“Impact of Manufacturing Performance and Sustainability Performance on Supply Chain Performance”

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Dedication

To my Beloved and Respected

Parents

Declaration Form

I, **Awais Boota, Enrollment No: 01-120162-010, Reg. No: 48016, MBA** hereby declare that the thesis has been submitted by me in the partial fulfillment of the requirement for the degree of MBA and this thesis present research carried out at Bahria University Islamabad Campus and aims encouraging discussion and comments. The observation and viewpoints expressed are the sole responsibility of the author. It does not necessarily represent positions of Bahria University Islamabad Campus or its faculty. I also understand that if evidence of plagiarism is found in my thesis at any stage, even after the award of my degree, the work may be cancelled, and the degree revoked.

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ABSTRACT

The purpose of this study is to include sustainability and performance in measuring the supply chain performance. This study presents a unique approach by finding the impact of manufacturing performance, sustainability performance on supply chain performance in manufacturing sector of Pakistan. Subsequently, a questionnaire was designed, and a survey of manufacturing firms was conducted. Finally, implications to theory and practice are discussed, especially for emerging economies. The target population for this study was those 235 manufacturing firms. The questionnaires were distributed to the respondents through online survey and printed hard copies as well. The results of this study indicate that the manufacturing and sustainability performance have a significant positive impact on supply chain performance implication and recommendations for future studies are also discussed.

Keywords: Manufacturing Performance, Sustainability Performance and Supply Chain Performance

CHAPTER 1

INTRODUCTION

The chapter includes background, problem statement showing the previous research gap then proceeds to explain the objectives, research questions, significance and sequence of the study. Finally, an overview of the way in which the study is conducted has been provided

1.1 Background of the study

Emerging economies index suggests that the emerging markets account for 10 percent of world market capitalization. The emerging economies not only supply to its own market, but also serve as a global manufacturing base. The need to improve supply chain performance (SCP) in emerging economies (Geng et al., 2017) is increasing. Supply chain management practices (SCMP) circumscribe perspectives and practices that effectively help all suppliers, manufacturers, distributors, and consumers achieve their long-term performance objectives (Hugos, 2018).

Supply management is found to contribute to a company's sustainability performance (Gualandris et al., 2014), and supply management strategies are developed to support a company's sustainable development at both the strategic and operational levels and to foster innovations (Tchokogué et al., 2017). Close buyer–supplier collaboration regarding sustainable product designs and innovations in manufacturing and supply chains is also found to be an essential driver of the sustainability performance of a firm (Paulraj et al., 2017).

Even though emerging countries play a crucial role in the global supply chain, empirical evidences and theoretical reflection on sustainability-based SCP and future viable course of actions are limited in the literature (Silvestre, 2015). Due to increasing pressure from the consumers and the government, the manufacturing sector has begun to realize the need to balance the economic outcomes with the environmental and social consequences (Esfahbodi et al., 2016).

It has become abundantly clear that the conventional profit orientated approach towards production is not sustainable and the industries must comply with the regulations (Jayaram and Avittathur, 2015; Mani et al., 2016), that seek a balance between economic gain and environmental/social consequences. This balance between economic, environmental, and social performance is known as sustainability performance.

Fundamental elements of supply chain functions (SCFs) involving planning, sourcing, manufacturing, and delivering a product to customers are vital for manufacturing industry and supply chain to realize a greater profit, low cost, customer satisfaction, and compliance with sustainability requirements. Sustainable supply chain focuses on SCFs that promote sustainability (Reefke and Sundaram, 2017). Hence, it is imperative to

(1) Examine the role and the importance of SCFs in driving sustainability performance, and
(2) Rank and benchmark SCFs and sustainability performance as they are important in improving the overall SCP.

In order to respond to the ever-growing environmental awareness, the sustainable supply chain has emerged as a key strategy. The increasing awareness about the environmental impact of the production processes, transportation of goods, and sourcing is putting an escalating pressure not only on the manufacturers but also on the upstream and the downstream supply chain partners (Geng et al., 2017).

Supply chain sustainability is closely related to a circular economy where both strategies are effective ways to maximize resource utilization, minimize environment pollution by adapting 3R practices (Reduction, Reuse, Recycle), and involves production, distribution, consumption, and waste recycling (Zeng et al., 2017).

Hearnshaw and Wilson (2013) aver that supply chains can be modelled as a network by a set of “nodes” representing autonomous business units as firms capable of exercising sovereign choices, and as sets of “connections” that link these firms together for the purposes of creating products or services. The linkages between firms represent exchange relationships and the

underlying contract if present. The critical connection types are the presence of contracts and various flow types such communication frequency, amount of information sharing, quality of supplier product as material flows, monitoring of supplier market information flows and financial flows. Network theory is descriptive in nature and has primarily been applied in SCM to map activities, actors, and resources in a supply chain. The focus has been on developing long-term, trust-based relationships between the supply chain members. Examples of issues include buyer-supplier relationships, third party logistics, and management roles in supply networks (Gunasekaran, Lai and Cheng 2008).

Building collaborative supply base with supplier is the key element in supplier strategy (Chopra et al., 2007), referred to trust, mutuality, information exchange, openness and communication as important ingredients in buyer-supplier partnership. (Chopra et al., 2010) claimed that buyer-supplier relationships were becoming more popular in supply chain because of their ability to reduce fraction and uncertainty.

Zailani and Rajagopal (2005) stated that Long-run collaborative relationships with key supplier contribute to firm's financial performance. There is a positive relationship between collaboration and performance. Collaboration with suppliers and customers when responding to risk as well as redesigning products and processes gives firms an advantage through increased information flow, reduced uncertainty, improved quality and increased profitability ((Breuer, Siestrup, Haasis and Wildebrand, 2013).

Mitchell and Nault (2007) have argued that synchronized business processes such as material, information and financial flows improve supply chain performance thus leading to business growth. Collaborative SC relies on the desire to share information and collaborative management. Effective information sharing among partners is a key determinant in reducing internal and external risk in the supply chain environment.

In supply chain management, the network theory is valuable in the analysis of buyer-supplier relationships management. More importantly, it informs choice of supplier strategies and decision making regarding how to handle suppliers. Vinodh et al., (2014) contend that network

theory provides the ideal environment for nurturing relationships that encourage trustful exchange making continuity in relationships possible. Choice of the network theory for this study was therefore based on the premise that buyer-supplier relationships management as supply chain determinants of performance needed to be examined via behavioral aspects that play part in improvement of relationships and by consequence, organizational performance (Chaplin and O'Rourke, 2014).

The supply chain sustainability issue has attracted the attention of the scholars and the practitioners. Some literature is available on measuring the effect of manufacturing processes, transportation, and sourcing decisions (i.e., the supplier evaluation and supplier selection) on the SCP. However, there is a paucity of work dealing with measuring the impact of fundamental SCFs, i.e., sourcing practices, manufacturing process, and delivery methods towards the triple bottom line of sustainability in the supply chain context (Malik et al., 2016).

1.2 Research Gap

Supply chain Management is a functional area which contributes immensely to the success or failure of a manufacturing company. Therefore, the management of manufacturing firms stands to benefit from information regarding essential determinants of supply chain management and the influence they pose on the overall efficiency of the organization.

Most organizations consider adoption of sustainable practices as not only a competitive advantage but also a necessity for long-term survival. It is, therefore, imperative that we include sustainability in measuring the supply chain performance of a firm. However, very few studies have investigated the impact of sustainability on supply chain performance (Katiyar,2018).

A major concern of the present study is the capacity of the textile supply chain to manage complexity, rapid change and trend responsiveness. The clamor for used clothing popularly known as 'mitumba' shows that consumers are demanding greater variety of cheaper and high-quality products delivered consistently. There however seems to be a significant disconnect

between what consumers want and what textile firms in Kenya are capable to provide. This reflects a disjointed and less than streamlined supply chain (Musau,2018).

1.3 Problem Statement

Supply chain has become an important focus of competitive advantage for organization business. The management of supply chain study emphasizes how to maximize the overall value of the firm by better using and deployment of resources across the whole of the firm. A supply chain is the set of values adding activities connecting the enterprise's suppliers and its customers. Hence, the purpose of this study is to find out the impact of manufacturing and sustainability performance on supply chain performance.

1.3 Research Questions

Based upon the research problem, following are the research questions of the study:

What is the effect of manufacturing performance on Supply Chain performance?

What is the impact of sustainability performance on Green Supply Chain performance?

1.5 Objectives of the Study

Objectives of the study are as follow.

To investigate the impact of Manufacturing Performance has a positive effect on Supply Chain performance

To examine the impact of Sustainability Performance has a positive effect on Green Supply Chain performance

1.7 Significance of the Study

The results will indicate that a higher level of adoption, implementation, and improvement in SCM practices will directly lead to improve SC and overall firms' performance. In addition, a higher level of SCM practices will also lead to a higher level of SC performance. Most industrial firms' theories, for example, competitive strategy, cost analysis and political economy all highlight the importance and emphasise the implementation of SCM. Therefore, the results of this study will provide the empirical support to these theories. The results of this study will indicate and highlight the best and specific SCM practices that can be adopted by Pakistani manufacturing firms to improve their SC and overall firms' performance.

The research findings will also emphasise that the proposed conceptual framework used in this study for the manufacturing supply chain can be well applied to other developing countries with similar capabilities and circumstances. The proposed model and the research findings will have the potential to help policy makers to design better policies for manufacturing, sustainability and supply chain performance.

The study relevance will provide appropriate information of supply chain performance to Policy makers both in private and public entities which may enable them to formulate better policies regarding inventory management, transport management, warehousing management, supply chain information systems and customer supplier relationship. Therefore, from the findings the regulations can be derived that intends to enhance efficiencies and effectiveness to improve manufacturing sector thereby increasing the national GDP and by extension job creation is realized.

1.8 Organization of the Study

This chapter One: Covered the brief introduction of basic idea of the study, its basic explanation, objectives, significance and necessary terminologies used in the study.

In chapter Two: Detailed review about previous studies has been included in this chapter. Key definitions, variables as well as their specific definitions given in past literature, framework and hypothesis have been discussed.

In chapter Three: The information about population, sample and collection of data along with data analysis has been mentioned, information about adopted questionnaire, Likert scale used in this study and information about the statistical tests for final empirical analysis.

In chapter Four: This chapter incorporates All statistical tests i.e. reliability test, correlation, descriptive stats and regression analysis have been used and their proper explanation has been explained.

In chapter Five: Conclusion, Recommendation, Implications and future research have been drawn after applying the statistical tools on the data. These conclusions are based on the acceptance and rejection of the hypotheses drawn for the study.

CHAPTER 2

Literature Review

This chapter provides an overview of previous research on knowledge sharing about the theories, variables, their relationships and trend of research about variables used in this study. It also presents conceptual framework and hypotheses of the study that comprises the focus of the research described in this study.

2.1 Theories supporting Literature

2.1.1 Institutional theory

Institutional theory examines how external pressures affect organisations and their practices and consequently enables a rich understanding of organizational behavior (Meyer and Rowan 1977; Stanger et al. 2013). Institutional theory proposes that three major forces – coercive, mimetic and normative – impact the practices that organizations adopt as well as the environmental alignment of such practices (DiMaggio and Powell 1983; Meyer and Rowan 1977; Scott 1995).

Normative forces refer to the pressure placed on organizations to find legitimacy from their supply chain or other commercial partners (Scott 2008). The pressure from these supply chain partners can lead to organizations adopting new practices. Coercive forces refer to the pressure on organizations to adopt certain practices or behaviors as a result of legislation or other directives from regulatory authorities (e.g. government). Mimetic forces refer to the competitive pressure to measure up to successful competitors by mimicking or copying practices of such competitors (Zhu and Sarkis 2007).

However, theorists have also argued that while institutional forces can compel homogeneity in adoption and implementation of organizational practices, the benefits of such adoption are not guaranteed. This may be because the adoption of identical practices does not imply an identical level of implementation, entrenchment and performance (Shi et al. 2012; Yeung, Cheng, and Lai 2006). In an increasingly competitive marketplace where innovation is seen as important to

competitive advantage (Chen, Lin, and Chang 2009), there is increasing institutional pressure on organisations to develop innovative capabilities. Organisations are increasingly expecting their suppliers to be initiators and important sources of product and process innovation (Azadegan et al. 2008) and supplier innovativeness is increasingly being evaluated by customers (Winter and Lasch 2016). Innovation and innovative capabilities, therefore, can be viewed through the lens of institutional theory.

2.1.2 RBV theory

The pressure from institutional forces for organisations to be innovative can lead to adoption of innovation-related activities (Da Silveira, 2001). However, for these activities to be truly meaningful, they need to lead to tangible benefits for the adopting organisations. RBV theory has been used to examine and explain differences in performance between organisations (Moyano-Fuentes, Sacristán-Díaz, and Garrido-Vega 2016; Wiengarten et al. 2014).

RBV theory suggests that organisations have or are able to acquire unique resources or capabilities which can provide them with competitive advantage (Halley and Beaulieu 2009). Therefore, RBV considers organisations to be in possession of capabilities and resources, which leveraged distinctively, confer competitive advantage (Peteraf 1993) and explain differences in performance (Barney 1991). Consequently, RBV theory has been well established as an important and relevant theory for examining the relationship between innovative capabilities and organizational performance (Kang and Park 2012; Yeung, Lai, and Yee 2007).

