International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 9, pp: 134-146 www.ijaem.net ISSN: 2395-5252

Effect of Firm's Age on the Relationship between Triple Bottom Line Sustainability and Operational Performance in the UK Manufacturing Sector

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Date of Submission: 05-11-2020 Date of Acceptance: 18-11-2020

ABSTRACT: Sustainability is commonly viewed in terms of environmental initiatives. However, Triple Bottom Line (TBL) concept suggests striking a balance between environmental, social, and economic sustainability. This study explores the influence of green supply chain (GSC) drivers on TBL sustainability dimensions and that of TBL dimensions on operational performance of firm in presence of a moderator – Firm's age. Data collected from senior operation and/or purchasing managers of manufacturing firms in United Kingdom (UK) was analyzed using Structural Equation Modeling (SEM). Multi-group moderation approach was followed to test the influence of firm's age as a moderator on the hypothesized relationships in the research model. It was found that economic performance was the best predictor of operational performance in older companies whereas social performance predicted operational performance better in younger firms. Against common belief, environmental performance did not influence the operational performance of older or younger companies. Eco-design and production emerged as a significant GSC driver, influencing environmental performance in older firms, economic performance in younger firms, and social performance for both groups.

Keywords: Green Manufacturing, Sustainable Production, Environmental impact, Manufacturing Performance

I. INTRODUCTION

Sustainability became the new corporate mantra in the early 1990s when organizations realized that profit-making alone cannot sustain businesses in long run (Sarkis, 2001). The three 'P' goals gained popularity where organizations needed to focus on Profits, along with People and Planet (Elkington, 1994). Initially, sustainable goals focused mostly on environmental sustainability (Sarkis, 2001). However, gradually organizations realized that the concept extends beyond mere environmental initiatives (Wilson, 2015) to encompass even social and economic dimensions (Hussain et al., 2018; McLean, 2019).This is referred to as TBL sustainability and integrates all the three sustainability dimensions into the business model (Carter and Rogers, 2008).However, most firms struggle to implement TBL practices in its true sense (Klumpp, 2018) because of the inherent complexity of TBL dimensions competing with each other for budgetary space (Van der Byl and Slawinski, 2015). Sustainability studies continue to focus largely on environmental sustainability with little focus on the other dimensions (Bastas and Liyanage, 2018; Rajeev et al., 2017).While TBL literature itself is scarce and needs attention (Ahi and Searcy, 2015; Rajeev et al., 2017), what is more unexplored is the effect of a company's age on the TBL dimensions and their relationships with GSC drivers and operational performance of firms. It is believed that newer companies have built themselves around sustainability goals right from the start and hence, would have a stronger linkage between GSC drivers, TBL performances, and operational performance, as compared to older companies who find it difficult to change their entire manufacturing set up to gear up to the new-age sustainable practices (Zsidisin and Hendrick, 1998). However, older and larger companies are often more cash rich and could afford to invest in sustainable practices and also reap more benefits from these investments by using economies of scale as compared to younger and smaller firms (Rafiq et al., 2016; Wang et al., 2018). Hence, TBL sustainability could influence operational

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performance more strongly for them. Hence, though there seems to be a definitive effect of company's age on relationship between GSC drivers, TBL sustainable practices, and operational performance, but the exact effect is unclear from extant literature.

This paper attempts to address the above gap by exploring the relationship between GSC drivers, TBL performance dimensions, and operational performance of a firm with company's age proposed as a potential moderator of the relationships. This is a unique empirical investigation since no such studies have been conducted before in UK manufacturing industry as per best of authors' knowledge. It also addresses the lacuna of empirical studies in TBL sustainability (Ozanne et al., 2016), contributing meaningfully to the scarce TBL literature and holds important practical implications for UK manufacturing companies.

II. LITERATURE REVIEW

2.1 TBL performance and operational performance

Modern sustainability requires firms to focus on more than just operational sustainability (Ciccullo et al., 2018; Famiyeh et al., 2018). Environmental initiatives have been built into supply chain management (McLean, 2019). The environmental-oriented GSC (Delmas and Montiel, 2009; Vachon and Klassen, 2006) includes activities like green purchasing, seamless integration of logistics betweensupplier-producers-distributers-consumers, and also reverse logistics where a product could move backwards in the supply chain from a consumer or distributor to the manufacturer to be re-manufactured or refurbished that includes re-building the product to its original specifications using a combination of reused, repaired, and newly added parts (Zhu et al., 2017). Environmental performance of a firm is defined as: "... firm's effectiveness in meeting and exceeding society's expectations with respect to concerns for the natural environment. This desired end would extend beyond mere compliance with existing regulations to a proactive stance concerning future environmental considerations" (Judge and Douglas, 1998, p. 245).

