model will guide them through this process and will also highlight the important areas to  
19 be considered seriously before making any future collaborative plans. Moreover, based  
20 on the collaborative partners' suitability and their criticality in collaboration formation,  
21 organizations can invest resources wisely to improve the sustainability performance of all  
22 involved bodies. The strategies for duration of collaboration can also be accordingly  
23 decided. Additionally, managers aware in sustainable operations have to consider that a  
24 collaborative partnership with environmental sustainable focus succeeds through  
25 improving of both business and environmental performances.  
26  
27  
28  
29  
30  
31  
32  
33

34 Previous results should be considered in line with the following limitations. Our  
35 research is built on case study interviews and surveys with a few companies operating in  
36 three main industries. We have considered only these three global companies for  
37 collecting qualitative data. This can be extended to many companies working in the same  
38 industry or different industries. Generalising the current research findings will be possible  
39 if this research can be extended for many companies operating in a variety of industrial  
40 setups. Moreover, multi-group analysis with country specific data will add value to the  
41 existing literature. However, our research also has a quantitative survey and we are  
42 positive that our findings will support other researchers in testing and validating the  
43 conceptual model for different industries.  
44  
45  
46  
47  
48  
49  
50  
51

## 52 **References**

- 53  
54 Albino, V., Dangelico, R.M., Pontrandolfo, P. 2012. "Do inter-organizational collaborations  
55 enhance a firm's environmental performance? A study of the largest US companies."  
56 *Journal of Cleaner Production* 37: 304–315.  
57  
58 Amit, R, A., Zott, C. 2012. "Creating Value through Business Model Innovation." *MIT Sloan*  
59 *Management Review* 53(3): 41-49.  
60

- 1  
2  
3  
4 Anderson, J.C., Gerbing, D.W. 1988. "Structural equation modelling in practice: a review and  
5  
6 recommended two-step approach." *Psychological Bulletin* 103(3): 411-423.  
7  
8  
9 Arivazhagan, R., P. Geetha, and Ravilochanan Parthasarathy. 2012. "Analysis of Sources of Fruit  
10  
11 Wastages in Retail outlets in Chennai, Tamilnadu, India." *International Journal of Trade*  
12  
13 *Economics And Finance*. 3 (3): 199.  
14  
15 Armstrong, J. S., and Overton, T. S. 1977. "Estimating nonresponse bias in mail surveys."  
16  
17 *Journal of Marketing Research* 14 (3): 396–402.  
18  
19 Ashby, A., Leat, M., Hudson-Smith, M. 2012. "Making connections: a review of supply chain  
20  
21 management and sustainability literature." *Supply Chain Management: An International*  
22  
23 *Journal* 17(5). 497-516.  
24  
25 Aviv, Y. 2007. "On the benefits of collaborative forecasting partnerships between retailers and  
26  
27 manufacturers". *Management Science* 53(5): 777–794.  
28  
29 Awasthi, A., Chauhan, SS., Goyal, SK. 2010. "A fuzzy multicriteria approach for evaluating  
30  
31 environmental performance of suppliers." *International Journal of Production*  
32  
33 *Economics* 126(2): 370-378.  
34  
35 Ahi, P., and Searcy, C., 2015. "An analysis of metrics used to measure performance in green and  
36  
37 sustainable supply chains." *Journal of Cleaner Production*. 86: 360-377.  
38  
39 Barratt, M. 2004. "Understanding the meaning of collaboration in the supply chain." *Supply*  
40  
41 *Chain Management: An International Journal*. 9(1): 30-41.  
42  
43 Beheregarai Finger, A., Flynn, B., and Laureanos Paiva, E. 2014. "Anticipation of new technologies:  
44  
45 Supply chain antecedents and competitive performance." *International Journal of*  
46  
47 *Operations & Production Management* 34(6): 807–828.  
48  
49 Benjaafar, S., Li, Y., Daskin, M. 2013. "Carbon footprint and the management of supply chains:  
50  
51 Insights from simple models". *IEEE Trans. Autom. Sci. Eng* 10: 99–116.  
52  
53 Beske, P., Johnson, M. P., Schaltegger, S. 2015. "20 years of performance measurement in  
54  
55 sustainable supply chain management—what has been achieved?" *Supply Chain*  
56  
57 *Management: International Journal* 20(6): 664-680.  
58  
59 Beske, P., Johnson, M. P., Schaltegger, S. 2015. "20 years of performance measurement in  
60  
61 sustainable supply chain management—what has been achieved?" *Supply Chain*  
62  
63 *Management: International Journal* 20(6): 664-680.  
64  
65 Beske, P., Seuring, S. 2014. "Putting sustainability into supply chain management." *Supply*  
66  
67 *Chain Management International Journal* 19: 322–331.  
68  
69  
70