2.1.3 Supply Chain Network Theory

The networks theory is founded on the rational self-interest paradigm advanced by Sociologist James Coleman in 1988 (Katz, Lazer, Arrow and Contractor, 2004). The assumption by proponents of the theory was that people form dyadic and group ties ostensibly to maximize their own individual preferences and desires. Buyer-supplier relationship management can therefore be viewed in the realm of supply chain networks which Zuo and Kajikawa (2017) refer to as the new analytic paradigm in the management of the supply chain. Zuo, Kajikawa and Mori (2016)

argued that supply networks theory enables firms to maintain existing partners active, while at the same time identifying other potential cooperation partners. In essence therefore examination of buyer-supplier relationships is best situated in the supply chain network theory. Supply networks are credited with finding new business partners, increasing efficiency in operations, sourcing for new opportunities, and informing strategic direction (Dyer and Hatch, 2004).

Hearnshaw and Wilson (2013) aver that supply chains can be modelled as a network by a set of "nodes" representing autonomous business units as firms capable of exercising sovereign choices, and as sets of "connections" that link these firms together for the purposes of creating products or services. The linkages between firms represent exchange relationships and the underlying contract if present. The critical connection types are the presence of contracts and various flow types such communication frequency, amount of information sharing, quality of supplier product as material flows, monitoring of supplier market information flows and financial flows. Network theory is descriptive in nature and has primarily been applied in SCM to map activities, actors, and resources in a supply chain. The focus has been on developing long-term, trust-based relationships between the supply chain members. Examples of issues include buyer-supplier relationships, third party logistics, and management roles in supply networks (Gunasekaran, Lai and Cheng 2008).

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2.2 Variables explanation

2.2.1 Supply Chain (SC)

Competitive advantage remains a key focus among organizations yearning to enhance their performance relative to their competitors. It is argued that this desire among organizations informs strategic management decisions (Flint and Van Fleet, 2005; King, 2007). In such a scenario of sustaining competitive advantage, Jain, Dangeyach, Agarwal and Banerjee (2010) contend that supply chain management takes on, a more central role that requires keen interest. In essence, the argument then is that processes under the supply chain possess the key to unlock organizations competitive ability. The supply chain also referred to as the value chain is defined variedly among scholars in relation to their specific industry area. However, most contemporary definitions build on the definitions advanced by (Arora, 2014).

In this definition value chain is viewed to comprise of primary activities that focus on among other core values; logistics for in bonds, operations, out-bond logistics, sales and marketing, and services. Building on this definition, Kaplinsky and Morris (2006) define the value chain in terms of service and product flow. Consequently, these authors posit that the supply chain relates to activities undertaken to oversee the flow of a product or service through the stages of conception, production, delivery and disposal. Deshipande (2012) builds on the goods flow thinking by contending that a supply chain is the linkage of a set of organizations by flows of services, finances, products, and information either upstream or downstream from a given source to an intended customer. USAID however takes a different position as regards the value chain is concerned.

A USAID brief (2008) argues that key sectors experience sector – level constraints that tend to affect individual first, yet these individual firms lack ability to address them on their own. Consequently, efforts aimed at increasing competitiveness should look to focus more on across firm cooperation as opposed to individual firms. Moreover, it argues that a value chain differs from a supply chain in that it emphasizes more on value creation throughout its segments (USAID, 2008).

More definitions on supply chain builds on the premise of cooperation of involved parties for the benefits of the customer. Chopra and Mendl (2010) for instance view a supply chain as a direct or indirect involvement of manufacturers, suppliers, retailers, warehouses, transporters and customers for purposes of meeting customer needs. Harrison and Hoek (2005) on their part regard the supply chain as intra and Inter organizational processes used to maneuver from the purchasing side all the way up to the distribution of products done physically. Although it is acknowledged that the supply chain offers potential for a new form of organizations, it is however noted that inter-industry players sometimes have complicated interactions such that the envisaged value or supply chain fails to meet market and hierarchy category needs (Alflayyeh, 2013). Besides, it is also reported that scanty information exists as to how diverse supply networks impact on performance (Zhang and Dilts, 2004). The panacea possibly lies in the management of these chains.

2.2.2 Supply chain management

The business environment in contemporary society is bedeviled by growing challenges arising from turbulence markets, emerging changes occasioned by technology, ever changing customer tastes, and global competition. All these factors combine to make supply chain to be more complex and requiring prudent management. It is argued that the competitive business environment pushes firms to focus on a multiplicity of performance requires that include but not limited to delivery, quality, flexibility, and efficiency (Roh et al., 2014; Park and Hong, 2013). This ends up complicating the supply chains more since they occasionally involve hundreds or thousands of firms. Under such circumstances it is imperative to manage the supply chains.

According to DeshPande (2012). Supply chain management involves the management of components of a supply chain. Consequently, supply chain management is an Orchestrated way of handling business functions that were hitherto traditional, and approaches to these function across and within businesses with a view to sustaining performance of individual firms within a supply chain. Technological development has seen an evolution of diversity in supply chains both in terms of chain linkage as well as in terms of ingredients of performance. This has led varied interpretations of supply chain management among researchers.

Jain et al., (2010) for instance, views supply chain management in terms of facilities and available
distribution options networked to perform key functions of material procurement, production, and distribution of the products to customers. In another perspective supply chain management is the creation of a distribution system through which facilities for procurement of raw materials, production of intermediate and final products and delivery of these products to customers is integrated (CSCMP, 2013).

2.2.3 Development of Supply Chain Management (SCM)

Interest in supply chain management dates back to the dormant years prior to 1950 when logistics as noted by (Habib, 2011) was not treated as a strategic function. The first

transformation is reported to have led to recognition of logistics occasioned by the need to manage physical distribution in manufacturing firms (Haskett et al., 1964 as cited in Habib, 2011). Logistics were therefore employed to handle physical distribution which at the time was treated as an independent organizational function.

The coming of supply chain management is reported to have been informed by realization that the supply chain ought to be viewed as single function where decisions pertaining to the management of the chain are made at the top level (Gripsrud, 2006). The concept of SCM as currently used owes its development to a change in paradigm on how to manage modern business. This paradigm shift sees entities networking with each other as opposed to competing individually (Drucker, 2002). Since then several studies have been conducted to examine the adoption of SCM in diverse contexts. (Habib, 2011) for instance, is reputed to have authored the first ever paper concerning SCM as applied in the service industry when examining SCM in health services. More studies focusing on SCM in the service industry have since been conducted (Sampson, 2000; Kathawala et al., 2003; Cigolini et al., 2004). Another context that has interest on SCM is the educational context (Lau, 2007). The evolution of SCM can therefore be segmented into distractive stages in line with findings by others (Movahedi et al.; 2009).

Under this school of thought of Movahedi et al. (2009), the creation era provides customers and suppliers. The platform to understand potential benefit of cooperation and hence the need for supply chain management. The integration era on the contrary introduces sophistication in information technology systems used. Consequently, the Electronic Data Interchange (EDI) system gets replaced by the Enterprise Resource Planning (ERP) system, which not only focuses on resource management within individual firms but also on resources within the integrated chain (Movahedi et al., 2009).On the contrary, the globalization era has witnessed cut throat competition occasioned by trade liberation policies thereby requiring a unity of purpose among organizations that can link with each other. Literature however traces interest shown towards the concept of supply chain management as a response towards recognition of the need to capitalize on customer satisfaction to remain competitive (Blome et al., 2014; Cousins, 2005).

In this regard, it is noted that in its original firm, the supply chain concentrated more on the integration intra organization functions (Flynn et al., 2010).The supply chain management scope has only broadened with time to the present form that also incorporates a focus across organizations. Several components are associated with the supply chain within organizations.

The concept of supply chain management is gaining more prominence among organizations as they strive to remain competitive in today's global markets that are ever more dynamic. Supply chain practices are becoming more and more central to improved performance and value creation within organizations. Focus is now more on networked business operations that require heavy investment in supply chain management practices. It is argued that through improvements targeting the supply chain, firms as well as customers and partners stand to reap more benefits (Kepher, Shalle and Oduma, 2015).

2.3 Supply Chain Performance (SCP)

Supply Chain Performance (SCP) refers to the overall supply chain's activities in meeting end-customer requirements, including product availability, timely delivery, and all the required inventory and capacity in the supply chain to deliver that performance in a responsive manner. SCP crosses company boundaries since it includes basic materials, components, subassemblies and finished products, and distribution through various channels to the end customer. It also crosses traditional functional organization lines such as procurement, manufacturing, distribution, marketing and sales, and research and development. In the Indian context, there have been many attempts to measure the performance at the organizational level, but very few attempts have been made to measure the performance at inter-organizational level (Saad and Patel, 2006).

New organizations have to deal with various kinds of performance pressures and suitable approaches are needed (Gunasekaran et al., 2005). The study is also the direct justification for the need of a new performance measurement. Supporting the idea of new performance measurement system, few other approaches have been proposed. There is an integrated approach for measuring supply chain performance, combining economic value added (EVA), the balanced

scorecard (BSC) and activity based costing (ABC), clearly emphasizing the need of overhead handling and a balanced approach (Yao and Liu, 2006).Other approaches focuses on ERP-based supply chain performance and proposes an integrated method, total related cost measurement, to evaluate supply chain performance of a three-echelon, ERP-based supply chain system (Ho, 2007). Supply chain performance (SCP) has become a critical source of sustainable advantage in many industries (WH Ip et al., 2011). SCP is defined by Banomyong and Supatn (2011) as "the efficiency which takes into account multiple performance measures related to supply chain members, as well as the integration and coordination of members' performance". According to Harland (1999), most of the traditional performance measures are oriented towards economic performance. Various studies have suggested and used a set of new measures to respond to the current requirements for SCP measurement. Stevens (1990) presents SCP measurement in terms of service level, cost, throughput efficiency, inventory level, and supplier performance; while, SCP measures according to Pittiglio et al. (1994) fall into one of four categories: customer satisfaction/quality, cost, time, and assets. Spekman et al. (1998) used customer satisfaction and cost reduction as the SCP measure. Other qualitative SCP measures such as flexibility, information and material flow integration, customer satisfaction, supplier performance, and effective risk management were identified by Beamon (1999).

As in practice it is not feasible to consider all the SCP dimensions found in the academic literature, those suggested by Beamon (1999) were adopted for this study as they are comprehensive and include all the dimensions of interest (see Figure 1). External-internal linkage between manufacturing firms and their supply chain facilitate reconfiguring their manufacturing systems exactly when needed to meet the requirements infused by market and/or suppliers and/or manufacturing requirements (Abdi and Labib, 2016).

Many researchers have proposed new performance measures and metrics considering the changes in markets and enterprise environments. However, there are some confusion surrounding those measures and metrics regarding their importance and specific areas of application in SCM systems. The use of new emerging metrics defined in five categories has been suggested: external, consumer, value-based competition, network performance, and intellectual capital (Basu, 2001). A study based on a survey of 22 firms,, SC systems, concluded

that SC partners do not share a common vision of or react to the same set of metrics (Spekman et al., 1998).

2.3.1 Flexibility of Supply Chain

According to Koh et al. (2007), flexibility is defined as "the firm's ability to adapt to changes in its environment". Many researchers included "velocity" and "speed" into their flexibility definition and emphasised that flexibility means doing things fast (Li et al, 2006). Therefore, adaptation of "many suppliers" practice gives the firm an opportunity to increase flexibility of generating alternative sourcing for procurement by reducing SC risks (Koh et al., 2007). Thus, building long-term partnership relations with suppliers and customers helps to improve the flexibility of the SC by creating a mutual understanding among the members (Chang et al., 2005).Chopra and Meindle (2004) indicated that there are four dimensions of flexibility: customer service, order, location, and delivery time flexibility. In the literature, there are several types of flexibility: volume, dynamic operations, range, and response flexibility (Ferry et al., 2007). Flexibility ensures that changes caused by risky events can be absorbed by the SC through effective responses (Skipper and Hanna, 2009).

Therefore, some studies found that much of manufacturing flexibility enhancement effort was not successful and, in some situations, flexibility could actually lead to negative results (Upton, 1994). Thus, firms do not benefit from the matching of internal manufacturing flexibility in uncertain environment, while it seems that more flexibility is not equivalent to higher competitiveness. In contrast, there is another group of researchers who confirmed the positive impact of flexibility on firm performance, for example, Swamidass and Newell (1987), found the positive effect of product mix and new product flexibility on net profit rate and sales growth. Additionally, firms which offered various product options were able to increase their market share (Bolwijin and Kumpe, 1990), while, in other studies it is found that there is a positive effect of volume flexibility on sales growth and net profits (Tannous, 1996).

2.3.2 Integration of Supply Chain

Integration is considered a core success factors for SCM because the implementation of SCM needs the integration of processes from sourcing, to manufacturing, and to distribution across SC (Stonebraker and Liao, 2006).Various researchers have conceptualized SC integration in various ways, which refers to the extent to which separate parties are able to work together in a cooperative manner to arrive at mutually acceptable outcomes. Accordingly, this definition encompasses constructs pertaining to the degree of cooperation, coordination, integration and collaboration (Richey et al., 2009).

According to Frohlich and Westbrook (2001), there are two types of integration along the SC: the first type involves the forward coordination and integration of the physical flow of deliveries between suppliers, manufacturers, and customers; the other type involves the backward coordination of information and flow of data from customers, manufacturers, to suppliers. Narasimhan and Jayaram (1998) stated that internal integration involves the coordination, cooperation and collaboration between all internal functions within the firm from raw material management through production, shipping, and sales; while, external integration emphasizes on the coordination, collaboration and integration with other members outside the firm such as suppliers and customers (Gimenez and Ventura, 2005).

Magretta (1998) presented that higher level of SC integration will allow firms to meet customer wants and needs faster and more efficiently than non-integrated firms. Effective and superior SCM is directly related to highly integrated SC (Cook et al., 2011). Therefore, SC strategies focus on how both internal and external business processes can be integrated and coordinated throughout the SC to better serve ultimate customers, while enhancing the performance of the individual SC members (Green Jr et al., 2008).