The above definition of environmental performance does hint at environmental practices being viewed as ethical obligations towards society. Hence, environmental performance is also tied to another dimension of sustainability such as social performance. Social performance is defined as "… how [well] companies contribute to the well-being and quality of life of society and individuals in current and future generations" (Lindgreen et al., 2008, p. 447). Modern consumers are well informed and Government regulations are more stringent. Hence, firms are bound to be socially responsible by being more sensitive towards human rights and safety (Carter and Jennings, 2004).

The other important sustainability dimension is economic performance. Zhu et al. (2007) defined economic performance as "… positive economic improvements, including decrease of cost for materials purchasing, decrease of cost for energy consumption, decrease of fees for waste treatment and waste discharge, and decrease of fines for environmental accidents" (p. 1045)

Carter and Rogers (2008, p. 368) define TBL sustainable supply chain management as "… the strategic, transparent integration and achievement of an organization's social, environmental, and economic goals in the systemic coordination of key inter-organizational business processes for improving the long-term economic performance of the individual company and its supply chains."

Operational performance is defined as the: "… actual impacts of green supply chain initiatives on operational performance of a firm such as cost reductions, product quality improvements, improvements in delivery and flexibility." (Eltayeb et al., 2011, p. 501).TBL dimensions are linked to operational performance of a firm. For instance, environmental management system (EMS) of a firm can improve profit margins by decreasing pollution, thereby contributing to enhanced operational performance (Melnyk et al., 2003). Firms with environment friendly practices could save expenses incurred in fines or legal litigations due to violation of environmental norms. Similarly, socially responsible firms often come up with better quality product designing at lesser cost, thereby positively influencing operational efficiency (Gimenez et al., 2018; Pullman et al., 2009). Further, better economic performance could allow firms the option of investing in enhancement of operational efficiency, which in turn might result in better economic performance. Thus, TBL performances could result in operational performance of a firm.

2.2 GSC drivers influencing TBL performance

What are the GSC drivers that influence TBL performance in a firm? A review of literature suggested the following four important drivers – Supplier and Customer Pressure, Environmental Purchasing, Eco-design and Production, and Supplier and Customer Collaboration.

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2.2.1 *Supplier and Customer Pressure*

Suppliers play a role in portraying the company's image to external stakeholders and customers (Rao, 2002). Hence, companies prefer suppliers who understand their environmental and social responsibilities well. Similarly, suppliers also want to earn a reputation of adhering to sustainable practices and prefer to deal with companies that are environmentally and socially responsible. Hence, Supplier and Customer Pressure is a primary driver leading companies to adopt GSC practices such as environmental purchasing or sourcing from minority groups, and so on (Carter, 2005). Salam (2008, p. 366) defined Supplier and Customer Pressure as, "…concern about the safety, environmental impact, and origin of products". Thus, supplier and customer pressure results in better social and environmental performance.

2.2.2*Environmental Purchasing*

Environmental purchasing (Green purchasing) refers to integrating the firm's purchasing policies as well as supplier selection policies with the firm's environmental goals (Sarkis, 2003). Zsidisin, and Siferd (2001, p. 69) defined environmental purchasing as:

"Environmental Purchasing (EP) for an individual firm is the set of purchasing policies held, actions taken, and relationships formed in response to concerns associated with the natural environment. These concerns relate to the acquisition of raw materials, including supplier selection, evaluation and development; suppliers' operations; in-bound distribution; packaging; recycling; reuse; resource reduction; and final disposal of the firm's products''.

Green purchasing reduces environmental damage, health hazards, and risks of regulatory non-compliance, thereby contributing to economic and environmental performance (Darnall et al., 2018; Feng et al., 2018).