- 1  
2  
3  
4 Bowen, F.E., Cousins, P.D., Lamming, R.C., Faruk, A.C. 2001. "The role of supply management  
5 capabilities in green supply". *Production and Operations Management* 10: 174–189.  
6  
7  
8 Brandenburg, M., Govindan, K., Sarkis, J., Seuring, S. 2014. "Quantitative models for  
9 sustainable supply chain management: Developments and directions." *European Journal*  
10 *of Operational Research* 233(2): 299-312.  
11  
12  
13 Burgess, K., Singh, P.J., Koroglu, R. 2006. "Supply chain management: A structured literature  
14 review and implications for future research." *International Journal of Operations and*  
15 *Production Management*, 26; 703–729.  
16  
17  
18 Byrne, B. M., and Stewart, S. M. 2006. "Teacher's corner: The MACS approach to testing for  
19 multigroup invariance of a second-order structure: A walk through the process,"  
20 *Structural Equation Modeling: A Multidisciplinary Journal* 13(2): 287–321.  
21  
22  
23 Cai, S., Goh, M, De Souza, R., Li, G. 2013. "Knowledge sharing in collaborative supply chains:  
24 twin effects of trust and power." *International Journal of Production Research* 51(7):  
25 2060-2076.  
26  
27  
28 Cao, M., Zhang, Q. 2011. "Supply chain collaboration: impact on collaborative advantage and  
29 firm performance." *Journal of Operations Management* 29: 163–180.  
30  
31  
32 Carter, C.R., Carter, J.R. 1998. "Interorganizational determinants of environmental purchasing:  
33 Initial evidence from the consumer products industries." *Decision Science* 29: 659–684.  
34  
35  
36 Chin, T.A., Tat, H.H., Sulaiman, Z. 2015. Green supply chain management, environmental  
37 collaboration and sustainability performance. *Procedia CIRP*. 26, 695–699.  
38  
39  
40 Chin, W. 1998. "The partial least squares modeling approach to structural equation modeling."  
41 In: Marcoulides, G. (Ed.), *Modern methods for business research*. Lawrence Erlbaum  
42 Associates, Mahwah, NJ, pp. 295–336.  
43  
44  
45 Clemens, B. 2006. "Economic incentives and small firms: does it pay to be green?" *Journal of*  
46 *Business Research* 59(4): 492–500.  
47  
48  
49 Devaraj, S., Krajewski, L., and Wei, J. C. 2007. "Impact of eBusiness technologies on operational  
50 performance: The role of production information integration in the supply chain." *Journal*  
51 *of Operations Management* 25(6): 1199–1216.  
52  
53  
54 Eisenhardt, K.M. 1989. "Agency theory: an assessment and review." *Academy of Management*  
55 *Review*. 14: 57–74.  
56  
57  
58 Fama, E.F., Jensen, M.C. 1983. "Separation of ownership and control." *Journal of law and*  
59 *economics*. 26(2): 301-325.  
60  
61 Fisher, M.L. 1997. "What is the right supply chain for your product?" *Harvard Business Review*.  
105-116.