2.3.3 Customer Responsiveness

Customer responsiveness is defined as the firm’s speed in response to the customer orders and requests (Ramanathan et al., 2011). Several researches pointed out that customer responsiveness is one of the most important factors that can be measured in the performance of SC.

According to Owens and Richmond, (1995), the main objectives of customer responsiveness are: increasing response to customer wants and needs, deriving costs out of the system and finally, turning savings into additional value for the customer. Effective performance measurement can be achieved based on SC metrics linked to customer satisfaction particularly (Banomyong and Supatn, 2011). Therefore, responsiveness is usually related with innovative products or products with short lead time, which describes the level of collaboration needed (Ramanathan et al., 2011).

2.3.4 Supplier Performance

According to Beamon (1999), supplier performance is defined as suppliers' ability to deliver raw materials/components/products to the firm on time and in good condition. In practice, many firms emphasise on the importance to use a limited number of qualified suppliers due to the fact that a significant shift has occurred in the traditional adversarial buyer-seller relationship. Therefore, suppliers' involvement needs to identify buyers' expectations in terms of quality, quantity, delivery, service and price, and can help firms to improve them in overall quality, reduce costs and competition (Morrisey and Pitaway, 2006); when the expectations are met, this relationship becomes valuable and it turns into a useful tool that helps the company achieve its objectives (Fierro and Rendondo, 2008). Firms' performance is a composite construct that indicates the business performance of a company. Specifically, it refers to how well a firm fulfils its financial and market goals (Li et al., 2006). The short-term objectives of SCM are mainly to reduce inventory, increase productivity and reduce cycle time of products and services, while long-term objectives are to increase profits, penetrating new markets, increasing quality, and increase market share for all units of the SC (Tan et al., 1998). Fraser (2006) suggests that to achieve maximum business performance it is important to align or link operations, such as those of SCs, to financial metrics. In this line, Fraser (2006) comments that the better a company's system for measuring and tracking financial and operational performance, the more finances and operations improve. Thus, it is of paramount importance to investigate the effect that SCM practices have on the financial performance of manufacturing firms.

2.4 Sustainability Performance (SP)

A sustainable supply chain is one "that performs well on both traditional measures of profit and loss as well as on an expanded conceptualization of performance that includes social and natural dimensions" (Pagell and Wu, 2009, p. 38). Whereas firm performance traditionally refers to a firm's financial success measured by economic performance measures (e.g. profit, ROI), the sustainability performance, on the other hand, refers to "a company's environmental and social performance" (Gualandris et al., 2014, p. 263). Several recent studies on SSCM (Montabon et al., 2016; Matthews et al., 2016) have called for viewpoints and research beyond instrumental logic, where the main goal is to achieve economic performance.

Measuring performance purely by means of financial and economic factors creates a paradox in the current business environment, largely because it provokes tradeoffs by prioritizing profits over people and planet (referring to the three dimensions of sustainability) and takes a firm-level perspective instead of examining a supply chain or network (Montabon et al., 2016). Overall, sustainability performance management is an integral part of performance management, but it has received scant attention in the research (Schaltegger and Burritt, 2014).

There have been attempts (Azevedo et al., 2016; Joshi et al., 2013; Nunes and Bennett, 2010; Zhu et al., 2007) to study sustainability implementation in automobile industry which is one of the significant sources of pollution and hence provides an opportunity to reduce pollution. As the GDP and the purchasing power, in the emerging economies, continue to grow, the households are more likely to own personal cars which results in the further growth of the automotive industry. However, the green supply chain management (GSCM) initiatives and the performance outcomes in the automotive industry, lack behind other industries, such as electrical/electronic, power plants, chemical, etc., in China (Zhu et al., 2007).

With the help of three case studies of Toyota, General Motor (GM), and Volkswagen, Nunes and Bennett (2010) examined green initiatives in the automotive industry. Azevedo et al. (2016) developed supply chain index to measure the health of automobile industry based on lean, agile, resilience, and green (LARG). Environmental pressure and need to cope with those pressures are

among highest in the automotive industry in India (Jayaram and Avittathur, 2015), suggesting the need of understanding firms' approach towards realizing sustainability performance and in turn SCP circular economy and mineralization technology, such as waste-to-energy and waste-to-resource supply chain, is one of the efficient ways of managing and deploying environmentally efficient operations (De los Rios and Charnley, 2017; Guo et al., 2017; Zaman, 2016). The circular economy advocates minimizing the use of raw materials/waste and maximizing its use/utilization by integrating clean production, maximum utilization, and eco-design of sustainable consumption (Ma et al., 2015). It keeps the added-value in the products as long as possible (Smol et al., 2015), and is practiced as 3R—Reduction, Reuse and Recycle (Andersen, 2007). Two more R's - Recovery and Reclamation have been suggested by Pan et al. (2015). Dhar et al. (2017), Zaman (2016) and Pan et al. (2015) suggested that waste-to-energy (such as combustion, gasification and anaerobic digestion) and waste-to resource supply chain is a viable method.

Guo et al. (2017) evaluate progress in implementing circular economy in terms of resource productivity, waste reuse, and recycling rate. Based on eco-industrial park firms, Zeng et al. (2017) find that a sustainable supply chain is a steppingstone to building a circular economy capability. These studies address the concern on minimizing, utilizing, and recycling waste, thereby contributing to sustainability. However, these approaches have not converged on the issues dealing with sustainability and SCP. Implementation of sustainability starts from strategy formulation, and then SCFs have to be deployed to fit the strategies. Sustainability strategies influence design and deployment of the green supply chain. Jayaram and Avittathur (2015) find green design, product recovery, and reverse logistics as key facets of GSCM strategies in India. Sustainable supply chain network design that consists of manufacturing, logistics, and reverse logistics are key to achieving sustainable development (Zeng et al., 2017).

Studies have highlighted that the supplier relationship management and the sourcing strategies play a decisive role in achieving sustainable practices, and the Chinese manufacturers have also started to take benefits of the supplier relationship management and the sourcing strategies (Zeng et al., 2017). The sustainable processes and the sustainable supply chain management are widely recognized (Gimenez and Sierra, 2013; Zeng et al., 2017) as some of the key elements required

to manage sustainability. To align sustainable strategy and supply chain, Hassini et al. (2012) proposed an SSCM framework consisting of major relevant functions within the supply chain, namely, sourcing, transformation, delivery, value proposition, customers, and recycling. Apart from planning and execution of supply chain, Reefke and Sundaram (2017) further add coordination and collaboration as integral components to achieve sustainable performance.

Supply chain execution translates planning into sourcing, manufacturing or production, and delivery (Reefke and Sundaram, 2017). Sustainability performance is, therefore, becoming highly reliant on these stages, namely, sourcing, manufacturing, and delivering. Different processes of supply chain contribute to green/sustainable performance and eventually contribute to SCP (Jayaram and Avittathur, 2015).

To gain a deeper understanding of the sustainability dynamics, an industry specific study on sustainability practices is required (Hassini et al., 2012), especially in the emerging economies that face considerable infrastructure and resource limitations. A combination of technological barriers combined with economic, institutional and political barriers contribute to the low level of sustainability implementation (Polzin, 2017). Various technological barriers to green and sustainable energy technology have been identified by Luthra et al. (2015). These barriers fall into seven categories: economical and financial, market, awareness and information, technical, ecological, cultural, and political. Costs, complexity, operationalization, mindset and cultural changes, and uncertainties are five major challenges in implementing environmentally sustainable supply chain (Abbasi and Nilsson, 2012). Emerging economies face many day-to-day operational obstacles, such as lack of sufficient physical infrastructure (Jayaram and Avittathur, 2016), energy, skilled manpower, healthy competition, etc.

Researchers (Govindan et al., 2014; Mathiyazhagan et al., 2013) have also found many other barriers to green supply chain implementation in the emerging economies, such as lack of environmental awareness, lack of effective environmental measures, fear of failure, investment in supplier assessment, lack of technical expertise, complexity in designing product recycling paths, high initial investment and less return-on-investment, etc. The sustainability performance of a company is heavily dependent on the performance of each member of the supply chains such

as the suppliers, sub-suppliers, and the downstream customers of each supply chain process (Krause et al., 2009).

Carter and Roger (2008) showed that sustainability implementation helps firms in cost saving (due to reduced waste), reducing health and safety cost, better product quality, and enhanced reputation. Although the concept of Corporate Sustainability Development (CSD) is understood intuitively, it remains difficult to express in concrete operational terms (Labuschagne et al. 2005). Realizing the goal of CSD implies that companies need to be able to measure the sustainability of their current practices as well as the direction in which they are moving, and to say what size of changes is necessary to meet their goals (Erol et al. 2009).

Studies of CSD have adopted various perspectives of analysis. Many authors have proposed to measure CSD in the form of discreet elements of the CSD dimensions, rather than considering them integrated in terms of CSD's multi-dimensional nature (Baumgartner and Ebner 2010).For instance, Porter (1985) analyzed the importance of financial results in terms of profitability and economic growth with respect to CSD. Peteraf (1993) related CSD to the economic performance, growth, and long-term profitability of organizations. Other works have focused more on ethical aspects. For example, Chan (2005) and Christmann (2000) analyzed CSD through the impact of environmental management on corporate everyday operations. Molnar and Mulvihill (2003) reviewed the experiences and challenges firms encounter in CSD from the viewpoint of organizational learning. Brown and Dacin (1997) studied in greater depth the effect of social responsibility on the overall valuation of a firm and its products.

Corporate sustainable development, however, should be treated as a multi-dimensional construct (Baumgartner and Ebner 2010). Studies that consider its multi-dimensional nature take into account its diverse related dimensions. For example, some have held that organizations should consider CSD in terms of the interrelations between various components, such as the individual, organizational, social, and political (e.g., Baumgartner 2009; Linnenluecke et al. 2007); some have concentrated on eco-equity, eco efficiency, and eco-effectiveness, holding that organizations should be working toward efficiency and equity for the natural environment (e.g., Bansal and Roth 2000; Chen et al. 2008); while others have considered CSD strategy as the

integration of pollution control, eco-efficiency, recirculation, eco-design, ecosystem stewardship, and business redefinition (e.g., Sharma and Henriques 2005).

Despite the diversity of the views above, recent researchers have concurred that CSD can be explained in a framework represented by three dimensions, namely social, economic, and environmental development (Baumgartner and Ebner 2010; Erol et al. 2009; Ness et al. 2007). The CSD literature considers this framework to be widely accepted as well as being the most important one. For example, Lopez, et al. (2007) and Marrewijk (2003) pointed out that CSD is achieved through social, economic, and environmental development, and that these three dimensions are all interrelated.

Melville (2010) argued that CSD is geared toward the triple bottom line—people, planet, and profit, which refers to companies harmonizing the green environment by addressing their efforts to implementing social, economic, and environmental development simultaneously (Elkington 1997). In this study, we adopted this framework as the representation of a construct of CSD. We defined the concept of CSD as the degree to which firms adopt social, economic, and environmental development in their operations (Baumgartner and Ebner 2010; Hillman and Keim 2001; Russo 2003).Sustainability performance involves factors in three broad dimensions: economic, environmental, and social (Sloan, 2010; Geng et al., 2017).

2.4.1 Economic Sustainability Performance (ESP)

The economic performance of the supply chain refers to the profits earned by the supply chain partners as well as the economic benefits gained by the host countries, regions, and communities of those partners (Sloan, 2010). The broad factors that affect economic sustainability are growth in the revenue or the sales and reduction in the overall cost (Rabbani et al., 2014; Geng et al., 2017). Economic development means managing a company as a durable participant in the market, with a positive impact on the economic circumstances of its stakeholders and on systems at the local, national, and global levels. ECO is important for a corporation because it is a prerequisite for the corporation’s survival (Steurer et al. 2005). Baumgartner and Ebner (2010)

claimed that ECO ‘‘embraces general aspects of an organization that have to be respected— next to environmental and social aspects—in order to remain in the market for long time.’’

In the past, researchers considered the measure of ECO to be based mainly on a firm’s financial performance. For example, Porter (1985) claimed that ECO refers to the economic growth and long-term profitability of an organization. Steurer et al. (2005) suggested that the objectives of ECO be based on improvements in share earnings. Studies have claimed that ECO in a corporation should consider actions that lead to economic success rather than only financial results (Baumgartner and Ebner 2010). One way to achieve economic success or long-term competitiveness is value creation (Bansal 2005), which is calculated by subtracting capital investment from market value (Hillman and Keim 2001).

Firms can create value through the goods and services they produce (Bowman and Ambrosini 2000). Bansal (2005) claimed that firms can increase their value by improving the effectiveness and efficiency of their goods or services. Value can be created directly based on Hillman and Keim’s (2001) equation above. First, ECO could involve methods to maximize the value created and raise standards of living around the world by reducing operational costs (Farrell 2005; Fowler and Hope 2006). Value creation could involve activities such as reducing employee payments (Erol et al. 2009), reducing the tax paid for employees (Veleva and Ellenbecker 2001), lowering the environmental cost burden (Tanzil and Beloff 2006), and so on. Value can also be created by generating revenue (Seth 1990), such as stimulating sales growth (Chirstmann 2000), improving the production process (Porter and van der Linde 1995), and enhancing government regulations (Makadok 2001). Active collaboration with stakeholders can also increase value (Ulaga 2003). Although this practice may not lead to a positive financial performance directly linked to revenues, it could create value for stakeholders that would achieve long-term economic success (Bansal 2005).