2.2.3 *Eco-design and Production*

Eltayeb et al. (2011, p.501) defined Eco design and Production as:

"…environmental-conscious design [and production] of a product and its packaging that aims at minimizing negative environmental impacts of the product and its packaging throughout its entire life and promoting positive environmental practices such as recycling and reusing of the product and its packaging."

Eco-design and Production ensures cleaner production and leads to reduction of wastes, maintenance cost, operating costs and energy consumption and would encourage easier recycling and re-using of the products (Hemel et al., 1997). Production of non-hazardous and eco-friendly products would not only enhance product reliability, but also would result in competitive advantage for the firm while marketing the products as customers are now-a-days showing strong preferences for eco-friendly products. This would lead to increase in market share or market penetration opportunities for the firm, resulting in higher sales and profits. Thus, Eco-design and production would result in environmental (Feng et al., 2018) as well as economic performance of the firm (Zhu et al., 2010)

2.2.4*Supplier and Customer Collaboration*

Paulraj (2011, p. 26) defined Supplier and Customer Collaboration as

"… indicators that measure the extent to which firms (1) cooperate with their suppliers [and customers] to develop environmental strategies and (2) provide suppliers [and customers] with materials, equipment, specifications, as well as services to support their environmental goals."

Firms follow the product stewardship approach in order to be environmentally sustainable that includes activities like reverse logistics and re-manufacturing and product recovery. This is not possible without collaborating and coordinating with immediate customers, end consumers or suppliers to harness a mutual collaborative advantage and generate synergy for sustainable practices (Vachon and Klassen, 2006).

2.3 Company's age as a moderator

Zsidisin and Hendrick (1998) mentioned that older companies have a set way of operations and might still be using inefficient machines that generate more waste and are not environment friendly. Since, sustainability decisions are investment-centric and need radical transformations in operational practices (Wu and Pagell, 2011), older companies might be less motivated to implement TBL practices as compared to younger companies that have high-technology production systems and consider sustainability as a strategic mandate. Hence, GSC drivers might have stronger influence on TBL sustainability for newer companies. Modern companies also adhere to more stringent regulations for the production process as compared to older companies (Zsidisin and Hendrick, 1998), making those better performers on sustainable practices. Thus, it is probable that the relationship between TBL sustainability and operational performance would be stronger for

newer companies. On the other hand, Wang et al. (2018) conducted an empirical study on 172 Chinese firms to reveal that sustainable practices translate to economic performance easily for larger firms. Hence, larger firms (and in most cases older too) might be more willing to invest in sustainable practices and might also enjoy a stronger influence on TBL practices on operational performance. On the contrary, Zsidisin and Hendrick (1998) stated that older companies would find it difficult to invest in TBL practices. Rafiq et al. (2016) stated that R&D activities in matured older organizations yielded better results in improving sales and profits as compared to non-innovative younger companies. On the other hand, Hui et al. (2013) concluded in a study across 168 manufacturing companies in the food industry across Asian countries like China, Taiwan, and Malaysia to reveal that younger firms value innovation and novelty more than older firms.

Hence, while the extant literature does reveal a definitive effect of company's age sustainable TBL practices, it does not state the effect clearly. The literature appears divided here. So, it becomes imperative that the effect of company's age as a moderator on the relationship between GSC drivers and TBL performances and that of TBL performances with firm's operational performance is empirically tested.

III. SAMPLE AND DATA COLLECTION

Senior purchasing and operation managers of 621 UK manufacturing firms were contacted. Link for online survey was emailed to them and then intermittent telephonic follow-ups were done for a period of two months. 286 responses were received (indicating a response rate of 46%), out of which only 239 responses were usable ones.

IV. RESEARCH MEASURES

Table 1 (Appendix A) describes the items under each construct. Responses were taken on a 7 point likert scale for all constructs with 1 indicating strongly disagree to 7 indicating strongly agree.
The survey questionnaire also asked for few other data points like company age, sub-industry within manufacturing, and respondent demographics.

V. RESULTS AND FINDINGS

Mean score of responses on a seven point likert scale was used to calculate the composite scores for each construct (Hair, Jr. et al., 2013). Confirmatory factor analysis (CFA) was done separately for exogenous (CMIN/DF = 1.607, CFI = 0.928, TLI = 0.917, RMSEA = 0.069) and endogenous variables (CMIN/DF = 1.712, CFI = 0.940, TLI = 0.927, RMSEA = 0.074) following Corsten and Felde (2005). Both models achieved good fit after removal of three items like EDP2, EDP5, and SCC3 from exogenous CFA model and OperPerf4 from the endogenous CFA model since these items had factor loadings less than the threshold value of 0.7 (Hair, Jr. et al., 2013). The removal of these items improved model fit.