- 1  
2  
3  
4 Forslund, H., Jonsson, P. 2007. "The impact of forecast information quality on supply chain  
5 performance." *International Journal of Operations & Production Management*. 27(1):  
6 90–107.  
7  
8  
9 Govindan, K. Rajendran, S, Sarkis, J, Murugesu, P. 2015. "Multi criteria decision making  
10 approaches for green supplier evaluation and selection: a literature review." *Journal of*  
11 *Cleaner Production* 98: 66-83.  
12  
13 Govindan, K., Khodaverdi, R., Jafarian, A. 2013. "A fuzzy multi criteria approach for measuring  
14 sustainability performance of a supplier based on triple bottom line approach." *Journal*  
15 *of Cleaner Production* 47: 345-354.  
16  
17 Green, K.W., Jr., Zelbst, P.J., Bhaduria, V.S., Meacham, J. 2012. "Do environmental  
18 collaboration and monitoring enhance organizational performance?" *Ind. Manag. Data*  
19 *Syst.* 112: 186–205.  
20  
21 Gunasekaran, A., Patel, C., McGaughey, R. E. 2004. "A framework for supply chain performance  
22 measurement." *International journal of Production Economics* 87(3): 333-347.  
23  
24 Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., and Tatham, R. L. 2006. *Multivariate*  
25 *data analysis*, 6th ed. Prentice-Hall Inc.: New Jersey.  
26  
27 Harland, C. M. 1996. "Supply chain management: relationships, chains and networks." *British*  
28 *Journal of Management* 7(1): S63-S80.  
29  
30 Hu, L., Bentler, P. M., Kano, Y. (1992), "Can test statistics in covariance structure analysis be  
31 trusted?", *Psychological Bulletin* 112(2): 351–362.  
32  
33 Igarashi, M., Boer, L., Fet, A. M. 2013. "What is required for greener supplier selection? A  
34 literature review and conceptual model development." *Journal of Purchasing and Supply*  
35 *Management* 19(4): 247-263.  
36  
37 Jensen, M. C., Meckling, W. H. 1976. "Theory of the firm: Managerial behavior, agency costs  
38 and ownership structure." *Journal of Financial Economics* 3(4): 305-360.  
39  
40 Joong-Kun Cho, J., Ozment, J., Sink, H. 2008. "Logistics capability, logistics outsourcing and  
41 firm performance in an e-commerce market." *International Journal of Physical*  
42 *Distribution and Logistics Management* 38(5): 336-359.  
43  
44 Kim, D. Y. (2014), "Understanding supplier structural embeddedness: A social network  
45 perspective." *Journal of Operations Management* 32 (5): 219–231.  
46  
47 Kleijnen, Jack PC, Van der Vorst, J.G.A.J. 2005. "Designing robust and sustainable fresh-food  
48 supply chains: Improved simulation methodology for reducing waste." Department of  
49 Information Systems & Management/Center for Economic Research, Tilburg University.  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