Value creation may intend to ‘‘reform or revolutionize the pattern of production by exploiting an invention’’ (Schumpeter 1942); researchers have found that innovative goods and services also play an important role and are considered an effective tool for ECO (Mansfield et al. 1977). It has also been suggested that value could be created by producing new and different goods or

services that would satisfy customers (Porter 1985). Lo´pez-Gamero et al. (2009) claimed that ECO could be promoted by engaging in operations such as goods or services innovation and differentiation. Sharma (2002) maintained that as the natural environment becomes more important, green technology could be an important tool for corporations in achieving financial success and competitive advantage. Firms should continuously improve their operational processes to differentiate their goods or services and achieve sustained competitiveness in the long run (Konrad et al. 2006).

2.4.2 Environmental Sustainability Performance

The term environmental performance deals with reducing waste, pollution, emissions, and energy consumption. Improving environment sustainability means decreasing the environmental footprint of the supply chain. The factors that affect environmental performance in a supply chain includes reducing CO2 emissions, waste, and hazardous materials consumption (Geng et al., 2017). Walton et al. (1998) found that the supply chain that explicitly measures environmental performance perform better than those that do not measure it explicitly.

Environmental development refers to a company's efforts to manage its operations in such a way that its final products do little harm to the environment, including land, air, and water. The core of ENV for an organization is to operate within the carrying capacity of the ecosystem by reducing environmental pollution and minimizing resource consumption and the corporation's ecological footprint (Lindgreen et al. 2009; Hart 1995), which can be practiced through corporate environmental management (Linnenluecke et al. 2007; Bansal 2005; Sharma 2002).In general, the difficulty in measuring ENV is evidenced by the diversity of data used, from anecdotal evidence, case studies, and surveys to proprietary data sources (Montabon et al. 2007). Most research has focused on ENV through the survey method (Sharma et al. 2007) because of its broad and purely perceptual view (Montabon et al. 2007). But using this method to assess ENV in a way that satisfies all user needs is no easy task (Ding 2008). Different studies have provided countless items for measuring ENV, such as reducing water consumption (Erol et al. 2009), reversing logistics (Prahinski and Kocabasoglu 2006), recycling waste and redesigning products (Jones and Comfort 2005), making green purchases (Zsidisin and Siferd 2001), and so on. Most

of these items, however, are more operational in nature and are constrained by specific types of industry (Lo´pez-Gamero et al. 2008). Companies in different industries may share common purposes while practicing different processes (Chan 2005; Sharma and Vredenburg, 1998). For example, companies may aim at reducing the risk of environmental accidents, spills, and releases by training employees on processes, monitoring environmental impacts, or even promoting environmental legislation. In this study, we collected the characteristics of existing measurements and analyzed ENV from a more generic and integral view. A number of taxonomies describe ENV, ranging from reactive to proactive approaches (Sharma and Ruud 2003).

In most cases, the reactive approach involves actions that could reduce the environmental impact of products and services or dispose of waste responsibly (Hart 1995; Schianetz and Kavanagh 2008), whereas the proactive approach requires alternative production processes that could reduce waste and emissions (Bansal 2005). Such alternative processes include using less traditional fuels (Lindgreen et al. 2009), reducing the impact on animal species and natural habitats (Rueda-Manzanares et al. 2008), and the like. Hart (1995) claimed that ENV can be based on pollution control, pollution prevention, and product stewardship. Pollution control is considered a reactive approach, also known as an end-of-pipe solution (Hart 1995). Pollution prevention is an example of the proactive approach. Product stewardship focuses on a firm's product in an effort to reduce its cradle-to-grave impact (Gilley et al. 2000; Hart 1995). This involves practices such as reducing purchases of non-renewable materials, chemicals, and components (Sharma 2000), decreasing energy consumption (Baumgartner and Ebner 2010), and so on. To conclude, firms need to identify a right way to achieve their ENV. A sound ENV practice would include reducing pollution (Sharma 2002), cutting down production costs (Arago´n-Correa 1998), complying with regulations (Berry and Rondinelli 1998), ensuring both capital and insurance (Anderson 1999), and so forth.

2.4.3 Social Sustainability Performance (SSP)

Social development refers to managing a company in such a way as to reduce social inequality and divisions, improve quality of life, and strengthen relationships with its various stakeholders. On the path to sustainability, SOC should be an important dimension for research and practice

(Sharma and Ruud 2003). SSP aims to influence positively all present and future relationships with stakeholders so as to ensure stakeholder loyalty to the company (Ebner 2008). Cuthill (2009) argued that SSP should include social capital, social infrastructure, social justice and equity, and engaged governance. In this study, SSP is focused more on moral and ethical imperatives—that is, social justice and equity—and a concern for the social good (Bansal 2005; Donaldson and Preston 1995).Social justice and equity is embodied in an ethical code for human survival and progress on a par with other high minded ideas such as democracy, freedom, and human rights (Lafferty and Langhelle 1999). It requires organizations to practice SSP by assuming wider responsibilities towards various stakeholder groups and their social environment to better fulfill stakeholders' needs and ensure their loyalty to the company (Baumgartner and Ebner 2010). Salmones et al. (2005) further claimed that to implement SSP, a corporation should behave beyond mere legal frameworks and be honest in its relationships between its customers and employees. Geibler et al. (2006) claimed that it is difficult to measure SOC because consensus on relevant criteria is lacking. In this study, we followed Bansal (2005) by focusing on corporate social responsibility (CSR) when measuring SOC on social justice and equity. CSR refers to a company's activities and status as related to its perceived societal or stakeholder obligations (Luo and Bhattacharya 2006).

Wood's (1991) framework for CSR, which is modeled and based on socially responsible processes, has been widely accepted in the business community (Hillman and Keim 2001). In this framework, CSR involves three processes: environmental assessment, stakeholder management, and social issues management. Here, we first discuss the latter two processes and then the environmental assessment in a later section. In CSR, stakeholders include, but are not limited to, suppliers, customers, employees, local communities, and governments (Berman et al. 1999). Stakeholder management involves actions to build a strong stakeholder relationship (Garriga and Mele´ 2004; Linnenluecke et al. 2007); such actions by firms include paying attention to the health and safety of the community and employees (Baumgartner and Ebner 2010), considering stakeholder interests by stakeholder involvement (Geibler et al. 2006), improving public disclosure by making operational processes transparent (Erol et al. 2009), and creating and distributing value for the equal treatment (Halme et al., 2006). Social issues management is ‘‘the process of addressing social issues’’ (Bansal, 2005). This involves a firm's

practicing ethical behavior with respect to human rights (Baumgartner and Ebner, 2010), social impact (Tanzil and Beloff 2006), social projects (Lindgreen et al. 2009), and so on. On the other hand, the social performance is related to the human capital of the supply chain. Improving sustainability performance with regards to the social sustainability dimension comprises of developing and maintaining business practices that are fair and favorable to the labor and the communities covered by the supply chain (Sloan, 2010). Social sustainability performance indicators include employees' health and safety and social welfare initiatives (Geng et al., 2017). Egels-Zandén (2007) found that a supply chain that clearly measures the social performance performs better in all sustainability dimensions compared to the others that do not measure.

2.5 Manufacturing Performance (MP)

In the global environment of manufacturing business competitive pressures are increasingly compelling those producing goods for sale to re-engineer or often redesign their process, making use of the latest information technology in order to remain competitive in the world market. Response to this environmental change in firms' management performance forms a body of literature with an extensive discussion of issues and facets involved (CarlosF. et al., 2012).

Multiple studies have been made concerning relationships among different such aspects as innovation and customization responsiveness to enhance and increase manufacturing performance of firms (Simpson and Belsky, 2008). These five studies cover (15) years agreeing that the keys for achieving quality in manufacturing cover flexibility in the production system, and involvement and commitment of employees. Eltayeb, Zailani, and Ramayah (2011) and Zhu and Sarkis (2004) which were focused on sustainability issues considered manufacturing performance by considering measures such as waste reduction, energy reduction and improved productivity. Other studies such as Fullerton, Kennedy, and Widener (2014) evaluated lean operations in manufacturers using operational measures such as reduction in scrap and rework, machine downtime, cycle time and lot sizes.

2.5.1. Manufacturing strategies

These stratagems first comprise competitive priorities (often used as an important part of measuring manufacturing strategy performance) involving costs, delivery, flexibility and quality (Thrulogachantaret et al., (2010); Zheng, Leaver and Tocher, (2008). In the nineties, means used by organizations to achieve better manufacturing targets included use of superior technologies and adopting new practices such as empowering employees and re-engineering manufacturing processes. A little later Das and Narasimhan (2000) emphasized supply chain capability as helping manufacturing strategy to raise quality, decrease costs, speed faster delivery and improve supplier flexibility and general flexibility.

2.5.2 Manufacturing performance and the SCP

The manufacturing process transforms raw materials into the final product. The components and the raw material acquired by the manufacturer from the suppliers influence the quality of the final products (Dangayach and Deshmukh, 2006; Prajogo et al., 2016). Making high-quality products is integral to manufacturing performance which in turn affects the SCP (Kannan and Tan, 2005). Various studies also show that the reduction in production cost positively impacts the manufacturing performance and the SCP (John et al., 2006; Beamon, 1999).

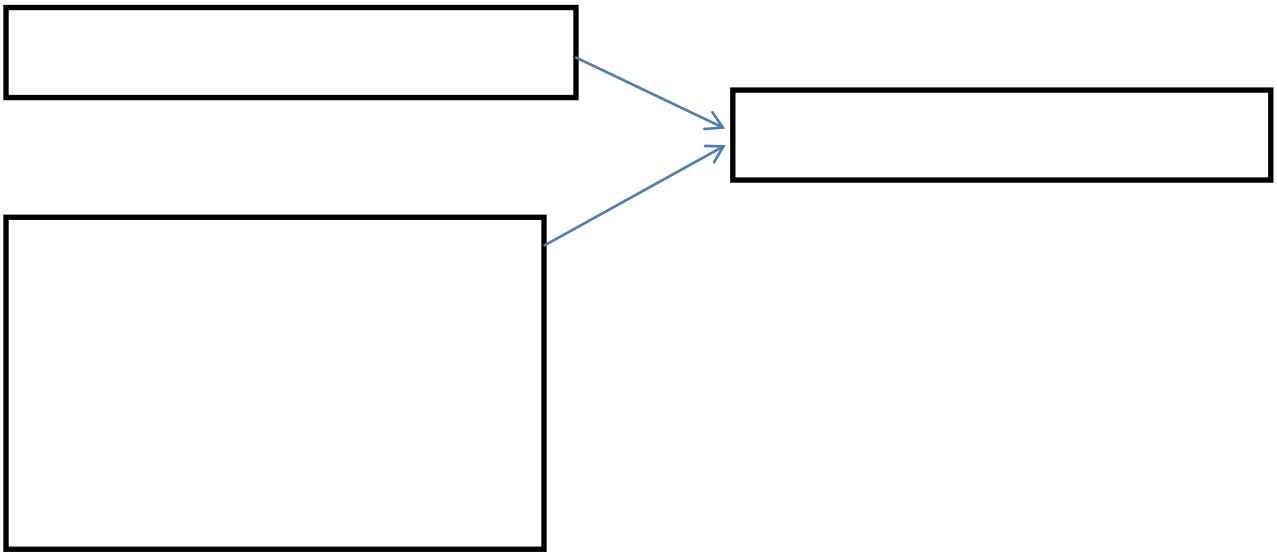
In today's competitive business environment, flexibility is another important factor that enables the companies to dynamically adjust to different types of changes and uncertainties, while continuing to provide the economies of scale (Chana et al., 2016). Literature suggests that the flexibility is an essential tool in improving the manufacturing performance (Prajogo et al., 2016). The flexibility in the manufacturing process also helps organizations in providing a wide range of the products or services (Bhagwat and Sharma, 2007; Gunasekaran et al., 2004). Garavelli (2003) and Aprile et al. (2005) also found that the manufacturing process flexibility (at the firm-level) helps companies in improving their SCP. Several other factors such as the effective capacity utilization, the efficient resource utilization, and the master production schedule also significantly affect the manufacturing performance (Philipoom and Fry, 1992). Liu et al., (2016) found that there is a positive relationship between effective resource utilization and the SCP. Ren et al. (2004) and Viswanadham and Samvedi, (2013) also suggested that the better manufacturing performance leads to higher SCP.

Many organizations have started placing more emphasis on implementing sustainable practices. The rationale for this additional focus on sustainability can be explained by the presence of several forces: external forces—increased regulations and changes in consumer preferences, and internal forces—the values and the strategies of the firm leadership. This shift in focus has forced companies to balance between the economic performance and the environmental performance (Law and Gunasekarn, 2012). The critical connection types are the presence of contracts and various flow types such communication frequency, amount of information sharing, quality of supplier product as material flows, monitoring of supplier market information flows and financial flows. Network theory is descriptive in nature and has primarily been applied in SCM to map activities, actors, and resources in a supply chain. The focus has been on developing long-term, trust-based relationships between the supply chain members. Examples of issues include buyer-supplier relationships, third party logistics, and management roles in supply networks (Gunasekaran, Lai and Cheng 2008).