Tables 2 and 3 (Appendix A) present the results of convergent and discriminant validity of the exogenous and endogenous variables. Composite reliability as well as Cronbach's alpha for all constructs was greater than the threshold of 0.7 (Hair Jr. et al., 2013) confirming the internal consistency of the scales used. Average Variance Extracted (AVE) for each construct was greater than 0.5 indicating convergent validity of the scales. The √AVE for each construct was also greater than its correlation with any other construct, indicating discriminant validity of all constructs.

Structural model for testing moderation was done after establishing scale reliabilities and validities. For the purpose of moderation, the data set was divided into two sets. Companies within the age range of 0-20 years were considered as young companies and those above 20 years were considered as old companies (Rafiq et al., 2016). The data set for old companies had 110 sample data and that for young companies had 129 sample data. Both these data sets were run on the SEM mentioned above, using AMOS 24. The model fit indices were decent enough. The path analysis was done and a comparison was done between the two models. The model fit indices and structural path estimates of both the models are presented in Table 4 (Appendix A).

5.1 SEM path diagram for Old Companies

Figure 1 (Appendix B) presents the SEM path diagram for Old Companies. It was found that the GSC drivers explained 41% of variance in economic performance, 27% of variance in environmental performance and 29% of variance in social performance. That means, in older companies, the GSC drivers have a stronger influence on economic performance than environmental and social performances. The relationship of environmental purchasing with economic performance and of eco-design and production with social performance were found to be significant and positive. The TBL performances together explained 74% of variance in operational performance, with maximum effect of economic performance on operational performance.

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5.2SEM path diagram for Young Companies

Figure 2 (Appendix B) presents the SEM path diagram for Young Companies. In young companies, eco design and production had a significant relationship with social performance and economic performance. The GSC drivers together explained 86% of the variance in social performance, 51% in economic performance and 49% in environmental performance. This means that GSC drivers in younger companies have maximum contribution towards the social performance of the company. The three TBL performances explained 78 % of the variance in operational performance and social performance had a positive significant relationship with operational performance.

5.3Comparison study of SEM- old companies and SEM- young companies

From the analysis of the two different models, it was found that in older companies the most important GSC driver is eco-design and production which highly influences the environmental performance as well as the social performance. Environmental purchasing has a significant positive effect on the economic performance. On the other hand, for younger companies, eco-design and production positively influences social and economic performance and the GSC drivers together explain largest variance (86%) in social performance.

While in older companies economic performance drives the operational performance, in younger companies social performance drives the operational performance. From the above analysis, it could be understood that younger companies derive the benefit for environmental initiatives by gaining customer goodwill and a clean societal image. However, for the older companies the GSC drivers contribute to operational performance through economic performance achieved from reduced cost of raw materials and production. It was also evident from the R^2 value and regression weights that the GSC drivers in young companies have much more influence on the TBL performances than those in older companies.

VI. DISCUSSIONS AND IMPLICATIONS

Results revealed that older companies gained from GSC initiatives through improved economic performance achieved through designing of environmental friendly products and re-strategizing their production process, aligned with environmental goals. This also caters to fulfilling their social responsibility of ensuring well-being of employees and the society at large. Further, purchasing of renewable, recyclable and non-hazardous goods has helped these older companies to reduce the cost, improve their return on investment and market share. This proves that environmental purchasing helps to get financial benefits in older companies. However, environmental purchasing did not have any significant influence on TBL performances for younger companies. This is aligned with findings of Rafiq et al. (2016) and Wang et al. (2018) that investment in environmentally sustainable practices translated faster to economic performance for older and larger firms as compared to smaller and younger firms owing to better economies of scale in larger firms. The significant positive link between economic performance and operational performance conveyed that in older companies the quality of the product, reduction in lead time and other operational improvements are generally dependent on the company's economic strength. This is because building of effective and robust operations requires financial support.