- 1  
2  
3  
4 Koufteros, X.A., Cheng, T.C.E., Lai, K.-H. 2007. ““Black-box” and “gray-box” supplier  
5 integration in product development: Antecedents, consequences and the moderating role  
6 of firm size.” *Journal Operations Management* 25: 847–870.  
7  
8  
9 Kruskal, W. and Mosteller, F. (1980). “Representative sampling, IV: the history of the concept  
10 in statistics, 1895 – 1939.” *International Statistical Review*, 48:169–195.  
11  
12 McFarlin, D. B., and Sweeney, P. D. (1992), “Distributive and procedural justice as predictors  
13 of satisfaction with personal and organizational outcomes” *Academy of Management*  
14 *Journal* 3(3):626-637.  
15  
16  
17 Minten, B, Thomas R, Rajib S. 2010. “Food prices and modern retail: The case of Delhi.” *World*  
18 *Development*. 38 (12): 1775-1787.  
19  
20  
21 Mohan, U., Amit, R.K. Subramanian, A. 2014. “Improving Supply Chain Efficiency for Food  
22 Security.” *Socially Relevant Project Report*, Indian Institute of Technology Madras.  
23  
24  
25 Nanako, K., Hirao, M. 2011. “Collaborative activity with business partners for improvement of  
26 product environmental performance using LCA.” *Journal of Cleaner Production* 19:  
27 1189–1197.  
28  
29  
30 Nyaga, G.N., Whipple, J.M., Lynch, D.F. 2010. “Examining supply chain relation- ships: do  
31 buyer and supplier perspectives on collaborative relationships differ?” *Journal of*  
32 *Operations Management* 28: 101–114.  
33  
34  
35 Podsakoff, P. M., Mackenzie, S., Lee, J. Y., and Pod- sakoff, N. 2003. “Common method biases  
36 in behavioral research: A critical review of the literature and recommended remedies.”  
37 *Journal of Applied Psychology* 88(5): 879–903.  
38  
39  
40 Ramanathan, R. 2010. “The moderating roles of risk and efficiency on the relationship between  
41 logistics performance and customer loyalty in e-commerce.” *Transportation Research.*  
42 *Part E: Logist. Transp. Rev.* 46(6): 950–962.  
43  
44  
45 Ramanathan, U. 2012. “Supply chain collaboration for improved forecast accuracy of  
46 promotional sales.” *International Journal of Operations & Production Management* 32  
47 (6): 676-695.  
48  
49  
50 Ramanathan, U. and Muyldermans, L. 2010. “Identifying demand factors for promotional  
51 planning and forecasting: A case of a soft drink company in the UK.” *International*  
52 *Journal of Production Economics* 128(2): 538-545.  
53  
54  
55 Ramanathan, U., Bentley, Y., Pang, G. 2014. “The role of collaboration in the UK green supply  
56 chains: an exploratory study of the perspectives of suppliers, logistics and retailers.”  
57 *Journal of Cleaner Production*. 70: 231-241.  
58  
59  
60

- 1  
2  
3  
4 Ramanathan, U., Gunasekaran, A. 2014. "Supply chain collaboration: Impact of success in long-  
5 term partnerships." *International Journal of Production Economics* 147: 252-257.  
6  
7 Rolle, R.S. 2006. "Improving postharvest management and marketing in the Asia-Pacific region:  
8 issues and challenges." *Postharvest management of fruit and vegetables in the Asia-*  
9 *Pacific region* 23-31.  
10  
11 Rosenzweig, E. D. 2009. "A contingent view of e-collaboration and performance in  
12 manufacturing." *Journal of Operations Management* 27(6): 462–478.  
13  
14 Sari, K. 2008. "On the benefits of CPFR and VMI: a comparative simulation study."  
15 *International Journal of Production Economics* 113(2): 575–586.  
16  
17 Sarkis, J. 2006. "The adoption of environmental and risk management practices: relationships to  
18 environmental performance." *Annals of Operations Research* 145(1): 367–381.  
19  
20 Sarkis, J., Zhu, Q., Lai, K.-h. 2011. "An organizational theoretic review of green supply chain  
21 management literature." *International Journal of Production Economics* 130(1): 1-15.  
22  
23 Shepherd, C., Günter, H. 2006. "Measuring supply chain: current research and future directions."  
24 *Journal of Productivity and Performance Management* 55(3/4): 242-58.  
25  
26 Skjoett-Larsen, T., Thernøe, C., Andresen, C. 2003. "Supply chain collaboration: Theoretical  
27 perspectives and empirical evidence." *International Journal of Physical Distribution*  
28 *Logistic Management*. 33:531–549.  
29  
30 Soosay, C.A., Hyland, P. 2005. "A decade of supply chain collaboration and directions for future  
31 research." *Supply Chain Management International Journal* 20: 613–630.  
32  
33 Theißen, S.; Spinler, S.; Huchzermeier, A. 2014. "Reducing the carbon footprint within fast-  
34 moving consumer goods supply chains through collaboration." *Journal of Supply Chain*  
35 *Management* 50:44–61.  
36  
37 Vachon, S, Mao, Z. 2008. "Linking supply chain strength to sustainable development: a country-  
38 level analysis." *Journal of Cleaner Production* 16(15): 1552–1560.  
39  
40 Vachon, S. 2007. "Green supply chain practices and the selection of environmental technologies."  
41 *International Journal of Production Research* 45: 4357–4379.  
42  
43 Vachon, S., Klassen, R. D. 2008. "Environmental management and manufacturing performance:  
44 the role of collaboration in the supply chain." *International Journal of Production*  
45 *Economics* 111(2): 299–315.  
46  
47 Vachon, S., Klassen, R.D. 2006. "Extending green practices across the supply chain: The impact  
48 of upstream and downstream integration." *International Journal of Operations and*  
49 *Productions Management* 26: 795–821.  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