Building collaborative supply base with supplier is the key element in supplier strategy (Chopra et al., 2007), referred to trust, mutuality, information exchange, openness and communication as important ingredients in buyer-supplier partnership. (Chopra et al., 2010) claimed that buyer-supplier relationships were becoming more popular in supply chain because of their ability to reduce fraction and uncertainty. Zailani and Rajagopal (2005) stated that Long-run collaborative relationships with key supplier contribute to firm's financial performance. There is a positive relationship between collaboration and performance. Collaboration with suppliers and customers when responding to risk as well as redesigning products and processes gives firms an advantage through increased information flow, reduced uncertainty, improved quality and increased profitability ((Breuer, Siestrup, Haasis and Wildebrand, 2013).Mitchell and Nault (2007) have argued that synchronized business processes such as material, information and financial flows improve supply chain performance thus leading to business growth. Collaborative SC relies on the desire to share information and collaborative management. Effective information sharing among partners is a key determinant in reducing internal and external risk in the supply chain environment. In supply chain management, the network theory is valuable in the analysis of buyer-supplier relationships management. More importantly, it informs choice of supplier

strategies and decision making regarding how to handle suppliers. Vinodh et al., (2014) contend that network theory provides the ideal environment for nurturing relationships that encourage trustful exchange making continuity in relationships possible. Choice of the network theory for this study was therefore based on the premise that buyer-supplier relationships management as supply chain determinants of performance needed to be examined via behavioral aspects that play part in improvement of relationships and by consequence, organizational performance (Chaplin and O'Rourke, 2014). The supply chain sustainability issue has attracted the attention of the scholars and the practitioners. Some literature is available on measuring the effect of manufacturing processes, transportation, and sourcing decisions (i.e., the supplier evaluation and supplier selection) on the SCP. However, there is a paucity of work dealing with measuring the impact of fundamental SCFs, i.e., sourcing practices, manufacturing process, and delivery methods towards the triple bottom line of sustainability in the supply chain context (Malik et al., 2016). Sarkis (2001) mentioned that the manufacturing performance is one of the key factors that affects the sustainability (i.e., economic, environmental, social) performance of an organization. Firms may take different sustainability initiatives, especially in manufacturing area to improve the overall sustainability performance (Tseng and Chiu, 2013).

2.6 Conceptual framework



2.7 Hypotheses

H_1: Manufacturing Performance has a positive effect on Supply Chain performance

H_2: Sustainability Performance has a positive impact on Supply Chain performance

CHAPTER THREE

Research Methodology

This chapter explains the research design and how this design led to the collection of data. It shows the basis for choosing the population, research sample, sampling methods and collection of data. It also explains about the variables used to carry out this study. It makes clear the reason behind using of a questionnaire survey as a method for data collection.

3.1 Research Design

Research design explains about the data collection from the respondents. Design makes sure a connection among data and the questions of the study. It assists determining the data into an understandable form in order to find answers of the research question. The design consists of sample, data and strategies. It explains as well the techniques for data collection and evaluating it. The study is consisted on primary data that has been gathered by standardized questionnaires. Questionnaires have been used after few alterations according to the requirements of the current study in perspective of Pakistan's scenario. This section of the study clarifies the choice of methodology selection that has been used in order to carry out the research its explanation and justification. Techniques of data gathering, sample selecting and tools for gathering the data and technique of reliability of the variables is also clarified and justified.

3.2 Quantitative Approach

The research is based on quantitative approach. Through quantitative research, the researcher tries to investigate the connection between the dependent variable and independent variables. This approach will be enabled researcher to apply the statistical technique and evaluate the results.

3.3 Research Measures

The researcher has used explanatory research to examine the relationship between dependent and independent variable. It will also help to identify cause of certain actions and to present theories and predictions.

3.4 Research Population

The population consists of pharmaceutical sector employees working in Rawalpindi and Islamabad. In this research, focus is on pharmaceutical sector. Researcher has collected proper filled questionnaire from these following mentioned sectors. Estimated population was 600 firms.

Table 1. Population/Sample

Sector	Population	Sample
Manufacturing	600	At confidence level 95% and confidence interval level 5% the calculated sample size.
Total	600	235

3.5 Sample/Sampling Techniques

Due to time constraint and main purpose of study being academic in nature, non-probability sample design with convenience sampling technique has been applied. This is a quick, convenient, and less expensive as well as the fact that most easily accessible technique to get respondents as members/subjects. Sample size was calculated as 235.

3.6 Participants

Manufacturing sector employees have been taken in Islamabad and Rawalpindi as participants of this study. Questionnaires were circulated among these participants via email and even in printed form to take accurate response about the research. It is anticipated that all respondents have

given the response openly and correctly up to their perceptive and understanding of the questionnaire.

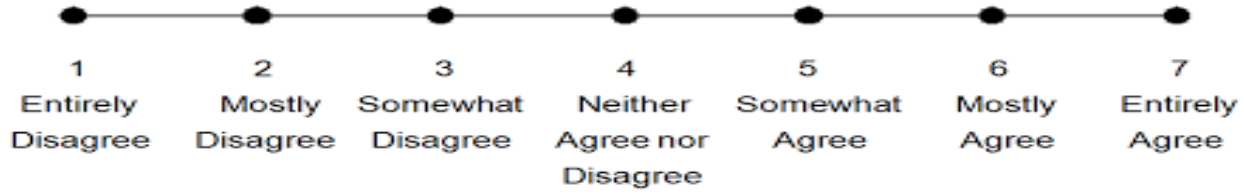
3.7 Instruments

The 8-item scale was adopted from Amit Kumar Marwah, Girish Thakar and R.C. Gupta (2014) for SCM Performance, 22-items scale was adopted from (W. S. Chow, Y. Chen, 2012) for Sustainability Performance (Environmental, Social and economic sustainability items included) and 4-items for manufacturing performance adopted from Dr. Khaled .Khalf . Alafi, (2014). These survey items were utilized and adopted to measure the respondents of three variables of the study on a 7-point Likert-type scale. Some modifications were made according to the requirements of the recent study.

3.7.1 Distribution of Questionnaire

Questionnaires were distributed in manufacturing sector organizations i.e. their commercial department, Product and service delivery, distribution and marketing and operation offices. Responses were collected by hand and email. Secondary data has been collected from published articles and journals etc.

Table 3.2 Likert Scale



3.8 Data Collection

Primary data has been obtained through structured questionnaires consisting of one independent variable and two dependent variables (having 3 determinants in conceptual model). Secondary data has been used for updating Literature Review and evaluating results with previous researches.

3.9 Statistical Tools

3.9.1 Reliability Analysis:

Cronbach's (Alpha) is a coefficient of reliability. This is usually used to compute the measure of internal reliability of a psychometric test score of examinees for a sample.

3.9.2 Descriptive Analysis:

A descriptive statistic is a summary statistic that quantitatively describes or summarizes features of a collection of information, while descriptive statistics in the mass noun sense is the process of using and analyzing those statistics. It is distinguished from inferential statistics (or inductive statistics), in that descriptive statistics aims to summarize a sample, rather than use the data to learn about the population that the sample of data is thought to represent.

3.9.3 Correlation Analysis:

It is used to measure the association among two items. The resulting value demonstrates that changes in one variable will result changes in the other variable. Whereas evaluating the association between two variables, one item is called the dependent item and the other is called independent item.

3.9.4 Regression Analysis:

It is a set of statistical processes for estimating the relationships among variables. It includes many techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables (or 'predictors'). More specifically, regression analysis helps one understand how the typical value of

the dependent variable (or 'criterion variable') changes when any one of the independent variables is varied, while the other independent variables are held fixed.

CHAPTER 4

Results and Discussion

4.1 Reliability Analysis

It is easy to show, however, that tests with the same test length and variance, but different underlying factorial structures can result in the same values of Cronbach's alpha. Higher values of alpha are more desirable. Some professionals, as a rule of thumb, require a reliability of 0.70 or higher with 0.60 as the lowest acceptable threshold (obtained on from substantial sample) before they will use an instrument. Reliability measures the internal consistency of items used to measure the latent constructs. The reliability analysis procedure calculates a number of commonly used measures of scale reliability and also provides information about the relationships between individual items in the scale. Summated scales are often used in survey instruments to probe underlying constructs that the researcher wants to measure. These may consist of indexed responses to dichotomous or multi-point questionnaires, which are later summed to arrive at a resultant score associated with a particular respondent. Usually, development of such scales is not the end of the research itself, but rather a means to gather predictor variables for use in objective models. However, the question of reliability rises as the function of scales is stretched to encompass the realm of prediction. One of the most popular reliability statistics in use today is Cranach’s alpha (Cranach, 1951). Cranach’s alpha determines the internal consistency or average correlation of items in a survey instrument to gauge its reliability. Scale purification, i.e. "the process of eliminating items from multi-item scales" (Wieland et al., 2017) can influence Cronbach's alpha. A framework presented by Wieland et al. (2017) highlights that both statistical and judgmental criteria need to be taken under consideration when making scale purification decision. Cronbach’s alpha will generally increase as the inter-correlations among test items increase, and is thus known as an internal

consistency estimate of reliability of test scores. Because inter-correlations among test items are maximized when all items measure the same construct, Cronbach's alpha is widely believed to indirectly indicate the degree to which a set of items measures a single unidimensional latent construct.

Table 2. Reliability Statistics

Variables	Cronbach's Alpha	No. of items
Manufacturing performance	0.788	**4**
Sustainability performance	0.811	**22**
Supply Chain performance	0.653	**8**

Manufacturing Performance having (4) items had Cronbach's alpha values greater than "0.6" which is 0.788 revealed Sustainability Performance -Collectively having (22) items. Cronbach's alpha values greater than "0.6" which is 0.811 revealed SCM Performance having (8) items had Cranach's alpha values greater than "0.6" which is 0.653 revealed.

4.2 Descriptive Analysis

A descriptive statistics is a summary statistic that quantitatively describes or summarizes features of a collection of information, while descriptive statistics is the process of using and analyzing those statistics. Descriptive statistics is distinguished from inferential statistics (or inductive statistics), in that descriptive statistics aims to summarize a sample, rather than use the data to learn about the population that the sample of data is thought to represent. This generally means that descriptive statistics, unlike inferential statistics, is not developed on the basis of probability theory, and are frequently nonparametric statistics. Some measures that are commonly used to describe a data set are measures of central tendency and measures of variability or dispersion. Measures of central tendency include the mean, median and mode, while measures of variability include the standard deviation (or variance), the minimum and maximum values of the variables, kurtosis and skewness. Descriptive statistics deals with the concepts and methods concerned with summarization and explanation of the important aspects of the statistical data. This area of the study consists of the summarizing of data, their graphical displays and the

calculation of a few statistical quantities that provide information about the center of the data i.e. mean and indicate the spread of the observed data i.e. dispersion (Lodico et al. 2010). As per study, N 235, Mean Values ranging from min. 4.124 to max 4.454 with positive std. Dev. values accordingly.

Table 3. Descriptive Statistics

	Min.	Max.	Mean	Standard Deviation
Manufacturing Performance	1.0	7.0	4.124	0.8701
Sustainability Performance	1.0	7.0	4.454	0.8908
Supply Chain performance	1.0	7.0	4.392	0.9744

4.3 Correlations Analysis

In statistics, dependence or association is any statistical relationship, whether causal or not, between two random variables or bivariate data. In the broadest sense correlation is any statistical association, though it commonly refers to the degree to which a pair of variables are linearly related. Familiar examples of dependent phenomena include the correlation between the physical statures of parents and their offspring, and the correlation between the demand for a limited supply product and its price. There are several correlation coefficients, often denoted or , measuring the degree of correlation. The most common of these is the Pearson correlation coefficient, which is sensitive only to a linear relationship between two variables (which may be present even when one variable is a nonlinear function of the other). Other correlation coefficients have been developed to be more robust than the Pearson correlation – that is, more sensitive to nonlinear relationships. The most familiar measure of dependence between two

quantities is the "Pearson's correlation." It is obtained by dividing the covariance of the two variables by the product of their standard deviations. A Pearson correlation coefficient is calculated to find the relationship between independent and dependent variable. It depicts the change in dependent variable due to change in the independent variable. Correlation has the ideal value between +1 and -1.

Correlations are useful because they can indicate a predictive relationship that can be exploited in practice. For example, an electrical utility may produce less power on a mild day based on the correlation between electricity demand and weather. In this example, there is a causal relationship, because extreme weather causes people to use more electricity for heating or cooling. However, when used in a technical sense, correlation refers to any of several specific types of relationship between mean values.

Table 4. Correlation results

	Supply Chain performance	**Manufacturing performance**	**Sustainability performance**
Supply Chain performance	1.000		
Manufacturing performance	0.423*	1.000	
Sustainability performance	0.464**	0.547*	1.000

*Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Table 4.3 presents the Spearman correlation coefficient which was interpreted in terms of its statistical significance to p-values (probabilities of relationships). The two hypotheses which test the impact of manufacturing performance and sustainability performance respectively on SC performance has a positive correlation with a value of .423, .464 at P = .001 accordingly.

4.4 Regression Analysis

Most commonly, regression analysis estimates the conditional expectation of the dependent variable given the independent variables – that is, the average value of the dependent variable

when the independent variables are fixed. Less commonly, the focus is on a quintile, or other location parameter of the conditional distribution of the dependent variable given the independent variables (Sauser, 2011). In all cases, the estimation target is a function of the independent variables called the regression function. In regression analysis, it is also of interest to characterize the variation of the dependent variable around the regression function which can be described by a probability distribution (Armstrong, 2012).

In statistical modeling, regression analysis is a set of statistical processes for estimating the relationships between a dependent variable (often called the 'outcome variable') and one or more independent variables (often called 'predictors', 'covariates', or 'features'). The most common form of regression analysis is linear regression, in which a researcher finds the line (or a more complex linear function) that most closely fits the data according to a specific mathematical criterion. For example, the method of ordinary least squares computes the unique line (or hyperplane) that minimizes the sum of squared distances between the true data and that line (or hyperplane). For specific mathematical reasons this allows the researcher to estimate the conditional expectation (or population average value) of the dependent variable when the independent variables take on a given set of values. Less common forms of regression use slightly different procedures to estimate alternative location parameters (e.g., quantile regression or Necessary Condition Analysis) or estimate the conditional expectation across a broader collection of non-linear models (e.g., nonparametric regression).