In younger companies, it was found that eco-design and production had a strong positive relationship with social performance. This supports the observation of Cruz (2008) that eco-design which started to develop environmental performance of the firms have now become their social responsibility. The younger companies are designing products and improving their production system to lessen the negative environmental impact as they are particular about the health, safety and well-being of not only their employees but the whole community. In addition to this, commitment to their social responsibility has helped these younger companies excel in their operational performance. Therefore, a significant positive relationship was observed between the social and operational performance of the younger companies supporting the statement of Pullman et al. (2009) that social practices reduce the total cost. It can also be argued that safe and eco-friendly production process improves the quality of the products.

Also, GSC initiatives had a stronger positive influence on TBL performances of the younger companies than those of older companies. This finding supports the observation of Zsidisin and Hendrick (1998) that older companies have less stringent and less technically advanced production process as compared to newer companies, which influences the sustainable performances. This is because older companies started when environmental sustainability was not the priority of the company and the companies performed business with the motive to gain financial benefits. Now, it is becoming difficult for

the older companies to bring a sudden and drastic change to make environmental strategies a part of their business strategy. To make their business operate in an environment friendly way they have to change their entire production systems and other operational practices which requires a lot of investments (Wu and Pagell, 2010) and above all have to change their working culture, which is not very easy. Therefore, the older companies are yet not ready to accept these environmental initiatives as a competitive advantage. On the other hand, the younger companies started their business when sustainability was becoming a concern for everyone globally. They developed their business, their strategies, and their production lines keeping in mind that environmental sustainability would become more of a necessity than a choice in the near future. Moreover, this environmental ways of doing activities have become their working culture. Therefore, younger companies' greater efforts in taking environmental initiative have helped them to make their TBL better than that of older companies.

The results have significant implications for UK manufacturing companies, their employees, Government bodies, and society at large. The power of internet and social media makes the present day customers fully aware and informed of organizational practices and statutory norms. It would not be long when social performance would be the major determinant of the overall operational firm performance. Hence, older companies need to redirect more efforts towards TBL sustainable practices and must look at effecting this process as well as culture change in a step-wise manner. At the same time, government policies must aid older companies in this herculean task through policy changes like subsidies or tax benefits to those taking these environmental initiatives. Government could also look at setting up consulting help-centres or knowledge exchange portals and forums to make the know-how of the newer processes easily available to the older companies. While the infrastructure cost for this is borne by the government, younger companies who already have the know-how could pitch in as the knowledge partners in these initiatives. These have to be aided with robust communication and awareness programs so that older companies realize the benefits of change and also understand the support that they can avail to effect the change. Employees must also be a part of this change for older companies and should be open to adapting newer work processes. Of course, this would require initial sensitizing and awareness programs from the management of firms trying to bring about the change in their operations. Finally, customers or society can extend their unstinted support to these older companies trying to change by endorsing their brands and products. They can either do this by actual purchase of products from these brands, contributing financially to the purpose of the change or by extending their goodwill to these brands on social media platforms. Suppliers or distributors could also lend support through enhanced goodwill or by providing their services at discounted rates to such older companies trying to implement GSC initiatives.

VII. CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH

The study concluded that the age of the company moderates the relationships between the environmental drivers and sustainable performances, and also between the sustainable performances and operational performance. While Eco-design and production had a positive impact on environmental and social performance in older companies, it had a positive impact on social and economic performance in younger companies. While Social Performance of the younger company had the maximum role in improving its operational performance, economic performance played the major role to improve operational performance in older companies. It was also found that these environmental drivers had a stronger positive effect on the sustainable performances of the younger companies than those of the older companies. This is because younger companies develop their business model in order to meet their environmental goals which they have accepted as a social responsibility while many older companies still resist changing their way of doing the business as this would require them to completely re-strategize their business which will need a lot of financial support and a complete cultural change, which is not easy. However with organized collective support from Government, younger companies with better technical know-how, employees and the society at large, such change would not be impossible.

Future research could test the same model in other industries across different national cultures to compare the findings with the present study. Future studies could try comparing the results between specific sub-industries within manufacturing. Supplier and Customer Collaboration or Supplier and Customer Pressure could be broken to further constructs like Supplier Collaboration, Customer Collaboration, Supplier Pressure, or Customer Pressure to validate their specific effect on TBL performances. Another

interesting study could build on the discussion section of this paper to elaborate on initiatives that could be taken to better prepare older firms to take GSC initiatives.