- 1  
2  
3  
4 Vachon, S., Klassen, R.D. 2008. "Environmental management and manufacturing performance:  
5 the role of collaboration in the supply chain." *International Journal of Production*  
6 *Economics* 111(2): 299-315.  
7  
8  
9 Van Hoof, B.; Thiell, M. 2014. "Collaboration capacity for sustainable supply chain management:  
10 Small and medium-sized enterprises in Mexico." *Journal of Cleaner Production* 67: 239–  
11 248.  
12  
13  
14 Varsei, M., Soosay, C., Fahimnia, B., Sarkis, J. 2014. "Framing sustainability performance of  
15 supply chains with multidimensional indicators." *Supply Chain Management: An*  
16 *International Journal* 19(3): 242-257.  
17  
18  
19 Verdecho, M.J., Alfaro-Saiz, J.J., Rodríguez-Rodríguez, R. 2010. "An approach to select  
20 suppliers for sustainable collaborative networks." *IFIP Adv. Inf. Communication*  
21 *Technology* 336: 304–311.  
22  
23  
24 Wernerfelt, B. 1984. "A resource-based view of the firm." *Strategic management journal* 5(2):  
25 171-180.  
26  
27  
28 William Thomson. 2012. "India's Food Security Problem." *The Diplomat*, April 2, 2012.  
29  
30 Xinyang D., Hu, Y., Deng, Y., Mahadevan, S. 2014. "Supplier selection using AHP methodology  
31 extended by D numbers." *Expert Systems with Applications* 41:156–167.  
32  
33  
34 Yan, M.-R., Chien, K.-M., Yang, T.-N. 2016. "Green Component Procurement Collaboration for  
35 Improving Supply Chain Management in the High Technology Industries: A Case Study  
36 from the Systems Perspective." *Sustainability* 8(2):105.  
37  
38  
39 Yu, J., Subramanian, Ning, K., Edwards, D. 2015. "Product delivery service provider selection  
40 and customer satisfaction in the era of internet of things: A Chinese e-retailers'  
41 perspective." *International Journal of Production Economics* 159: 104-116.  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 **How selection of collaborating partners impact on the green performance of global**  
4 **businesses? An empirical study of green sustainability**

5  
6 Usha Ramanathan<sup>a</sup>, Erica Mazzola<sup>b</sup>, Usha Mohan<sup>c</sup>, Manfredi Bruccoleri<sup>b</sup>, Anjali Awasthi<sup>d</sup>,  
7 Jose Arturo Garza-Reyes<sup>e</sup>  
8

9 <sup>a</sup> Nottingham Trent University, UK

10 <sup>b</sup> Palermo University, Italy

11 <sup>c</sup> Indian Institute of Technology Madras, India

12 <sup>d</sup> Concordia University, Canada

13 <sup>e</sup> University of Derby  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

For Peer Review Only

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

**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

**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

Table 3: Case companies' focus of collaboration

Case companies	Purpose of collaboration									
	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