Regression Analysis for Model

Table 5. Model Summary

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	0.452[a]	0.204	0.192	0.9648

a. Predictors: (constant), SC performance

As in Table 4.4.1 above explains: R= .452 or 45.2% (max. weightage of the model), R^2 Variance = .204 or 20.4% , Adj. R^2 .192 (min. weightage of the model), So having R^2 20.4% ,we can assume that independent variables has 20.4% impact on dependent variables on SC Performance.

Table 6. ANOVA

Model	Sum of Squares	Df	Mean Square	F	Significance
Regression	6.326	1	6.326	6.796	0.010[b]
Residual	269.014	233	0.931		
Total	275.340	234			

As per table 4.4.2 above: Residual sum of square is 269.014 which show the deviation of dependent variable i.e. on independent variable. The F-statistics is 6.796 at 0.010 sig level which is less than the cutoff of 0.05. This shows significant relationship between the independent variables and dependent variable for all extracted data having 235 sample size.

Table 7. Coefficient Results

Model		Unstandardized Coefficients		Standardized Coefficients	t-Statistics	Significance
		B	Std. Error	Beta		
1	SC performance (constant)	1.991	0.164		12.142	0.000
	Manufacturing Performance	0.158	0.061	0.152	2.607	0.010
	Sustainability Performance	0.206	0.055	0.216	3.767	0.000

a. Dependent Variable: SC Performance
b. MP = Manufacturing Performance
c. SP= Sustainability Performance

According to the results shown in table 4.4.3 Constant is significant B 1.991, Std. Error .164, T = 12.142 at .000 significant level.

The entire hypothesis related to independent variable i.e. Manufacturing Performance has been accepted due to their beta test and t-test values showing significant trend in above table. (beta .152 and t-test value 2.607) at Significance level .010. The entire hypothesis related to dependent variable i.e. Sustainability Performance has been accepted due to their beta test and t-test values showing significant trend in above table. (beta .216 and t-test value 3.767).

Table.7 Hypotheses Testing/Results

Hypotheses	Results
H_1: Manufacturing Performance has a positive effect on Supply Chain performance	Positive/Accepted
H_2: Sustainability Performance has a positive effect on Supply Chain performance	Positive/Accepted

CHAPTER NO 5

DISCUSSION, CONCLUSION and RECOMMNDATIONS

5.1 Discussion

The increasingly global nature of competition requires that firms utilize all of their available resources in order to survive and succeed. Consequently, their supply chains need to be very efficient. The present work aimed at narrowing down the different variables leading to SC performance. The focal firm's ability to adjust its production and manufacturing depends on the ability of its supply chain performance to quickly alter key aspects such as delivery quantities and schedule. Supply chain performance, which embodies the firm's ability to quickly adjust its tactics and operations, enables the firm to produce, manufacture and sustain in adaptation to high product variety and sudden changes in product volume, and to sense and react to changing requirements of the market. Understanding how supply chain agility affects performance is thus an important conceptual contribution to the study of how firms can produce and deliver effectively in the face of volatile demand, dynamic markets and short product life cycles. Yet, there has been little empirical research that addresses the relationship between supply chain agility and performance (Gligor, Esmark, and Holcomb 2015). In this study; researcher has explained that how the presence of particular supply chain practices and information processing capabilities can effect a positive relationship between manufacturing performance and sustainability performance for supply chain strategy and supply chain performance, and in doing so contribute to research that seeks to understand how the firm can produce to varying demands and markets.

In terms of our results, this means that in order for the supporting and amplifying effects of manufacturing and sustainability performance that enable the monitoring of changes in market conditions, sharing of information with customers and introduction of new products are required. Such processes i.e. gathering, collecting and analyzing data on demand and customer preferences, providing a boost for the firm's efforts in increasing customer intimacy, satisfaction and loyalty (Wang, Hu, and Hu 2013).

5.2 Conclusion

This study explores some interesting perspectives of manufacturing, sustainability and supply chain performance in manufacturing sector of Pakistan. In this study, researcher has developed a new conceptual model for measuring supply chain performance from manufacturing performance and sustainability performance. Even though there are some techniques and methods already existing, there are several factors which make this model stand out. First, the model is very simple and practical, and thus can be easily used for the performance measurement of supply chain in manufacturing sector of Pakistan. Second, the model is generic, which makes it possible to be used by any company in manufacturing sector. his study exposed those manufacturing organizations in Pakistan which are in various phases of adopting and implementing sustainable practices for better supply chain performance. Second, “environmental pressures” identified as strongest motives behind the adoption and implementation of sustainable practices. Moreover, globalization, consistent demands from international players along with competitive (industry) pressures were identified some other effective drivers for the implementation of sustainable practices.

In context of Pakistan, this study provides valuable insight regarding major motives behind the adoption and implementation of recent practices regarding manufacturing, sustainability and supply chain performance. Additionally, the outcome of this shed light on some interesting facts regarding the role of inter-firm knowledge dissemination in promoting and implementing these practices. Findings of this study facilities organizations in Pakistan to review their existing green/ sustainable practices and revise new strategies accordingly. Based on some bitter facts, prevailing situation invites the attention of Ministry of Production and Ministry of Environmental Affairs (Government of Pakistan), not only to review existing rules and regulations, rather assist organizations and their supply chain networks in implementing of supply chain practices.

5.3 Recommendations

Many manufacturing firms still do not have any strategic alliance between different departments for supply chain performance. Performance measurement in the whole SC is considered by many to be very important Many firms have not implemented any kind of performance measurement systems; the reason is mainly because of time, manpower and lack of management commitment. Cost and reliability are the most important aspects which need to be measured. The different perspectives and attributes of supply chain performance can be measured at a high level by applying the tool developed. The study intends to survey manufacturing firms of Pakistan. The recommendations of this research work would be to benefit the manufacturing sector to be surveyed in terms of new and customized SC performance approaches, with due consideration to their geographical location and related SC constraints.

5.4 Limitations

There are also some limitations for this research: As per the sample of this study i.e. 235, researcher cannot gain the raw data concerning SC performance to do further research on conceptual model in detailed level. Attributes for particular manufacturing SC are not discussed because of the duration of this research, researcher cannot measure the efficiencies and effectives of this tool to help industries to improve their performance measurement capability on their SCM. The methodology and tool which have been developed are not integrated with current real applications of supply chain performance measurement systems, e.g. SAP SCPM and PeopleSoft Enterprise SCM in many of these firms taken on board for this research.

5.5 Future Research

Finally, this study was conducted on firms in the manufacturing sector; similar studies in service sectors such as retail or healthcare may identify interesting comparisons. In taking further, the idea of complementarity between supply chain strategy and practices, research could examine SC practices that can link other supply chain strategies such as lean, with SC performance.

REFERENCES

Afthanorhan, W.M.A.B.W. (2013), A Comparison of Partial Least Square Structural Equation Modeling (PLS-SEM) and Covariance Based Structural Equation Modeling (CB-SEM) for Confirmatory Factor Analysis, International Journal of Engineering Science and Innovative Technology, 2(5), 198-205.

Ahi, P. and Searcy, C. (2013), A comparative literature analysis of definitions for green and sustainable supply chain management, Journal of Cleaner Production, 52(1), 329–341.

Andersen, M.S. (2007), An introductory note on the environmental economics of the circular economy, Sustainability Science, 2(1), 133–140.

Armstrong, S. and Overton, T.S. (1977), Estimating non-response bias in mail surveys, Journal of Marketing Research, 14(3), 396-402.

Azevedo, S.G., Carvalho, H. and Cruz-Machado, V. (2016), LARG index: A benchmarking tool for improving the leanness, agility, resilience and greenness of the automotive supply chain, Benchmarking: An International Journal, 23(6), 1472–1499.

Bagozzi, R.P., Youjae, Y. and Lyne, W.P. (1991), Assessing construct validity in organizational research. Administrative Science Quarterly, 36(3), 421-458.

Baron, R.M. and Kenny, D.A. (1986), The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations, Journal of Personality and Social Psychology, 51(6), 1173–1182.

Basu, R.J., Subramanian, N., Gunasekaran, A. and Palaniappan, P.L.K. (2017), Influence of non-price and environmental sustainability factors on truckload procurement process, Annals of Operations Research, 250(2), 363–388.

Beamon, B.M. (1999), Measuring supply chain performance, International Journal of Operations and Production Management, 19(3), 275–292.

Bureau, E.T. (2016), India retains 3rd spot on Unacted list of investment destinations

Bhagwat R and Sharma M K (2007), Performance Measurement of supply chain management: A balanced scorecard approach, Computers and Industrial Engineering, 53(1), 43-62.

Bhattacharya, A., Mohapatra, P., Kumar, K., Dey, P.K., Brady, M., Tiwari, M.K., and Nudurupati, S.S. (2014), Green supply chain performance measurement using fuzzy

ANP-based balanced scorecard: a collaborative decision-making approach, Production Planning and Control, 25(8), 698-714. Birchall, J., February 25 (2010), Walmart to Set Emissions Goals for Suppliers. Financial Times. Carter, C.R. and Rogers, D.S. (2008), A framework of sustainable supply chain management: moving toward new theory, International Journal of Physical Distribution and Logistics Management, 38(5), 360–387.

Carter, C.R. and Rogers, D.S. (2008), A framework of sustainable supply chain management moving toward new theory, International Journal of Physical Distribution and Logistics Management, 38(5), 360–387.

Charan, P., Shankar, R. and Baisya, R.K. (2008), Analysis of interactions among the variables of supply chain performance measurement system implementation, Business Process Management Journal, 14(4), 2008, 512-529.

Chin, T.A. and Tat, H.H. (2015), Does gender diversity moderate the relationship between supply chain management practice and performance in the electronic manufacturing services industry? International Journal of Logistics Research and Applications, 18(1),35–45.

Chin, W.W. (1998), The partial least squares approach to structural equation modelling. Marcoulides G. A. (Ed.) Modern Methods for Business Research, Lawrence Erlbaum.

Churchill, G.A. Jr (1979), A paradigm for developing better measures of marketing constructs, Journal of Marketing Research, 16(1), 64-73.

Costantino, N. and Pellegrino, R. (2010), Choosing between single and multiple sourcing based on supplier default risk: a real options approach, Journal of Purchasing and Supply Management, 16(1), 27–40.

Dangayach, G.S. and Deshmukh, S.G. (2006), An exploratory study of manufacturing strategy practices of machinery manufacturing companies in India. Omega, 34(3), 254-273.

De los Rios, I.C. and Charnley, F.J.S. (2017), Skills and capabilities for a sustainable and circular economy: The changing role of design, Journal of Cleaner Production, 160, 109–122.

Fornell, C. and Bookstein, F.L. (1982), Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. Journal of Marketing Research, 19(2), 440-452.

Fornell, C. and Cha, J. (1994), Partial least squares, Advance Methods of Marketing Research,407(3), 52-78.

Fornell, C. and Larcker, D.F. (1981), Structural equation model with unobservable variables an measurement error: algebra an statistics, Journal of Marketing Research, 18(3), 382-388.

Fornell, C., Johnson, M., Anderson, E., Cha, J. and Bryant, B. (1996), The American customer satisfaction index: nature, purpose, and findings, Journal of Marketing, 60(4), 7–18.

Ganeshan, R., Boone, T. and Stenger, A.J. (2001), The impact of inventory and flow planning parameters on SCP: an exploratory study, International Journal of Production Economics, 71(1-3), 111-118.

Govindan, K., Kaliyan, M., Kannan, D. and Haq, A.N. (2014), Barriers analysis for green supply chain management implementation in Indian industries using analytic hierarchy process, International Journal of Production Economics, 147(Part B), 555–568.

Green, K.W., Zelbst, P.J., Meacham, J. and Bhadauria, V.S. (2012), Green supply chain management practices: impact on performance, Supply Chain Management: An International Journal, 17(3), 290–305.

Gunasekaran, A. and Kobu, B. (2007), Performance measures and metrics in logistics and supply chain management: a review of recent literature (1995-2004) for research and applications, International Journal of Production Research, 45(12), 2819-2840.

Gunasekaran, A., Patel, C. and McGaughey, R.E. (2004), A framework for supply chain performance measurement, International Journal of Production Economics, 87(3), 333-347.

Gunasekaran, A., Patel, C. and Tirtiroglu, E. (2001), Performance measures and metrics in a supply chain environment, International Journal of Operations and Production Management, 21(1-2), 71-87.

Guo, B., Geng, Y., Ren, J., Zhu, L., Liu, Y. and Sterr, T. (2017), Comparative assessment of circular economy development in China's four megacities: The case of Beijing, Chongqing, Shanghai and Urumqi, Journal of Cleaner Production, 162, 234–246.

Hassini, E., Surti, C. and Searcy, C. (2012), A literature review and a case study of sustainable supply chains with a focus on metrics, International Journal of Production Economics, 140(1), 69–82.

Hou, Y., Wei, F., Li, S., Huang, Z. and Ashley, A. (2016), Coordination and performance analysis for a three-echelon suppl chain with a revenue sharing contract, International Journal of Production Research, 55(1), 202-227.

Hulland, J. (1999), Use of partial least square (PLS) in strategic management research: a review of four recent studies, Strategic Management Journal, 20(2), 195-204.

Ma, S., Hu, S., Chen, D. and Zhu, B. (2015), A case study of a phosphorus chemical firm's application of resource efficiency and eco-efficiency in industrial metabolism under circular economy, Journal of Cleaner Production, 87, 839–849.

Magidson, J. (1994), Multivariate statistical models for categorical data, in Bagozzi, R. (Ed.), Advanced Methods of Marketing Research, Blackwell, Cambridge, MA.

Malik, M.M., Abdulla, S. and Hussain, M. (2016), Assessing supplier environmental performance: Applying Analytical Hierarchical Process in the United Arab Emirates healthcare chain. Renewable and Sustainable Energy Reviews, 55, 1313–1321.