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APPENDIX A: TABLES

Table 1. Research measures

Items	Source
Antecedents: **1. Eco design and Production (EDP)** Currently, our company: ➢ Designs products for reduced consumption of material/energy (EDP1) ➢ Designs products for reuse, recycle, recovery of material, component parts (EDP2) ➢ Designs products to avoid or reduce use of hazardous products and/or their manufacturing process. (EDP3) ➢ Performs facility waste reduction activity (EDP4) ➢ Performs process improvement to achieve greener production (adapted) (EDP5) ➢ Performs resources recycling (EDP6)	**Adapted from(Zhu et al., 2005)**
2. Supplier and Customer Collaboration (SCC) Please indicate the extent to which you agree with the following: ➢ We cooperate with our suppliers to achieve environmental objectives (SCC1) ➢ We work with our suppliers for cleaner production (SCC2) ➢ We collaborate with our suppliers to provide materials, equipment, parts and/or services that support our environmental goals (SCC3) ➢ We cooperate with our customers to achieve environmental objectives (SCC4) ➢ We work with our customers for cleaner production(SCC5) ➢ We collaborate with our customers to provide materials, equipment, parts and/or services that support our environmental goals (SCC6)	**Modified from (Paulraj, 2011)** The items for supplier collaboration were repeated to measure customer collaboration. **Adapted from (Carter and Jennings, 2004)**
3. Supplier and Customer Pressure (SCP) My company's involvement in sustainability has been motivated by ➢ Social programs that our customers have in place (SCP1) ➢ Customers who seek socially responsible suppliers (SCP2) ➢ Increased awareness of social issues among our customers(SCP3) ➢ Social programs that our supplier have in place (SCP4) ➢ Supplier who seek socially responsible suppliers (SCP5) ➢ Increased awareness of social issues among our suppliers(SCP6)	**Adapted from (Carter et al., 2000)**
4. **Environmental Purchasing (EP)** Currently, our company: ➢ Purchases recycled packaging (EP1) ➢ Purchases packaging that is of lighter weight (EP2) ➢ Uses a life-cycle analysis to evaluate the environmental friendliness of products and packaging (EP3) ➢ Participates in the design of products for disassembly	**Adapted from (Paulraj, 2011)**

(EP4) ➢ Asks suppliers to commit to waste reduction goals (EP5) ➢ Participates in the design of products for recycling or reuse (EP6) Focal constructs (dimensions of sustainability) 1. **Environmental Performance (EnvPerf)** Please indicate the extent to which your company's involvement in sustainability has resulted in the following outcomes: ➢ Reduction in air emission (EnvPerf1) ➢ Reduction in waste (water and/or solid) (EnvPerf2) ➢ Decrease in consumption of hazardous/harmful/toxic materials (EnvPerf3) ➢ Decrease in frequency for environmental accidents (EnvPerf4) ➢ Increase in energy saved due to conservation and efficiency improvements (EnvPerf5) 2**. Social Performance (SocPerf)** Please indicate the extent to which your company's involvement in sustainability has resulted in the following outcomes: ➢ Improvement in overall stakeholder welfare or betterment **(**SocPerf1) ➢ Improvement in community health and safety (SocPerf2) ➢ Reduction in environmental impacts and risks to general public (SocPerf3) ➢ Improvement in occupational health and safety of employees (SocPerf4) ➢ Improved awareness and protection of the claims and rights of people in community (SocPerf5) **3.Economic Performance (EcoPerf)** Please indicate the extent to which your company's involvement in sustainability has resulted in the following outcomes: ➢ Decrease in cost of materials purchased (EcoPerf1) ➢ Decrease in cost of energy consumption (EcoPerf2) ➢ Decrease in cost for waste discharge (adapted) (EcoPerf3) ➢ Improvement in return on investment (EcoPerf4) ➢ Improvement in earnings per share (EcoPerf5) Consequence 1.**Operational performance(OperPerf)** Please indicate the extent to which your company's involvement in sustainability has resulted in the following outcomes: ➢ Significantly reduced overall operational costs (OperPerf1) ➢ Significantly reduced lead times (OperPerf2) ➢ Significantly improved product quality (OperPerf3) ➢ Helped your company design/develop better products (OperPerf4) ➢ Significantly reduced waste within the production process(OperPerf5)	**Adapted from (Paulraj, 2011)** **Adapted from (Paulraj, 2011)** **Adapted from (Melynket al., 2003)**