**Table 4:** Research themes emerged 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

Table 5: Descriptive analysis

Factors and items	Std. Load.	AVE	CR	Cronbach's alpha
<i>Supplier selection</i>		0.64	0.87	0.814
Product/service quality	.799			
Timely service	.905			
Cost of product/service	.687			
Reliability	.815			
<i>Logistics selection</i>		0.66	0.89	0.716
intact delivery of goods	.929			
on-time delivery	.897			
latest technology	.601			
<i>Information sharing</i>		0.65	0.88	0.733
Quality of information	.729			
Speed of information	.852			
Transparent information	.837			
<i>Organisation support</i>		0.67	0.81	0.839
sustainable operations	.767			
sustainable business objectives	.829			
NBD follow sustainable practices	.829			
set of environmental policies	.863			
<i>Green commitment</i>		0.58	0.76	0.631
Sustainable operations need investment	.765			
We get incentive in terms of profit	.764			
Control over other SC partners in greenness is difficult	.759			
<i>Green awareness</i>		0.78	0.91	0.862
Our firm chooses suppliers with environmentally sustainable operations	.893			
Our firm is interested in clients/buyers who practice sustainable operations	.881			
Our firm chooses logistics who practice green/sustainable operations	.885			
<i>Environmental performance</i>		0.66	0.89	0.745
Increased orders from customers with green awareness	0.777			
Showcase social awareness for green	0.809			
Achieving green objectives	0.854			
<i>Financial performance</i>		0.65	0.88	0.865
Our profit has increased in the last five years	.813			
Our operational cost is reduced in the last five years	.739			
We have increased our return on investment (ROI) in the last five years	.859			
Our market share has increased over the last five years	.831			
We get increased number of orders in the last five years	.792			
<i>Partnership performance</i>		0.58	0.75	0.854
Our firm makes accurate forecasts	.625			
Our organisation has improved in (NPD)	.819			
We gained reputation	.804			
We will have long-term partnership with current partners	.713			
We will have new collaborative plans	.819			
We get new businesses through collaboration	.780			

Table 6: Correlation matrix

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

<sup>a</sup> The square root of the AVE is shown in bold in the diagonal

<sup>b</sup> 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)

Figure 1: Initial Conceptual model - Collaboration for sustainability

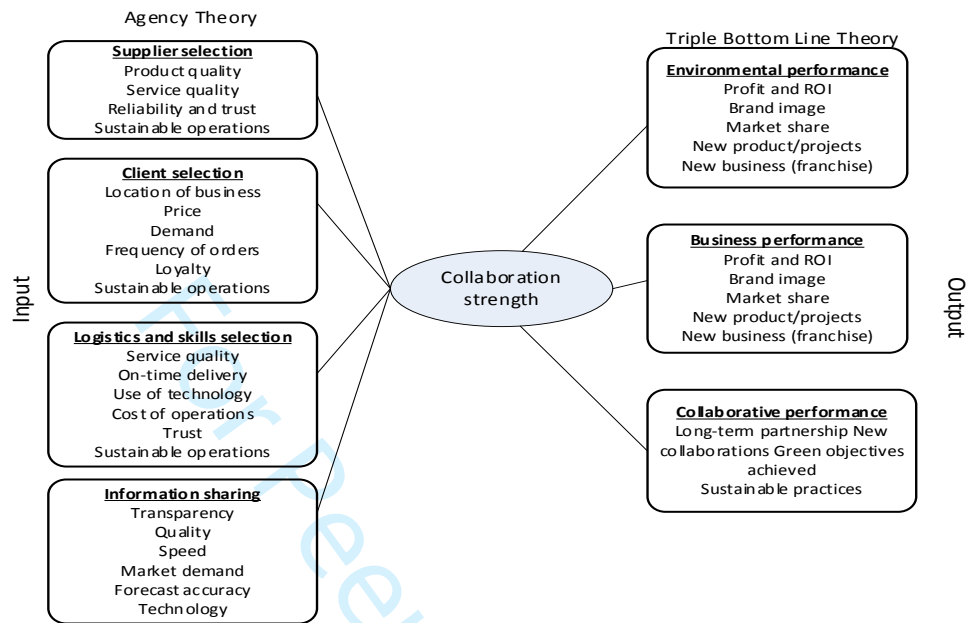
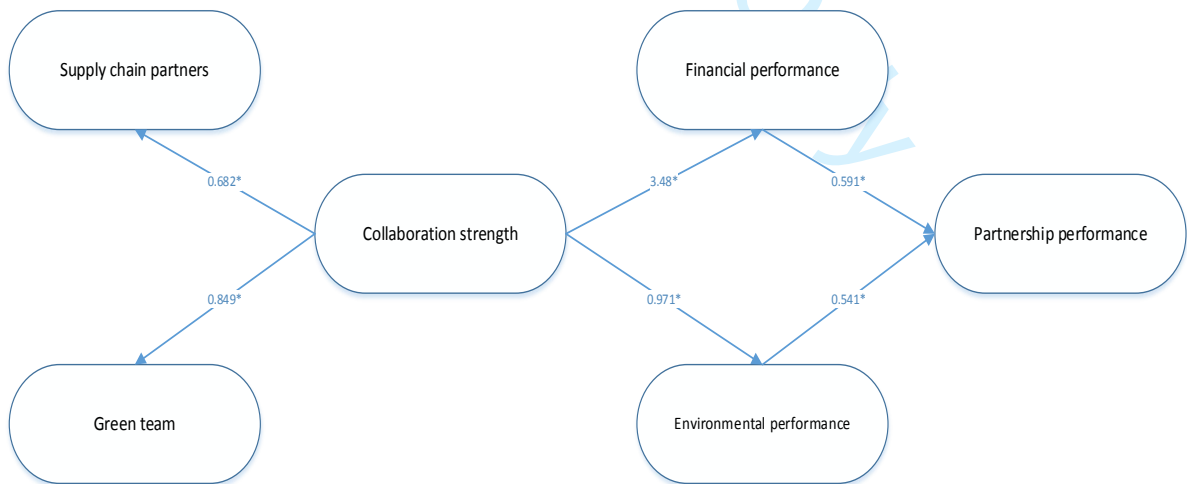