Mani, V., Gunasekaran, A., Papadopoulos, T., Hazen, B. and Dubey, R. (2016), Supply chain social sustainability for developing nations: Evidence from India, Resources, Conservation and Recycling, 111, 42–52.

Marshall, D., McCarthy, L., Heavey, C. and McGrath, P. (2015), Environmental and social supply chain management sustainability practices: construct development and measurement, Production Planning and Control, 26(8), 673-690.

Mathiyazhagan, K., Govindan, K., NoorulHaq, A. and Geng, Y. (2013), An ISM approach for the barrier analysis in implementing green supply chain management, Journal of Cleaner Production, 47, 283–297.

Meena, P.L., Sarmah, S.P. and Sinha, S. (2012), Measuring satisfaction in buyer-supplier relationship from suppliers' perspective, International Journal of Business Performance and Supply Chain Modelling, 4(1), 60–74.

Mitchell, R.K., Agle, B.R. and Wood, D.J. (1997), Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What Really Counts", The Academy of Management Review, 22(4), 853–886.

Narasimhan, R. and Das, A. (1999). An empirical investigation of the contribution of strategic sourcing to manufacturing flexibilities and performance. Decision Sciences, 30(3), 683–718.

Narasimhan, R. and Das, A. (2001), The impact of purchasing integration and practices on manufacturing performance. Journal of Operations Management, 19(5), 593–609.

Ndubisi, N.O., Jantan, M., Hing, L.H. and Ayub, M.H. (2005), Supplier selection and management strategies and manufacturing flexibility, Journal of Enterprise Information Management, 18(3), 330-349.

Nunnally, J.C. and Bernstein, I.H. (1994), Psychometric theory, 3rd ed., McGraw-Hill, New York.

Nunes, B. and Bennett, D. (2010), Green operations initiatives in the automotive industry: An environmental reports analysis and benchmarking study, edited by Sarkis, J. Benchmarking: An International Journal, 17(3), 396–420.

Pagell, M. and Shevchenko, A. (2014), Why Research in Sustainable Supply Chain Management Should Have no Future, Journal of Supply Chain Management, 50(1), 44–55.

Pan, S.-Y., Du, M.A., Huang, I.-T., Liu, I.-H., Chang, E.-E. and Chiang, P.-C. (2015), Strategies on implementation of waste-to-energy (WTE) supply chain for circular economy system: a review, Journal of Cleaner Production, 108, 409–421.

Paulraj, A. and Chen, I.J. (2007), Environmental uncertainty and strategic supply management: a resource dependence perspective and performance implications. Journal of Supply Chain Management, 43(3), 29–42.

Sarkis, J., Gonzalez-Torre, P. and Adenso-Diaz, B. (2010), Stakeholder pressure and the adoption of environmental practices: The mediating effect of training, Journal of Operations Management, 28(2), 163–176.

Sato, J. (2004), Comparison between multiple-choice and analytic hierarchy process: measuring human perception. International Transactions in Operational Research, 11(1), 77-86.

Sbihi, A. and Eglese, R.W. (2010), Combinatorial optimization and green logistics. Annals of Operations Research, 175(1), 159–175.

Sharma, M.K. and Bhagwat, R. (2007), An integrated BSC-AHP approach for supply chain management evaluation, Measuring Business Excellence, 11(3), 57–68.

Shepherd, C. and Gunter, H. (2006), Measuring supply chain performance: current research and future directions, International Journal of Productivity and Performance Management, 55(3–4), 242–258.

Shepherd, C. and Günter, H. (2006), Measuring supply chain performance: current research and future directions, International Journal of Productivity and Performance Management,55(3/4), 242–258.

Silvestre, B.S. (2015), Sustainable supply chain management in emerging economies: Environmental turbulence, institutional voids and sustainability trajectories, International Journal of Production Economics, 167, 156–169.

Sloan, T.W. (2010) Measuring the Sustainability of Global Supply Chains: Current Practices and Future Directions, Journal of Global Business Management, 6(1), 92–107.

Smol, M., Kulczycka, J., Henclik, A., Gorazda, K. and Wzorek, Z. (2015), The possible use of sewage sludge ash (SSA) in the construction industry as a way towards a circular economy, Journal of Cleaner Production, 95, 45–54.

Starr, K., Talens Peiro, L., Lombardi, L., Gabarrell, X. and Villalba, G. (2014), Optimization of environmental benefits of carbon mineralization technologies for biogas upgrading, Journal of Cleaner Production, 76, 32–41.

Stefanelli, N.O., Jabbour, C.J.C. and Jabbour, A.B.L. de S. (2014), Green supply chain management and environmental performance of firms in the bioenergy sector in Brazil: An exploratory survey, Energy Policy, 75, 312–315.

Tachizawa, E.M. and Wong, C.Y. (2014), Towards a theory of multi-tier sustainable supply chains: a systematic literature review, Supply Chain Management: An International Journal, 19(5/6), 643–663.

Tenenhaus, M., Vinzi, V.E., Chatelin, Y.M. and Lauro, C. (2005), PLS path modelling. Computational Statistics and Data Analysis, 48(1), 159-205.

The Council of Supply Chain Management Professionals (2008), Tracking the green miles, Industry Week, 267(1), pp. 60.

Toklu, M.C., Erdem, M.B. and Taskin, H. (2016), A fuzzy sequential model for realization of strategic planning in manufacturing firms, Computers and Industrial Engineering, 102(),512-519.

Vachon, S. and Klassen, R.D. (2008), Environmental management and manufacturing performance: the role of collaboration in the supply chain, International Journal of Production Economics, 111(2), 299–315.

Vanalle, R.M., Ganga, G.M.D., Godinho Filho, M. and Lucato, W.C. (2017), Green supply chain management: An investigation of pressures, practices, and performance within the Brazilian automotive supply chain, Journal of Cleaner Production, 151, 250–259.

Viswanadham, N. and Samvedi, A. (2013), Supplier selection based on supply chain ecosystem, performance and risk criteria, International Journal of Production Research, 51(21), 6484–6498.

Walton, S.V., Handfield, R.B., and Melnyk, S.A. (1998), The green supply chain: Integrating suppliers into environmental management processes, International Journal of Purchasing and Materials Management, 34(2), 2–11.

World Economic Forum (2009), Supply chain decarbonization: the role of logistics and transportation in reducing supply chain carbon emissions, World Economic Forum, January, pp. 1-40,

Xie, H., Yue, H., Zhu, J., Liang, B., Li, C., Wang, Y., Xie, L., et al. (2015), "scientific and Engineering Progress in CO2 Mineralization Using Industrial Waste and Natural Minerals, Engineering, 1(1), 150–157.

Youn, S., Yang, M.G. (Mark), Hong, P. and Park, K. (2013), Strategic supply chain partnership, environmental supply chain management practices, and performance outcomes: an empirical study of Korean firms, Journal of Cleaner Production, 56, 121–130.

Young, I. (2009), Sustainable logistics and supply chains, Chemical Week, 171(23), pp. 38.

Zailani, S., Jeyaraman, K., Vengadasan, G. and Premkumar, R. (2012), Sustainable supply chain management (GSCM) in Malaysia: a survey, International Journal of Production Economics, 140(1), 330–340.

Zaman, A.U. (2016), A comprehensive study of the environmental and economic benefits of resource recovery from global waste management systems, Journal of Cleaner Production, 124, 41–50.

Zeng, H., Chen, X., Xiao, X. and Zhou, Z. (2017), Institutional pressures, sustainable supply chain management, and circular economy capability: Empirical evidence from Chinese eco-industrial park firms, Journal of Cleaner Production, 155, 54–65.

Zhu, Q., Sarkis, J. and Geng, Y. (2005), Green supply chain management in China: pressures, practices and performance, International Journal Operations and Production Management, 2(5), 449–468.

APPENDIX 1

QUESTIONNAIRE

Dear Respondent;

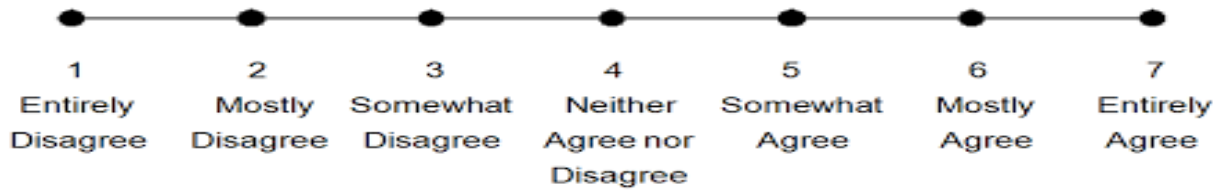
Researcher is a student of Master of Science (Management Sciences) at Bahria University, Islamabad and is conducting research on "Impact of manufacturing performance and Sustainability performance on Supply Chain Performance", In this regard; your cooperation in terms of providing insight on the provided questionnaire is required. The answers provided by you would be kept strictly confidential and will be used for academic purpose only.

Awais Boota

PART A

Education _____
Level of Post _____
Type of Industry _____
Ownership Structure _____
Organizational Annual income _____
Operational period in Business _____
Size of Organization (No. of Employees)_____

NOTE: To fill Part B of the questionnaire, please follow provided 7 point Likert Scale



		Likert Scale 7						
	SCM Performance Items **Amit Kumar Marwah, Girish Thakar & R.C. Gupta ,2014**	1	2	3	4	5	6	7
1	Our supply chain is able to meet special customer specification	1	2	3	4	5	6	7
2	Our supply chain is able to rapidly adjust capacity so as to accelerate or decelerate production in response to changes in customer demand	1	2	3	4	5	6	7
3	Our supply chain is able to rapidly introduce large numbers of product improvements/variations	1	2	3	4	5	6	7
4	There is high level of communication and coordination between all functions in our firm	1	2	3	4	5	6	7
5	There is a high level of integration of information systems in our firm	1	2	3	4	5	6	7
6	Our firm fills customer orders on time	1	2	3	4	5	6	7
7	Our firm has short order-to-delivery cycle	1	2	3	4	5	6	7
8	Our firm has fast customer response time	1	2	3	4	5	6	7
	Manufacturing Performance Items **Dr. Khaled .Khalf . Alafi, 2014**							
1	The extent to which the company has been able to meet its cost reduction goals,	1	2	3	4	5	6	7
2	The extent to which the company has been able to meet its quality improvement goals	1	2	3	4	5	6	7
3	The extent to which the company has been able to meet its customization responsiveness goals,	1	2	3	4	5	6	7
4	The extent to which the company has been able to meet its manufacturing cycle time-reduction goals.	1	2	3	4	5	6	7
	Sustainibility Performance **Wing S. Chow • Yang Chen 2012**							
	Social Sustainibility							
1	Our firm improved employee or community health and safety	1	2	3	4	5	6	7
2	Our firm recognized and acted on the need to fund local community initiatives	1	2	3	4	5	6	7
3	Our firm protected claims and rights of aboriginal peoples or local community	1	2	3	4	5	6	7
4	Our firm showed concern for the visual aspects of the firm's facilities and operations	1	2	3	4	5	6	7
5	Our firm communicated the firm's environmental impacts and risks to the general public	1	2	3	4	5	6	7
6	Our firm considered interests of stakeholders in investment decisions by creating a formal dialog	1	2	3	4	5	6	7
	Economic Sustainibility							
1	Our firm sold waste product for revenue	1	2	3	4	5	6	7
2	Our firm reduced costs of inputs for same level of outputs	1	2	3	4	5	6	7
3	Our firm reduced costs for waste management for same level of outputs	1	2	3	4	5	6	7
4	Our firm worked with government officials to protect the company's interest	1	2	3	4	5	6	7
5	Our firm created spin-off technologies that could be profitably applied to other areas of the business	1	2	3	4	5	6	7
6	Our firm differentiated the process/product based on the marketing efforts of the process/product's environmental performance	1	2	3	4	5	6	7
	Environmental Sustainibility							
1	Our firm reduced energy consumption	1	2	3	4	5	6	7
2	Our firm reduced wastes and emissions from operations	1	2	3	4	5	6	7
3	Our firm reduced impact on animal species and natural habitats	1	2	3	4	5	6	7
4	Our firm reduced the environmental impacts of its products/service	1	2	3	4	5	6	7
5	Our firm reduced environmental impact by establishing partnerships	1	2	3	4	5	6	7
6	Our firm reduced the risk of environmental accidents, spills, and releases	1	2	3	4	5	6	7
7	Our firm reduced purchases of non-renewable materials, chemicals, and components	1	2	3	4	5	6	7
8	Our firm reduced the use of traditional fuels by substituting some less polluting energy sources	1	2	3	4	5	6	7
9	Our firm undertook voluntary actions for environmental restorations	1	2	3	4	5	6	7
10	Our firm undertook actions for environmental audit, public disclosure, employee training and immunity	1	2	3	4	5	6	7

APPENDIX 2

Education of the respondents was also considered as a demographic variable.