Source: Pattnaik and Pattnaik (2019)

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Table 2.Reliability and Validity of Exogenous variables

Exogenous variables	Cronbach's alpha	Composite Reliability(CR)	AVE	√AVE	EP	EDP	SCC
SCP	0.884	0.876	0.590	0.768	0.485	0.274	0.418
EP	0.860	0.860	0.511	0.714		0.708	0.633
EDP	0.829	0.828	0.508	0.712			0.695
SCC	0.898	0.892	0.626	0.791			

Table 3. Reliability and Validity of Endogenous variables

Endogenous variables	Cronbach's alpha	Composite Reliability(CR)	AVE	√AVE	SocPerf	EcoPerf	OperPerf
EnvPerf	0.835	0.841	0.572	0.756	0.605	0.494	0.367
SocPerf	0.866	0.866	0.567	0.753		0.606	0.391
EcoPerf	0.886	0.888	0.666	0.816			0.692
OperPerf	0.845	0.853	0.661	0.813			

Table 4. Model fit indices and structural path estimates of SEM (old companies) and SEM (young companies)

Model fit Indices and Structural Paths	SEM Old Companies	SEM Young Companies
Model Fit Indices		
Relative-Chi Square	1.530	1.454
CFI	.889	.813
TLI	.869	.779
RMSEA	.083	.093
Structural paths		
Supplier& Customer Pressure → Social Performance	0.258	0.011
Supplier& Customer Pressure → Environmental Performance	0.100	- 0.134
Environmental Purchasing → Environmental Performance	0.030	0.254
Environmental Purchasing → Economic Performance	0.243**	0.199
Eco-Design and Production → Environmental Performance	0.587 *	0.349
Eco-Design and Production → Economic Performance	0.464	0.567*
Eco-Design and Production → Social Performance	0.393**	0.922**
Supplier & Customer Collaboration → Environmental Performance	- 0.174	0.254
Environmental Performance → Operational Performance	0.122	0.402
Social Performance → Operational Performance	0.210	0.677*
Economic Performance → Operational Performance	0.805**	0.154

`**Note:** *p < 0.05,**p< 0.01,***p< 0.001

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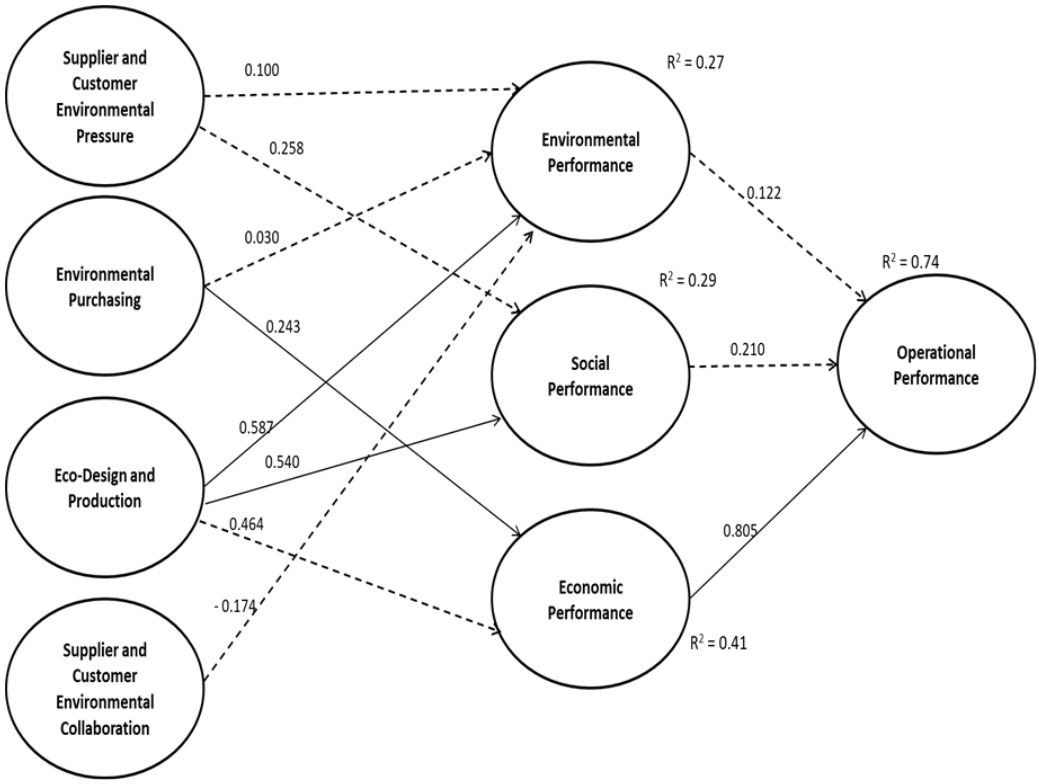
APPENDIX B: FIGURES