Figure 2: Complete structural model of green collaboration



1  
2  
3 **TPPC-2018-0330 - "How selection of collaborating partners impact on the green performance of**  
4 **global businesses? An empirical study of green sustainability"**  
5  
6

7  
8 Reviewer: 1  
9

10 Recommendation: Accept as-is or minor revisions – no further review  
11

12 Comments:

13 This research paper is very interesting and found several innovative findings. Following are the minor  
14 comments, which can be improved after revision:  
15

16 **Response: We would like to thank this reviewer for his/her positive notes. We have improved**  
17 **the paper to the highest possible standard with good readability.**  
18

- 19  
20 1. It is suggested to rewrite the abstract and emphasize the research results and implications.  
21

22 **Response: We have considered this point positively and improved the paper. Current version**  
23 **of the paper has improved abstract with emphasize on results and research implications.**  
24

- 25  
26 2. It is recommended to separate discussion from the Conclusion part.  
27

28 **Response: The revised version of the paper has two separate sections – Section 6:**  
29 **Discussions and Section 7: Conclusion, limitation and future research**  
30

- 31  
32 3. The researcher should include research implications and future research under the subheading of  
33 conclusion part.  
34

35 **Response: The current version has a separate conclusion section with research implications**  
36 **and future research & limitations.**  
37  
38  
39

40 Reviewer: 2  
41

42 Comments:

43 This paper considers that suppliers can involve in collaborative partnerships for green sustainability.  
44 The collaboration also can impact financial performance, environmental performance and overall  
45 partnership performance. A qualitative research using case study observations and data from the  
46 questionnaire survey finds that the importance of commitment from collaborating members with  
47 environmental awareness and environmental positioning of the company will strengthen its  
48 performances. However, there are still some problems in the article.  
49  
50

- 51 1. It is noted that your manuscript needs to be carefully edited by professional technical  
52 English editors, especially pay attention to English grammar, spelling, punctuation and  
53 sentence structure, so that the readers can clearly see the purpose and results of the  
54 study;  
55

56 **Response: We carried out a thorough proofreading and editing to improve language and**  
57 **structure. We hope the revised version of the article has high readability and logical**  
58 **connections to reflect quality of the journal.**  
59  
60