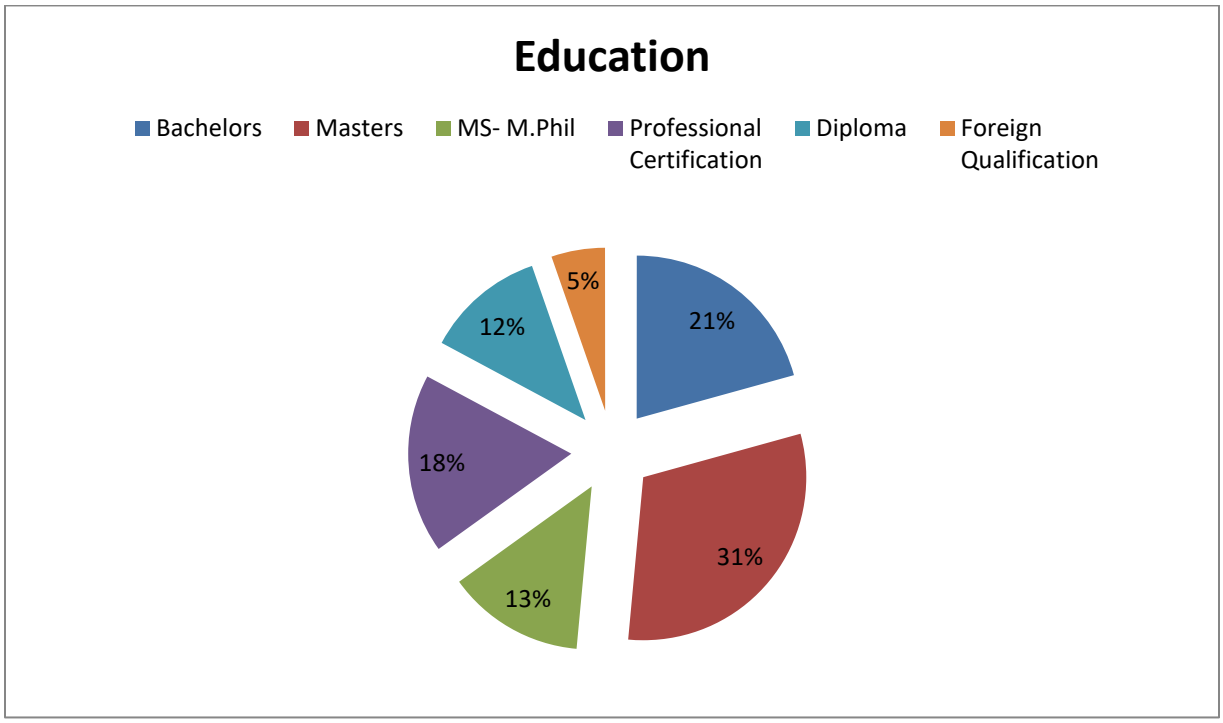
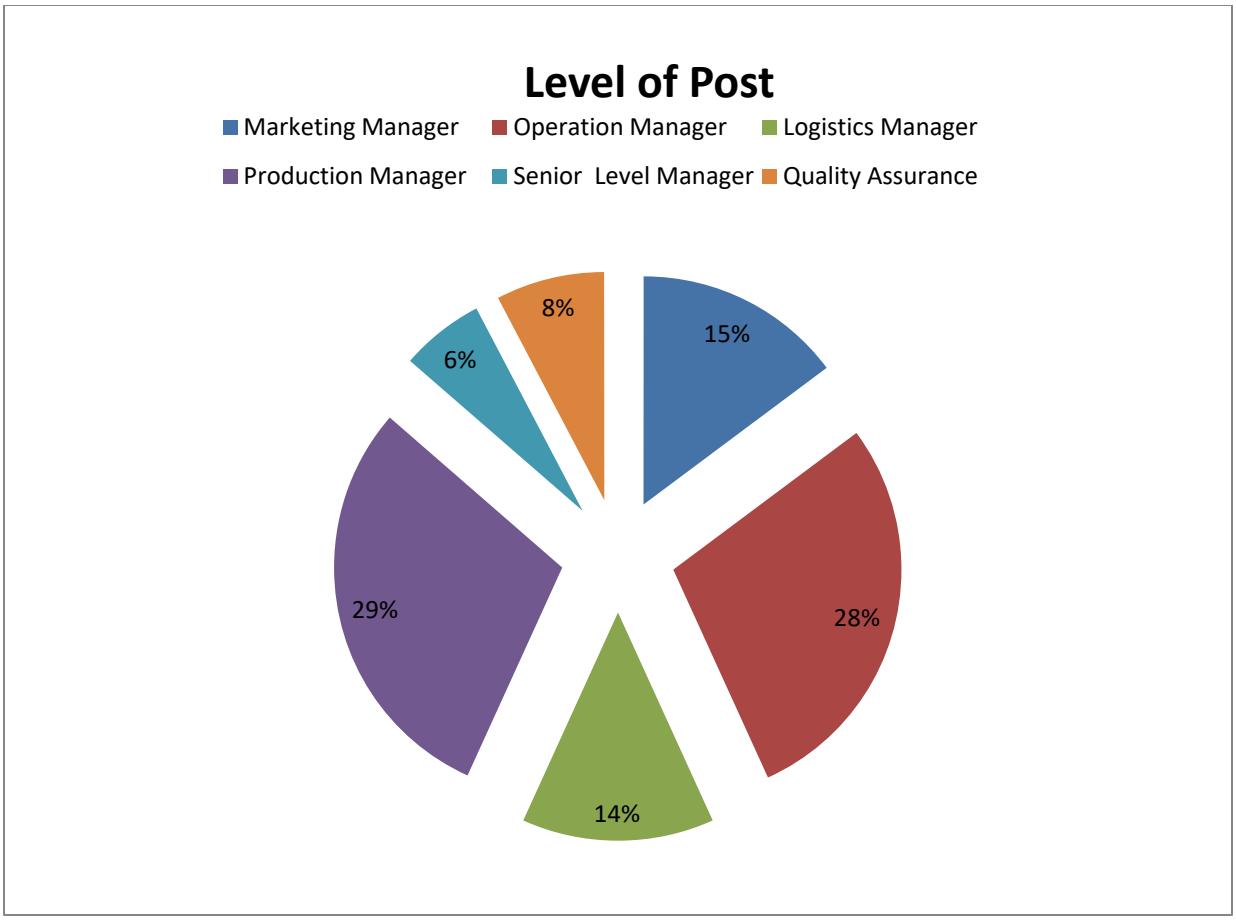


Figure 4-1 Education of Respondents

As the above mentioned figure explains out of the six categories of education the number of Bachelors were 21%, Masters were 31%, MS- M.Phil were 13% , Professional Certification were 18% , Diploma holders were 12 % and Foreign qualified were 5% of the provided respondents

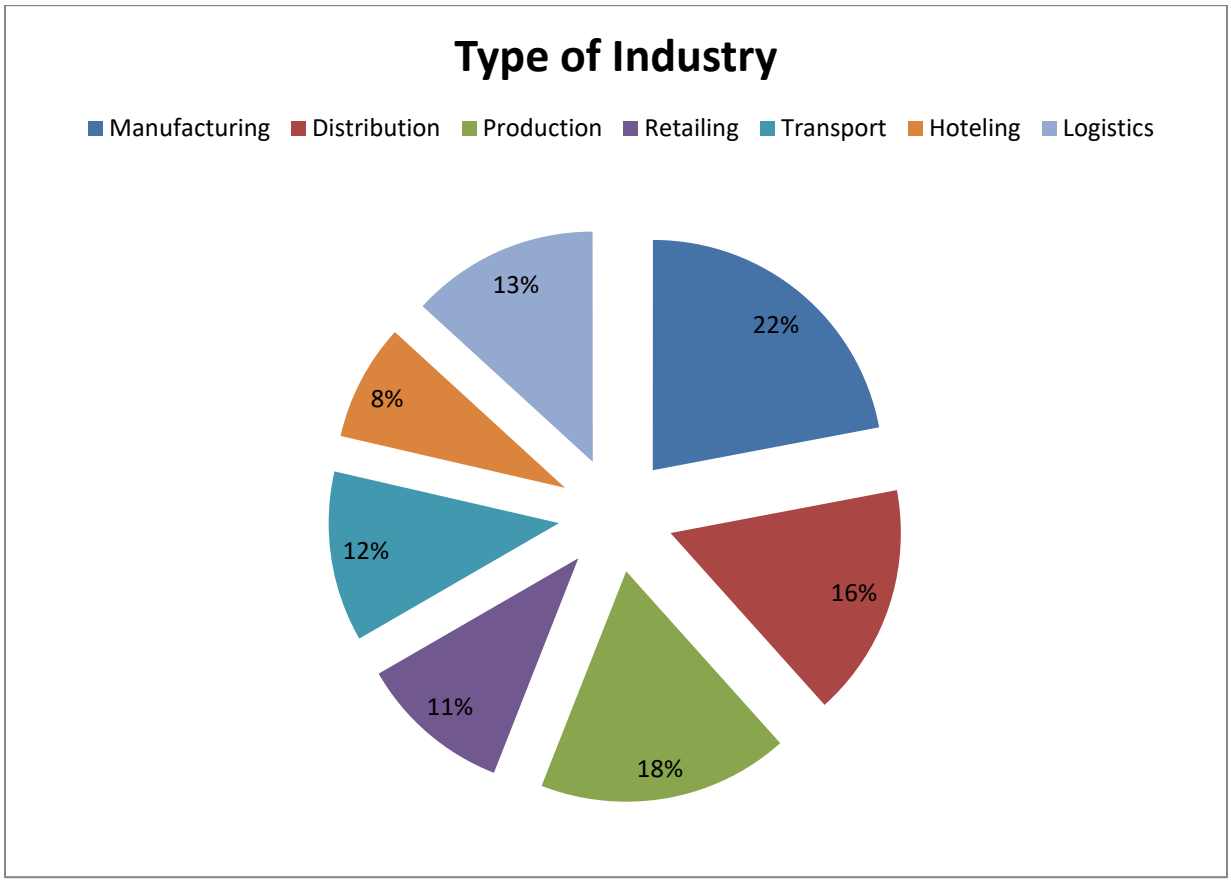
Level of Post of the respondents was also considered as a demographic variable. Six categories of respondents were formed and were contacted for filling the questionnaires.



As the above mentioned figure explains out of the six categories of level of posts respondents as level of posts; Marketing Manager were 15%, Operation manager were almost 28%, Logistics manager were 14%, production manager were 29% , senior level manager were 6% and 8% were quality assurance personnel.

Type of Industry

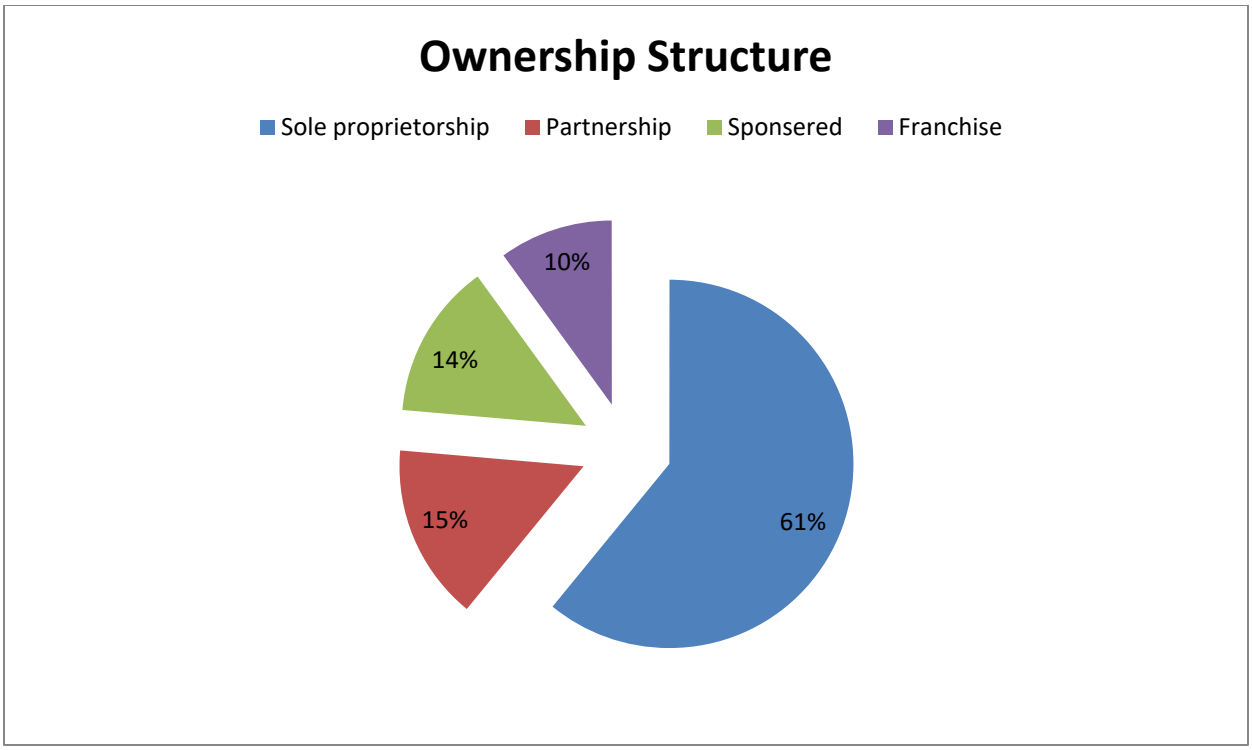
Type of industry of respondents was also considered as a demographic variable. Seven categories of respondents were formed and were contacted for filling the questionnaires.



As the above mentioned figure explains out of the seven categories of type of industry; manufacturing were 22%, distribution were almost 16%, production were 18%, retailing were 11% , Transport were 12% , Hoteling were 8 % and 13% were from logistics industry

Ownership Structure

Ownership Structure respondents was also considered as a demographic variable. Four categories of ownership were formed and respondent were contacted for filling the questionnaires.



As the above mentioned figure explains out of the four categories of Ownership structure of respondents as between sole proprietorship were 61%, Partnership were almost 15%, Sponsored were 14% and other were franchise as 10

Years of Experience

Years of experience of respondents was also considered as a demographic variable. Four categories of experience were formed and respondent were contacted for filling the questionnaires.

Working Experience

As the above mentioned figure explains out of the four categories of years of working experience of respondents as between 1-2 years were 41%, 2-4 years were almost 25%, 4-6 years were 21% and more than 6+ years were 13%.