Note: Solid lines represents significant path, Dotted lines represents insignificant paths.

Figure 1. Structural Equation Model for Old Companies

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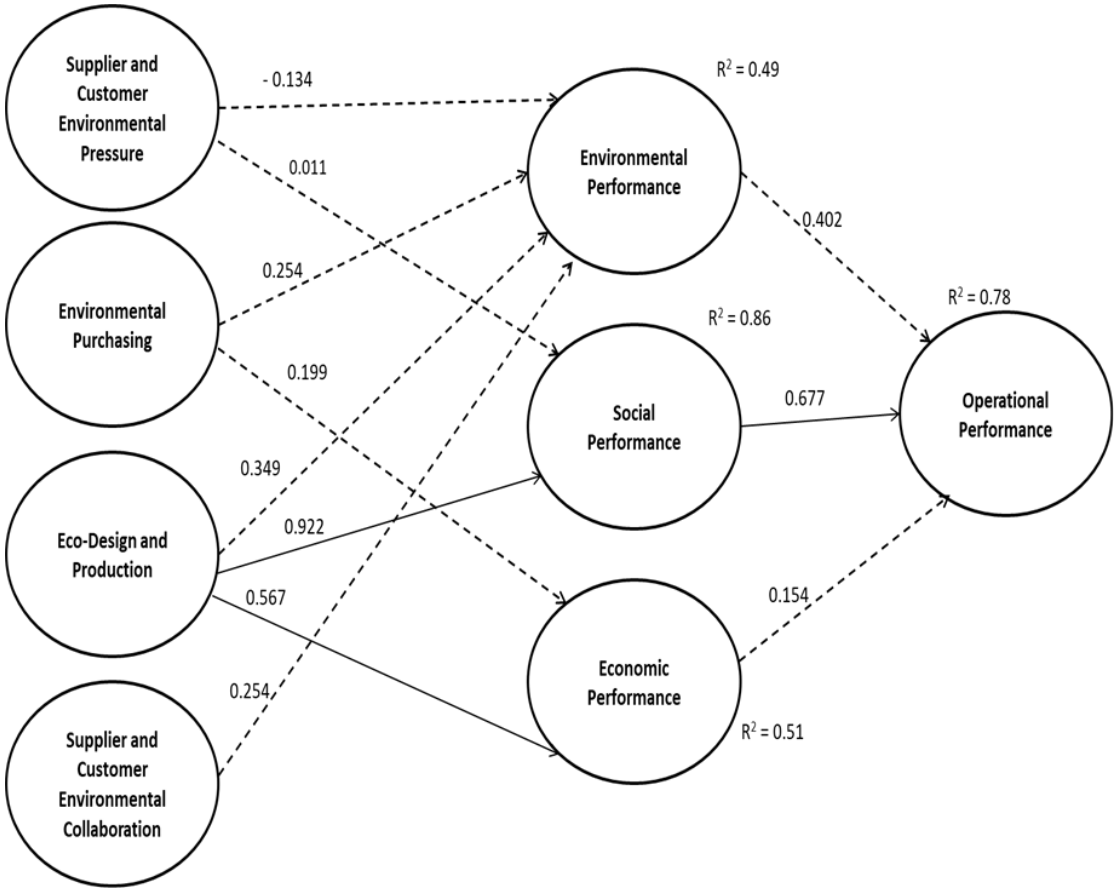

Note: Solid lines represents significant path, Dotted lines represents insignificant paths.

Figure 2. Structural Equation Model for Young Companies