- 1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60
2. In the process of summarizing literature review, the author should pay attention to the logical relations between sections and paragraphs within sections;  
Response: the revised version of the paper has better positioning of the sections and subsections in a logical way.
  3. The author should explain in more detail the characteristics of selected enterprises and supply chains so that they can represent global enterprises and different industries;  
Response: The case companies' description is elaborated with details of case company operations and sustainability approaches - Please see page 10 and 11.
  4. In general, professional terms should be spelled out when appearing in a paper for the first time, such as "SC", "EEE";  
Response: Now the revision version has been thoroughly checked for acronyms.
  5. In the case description, the author should distinguish the narrative order of internal and external management of the enterprise to make the thinking clearer and the structure better;  
Response: As much as possible, operational activities and management activities are classified for specific internal and external categories. With respect to survey questionnaire, we classified these narratives.
  6. In case 2, there is no clear description of the IT company's products, main business scope, and the business processes;  
Response: IT company in Case 2 is providing service as products. In is mentioned in the description page-16.
  7. Is the data mentioned 40% and 60% monthly, quarterly or yearly in case 3?  
Response: This is yearly data given by Rolle, (2006). The revised version of the paper is amended accordingly.
  8. The author should pay attention to the logical structure between sentences, especially the use of connectives;  
Response: We considered every single aspect of the case study, structure and logical reasoning carefully in the revised version.
  9. What are the specific relationships between the nine criteria and the seven themes? For example, Theme 7 is not reflected in the criteria accordingly;  
Response: Seven themes have been identified from cross-case study analysis. Research criteria has been set from existing literature while developing the conceptual model. We try to relate these two clearly in the revision version of the article.
  10. After Table 4, the basic differences between three industries mentioned in the first sentence are obtained, but there is no description of the difference of food industry in the following paper;  
Response: Page 16 and 17 of the revised version has included role of food company in both input and output sections.
  11. There is a lack of the source of the statement in quotation marks;  
Response: As the interview is anonymised, the company name is mentioned for the quotations used.
  12. In figure 1, the specific role of "Agency Theory/Triple Bottom Line Theory" is not reflected;

1  
2  
3 Response: Agency theory is used for input and triple bottom line theory is used for  
4 output. This is reflected in figure 1.  
5

- 6  
7 13. The paragraph format should be uniform, especially the indentation of the first line;  
8 Response: Formatting is verified along with proofreading of the article.  
9

- 10  
11 14. In addition, the format of the map needs to be uniform, especially whether italics are  
12 required for the header font;  
13 Response: Formatting and fonts are thoroughly checked in the revised version.  
14

- 15  
16 15. It is noted that only three items "H3, H4, H5" appear in the second hypothesis, but the  
17 description in the above paragraph is "four research hypotheses";  
18 Response: Thanks for pointing this error. The revised version has amended this to three  
19 hypotheses.  
20

- 21  
22 16. Is the paper questionnaire effective with an effective rate of only 22.5%?  
23 Response: Yes response rate is 22.5% and this is considered high with respect to industry  
24 related survey.  
25

- 26  
27 17. In the questionnaire adopted in this paper, are the number of selected companies in the  
28 three industries and different types of respondents equal?  
29 Response: Approximately equal response was shown from all three industries and hence  
30 it was not considered as a bias.  
31

- 32  
33 18. Try to clearly explain the difference between the parameter p in the unidimensional test and  
34 the t-test;  
35 Response: In our paper, we use multiple items to measure a single construct and hence  
36 multidimensional approach is used to get accurate estimates. We use p value  $<0.01$  or  $p < 0.05$  as significant values.  
37

- 38  
39 19. The standard for judging whether the path coefficient is significant need to be described;  
40 Response: This is described in page 26  
41

- 42  
43 20. An explanation of "\*" in figure 2 should be provided;  
44 Response: This is included under figure 2 as legend.  
45

- 46  
47 21. There are different descriptions of data sources in the paper, such as "from various  
48 industries from three different countries", "from three global companies", "with a few companies  
49 operating in three main industries", etc.;
- 50 Response: Thanks for this suggestion; the revised version has uniform use of 'global  
51 companies'  
52

- 53  
54 22. The references are old and need to be updated in the last three years. In addition, the  
55 citation of year, page number, etc. should be uniform.  
56 Response: Referencing style is checked and modified where necessary.  
57  
58  
59  
60