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RESEARCH ARTICLE

THE ROLE OF PRODUCT RETURNS ON THE RELATIONSHIP BETWEEN GREEN CAPABILITIES AND CLOSE-LOOP SUPPLY CHAIN

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ABSTRACT

Purpose Objective: The study aims to examine the mediating effects of product returns on the relationship between green capabilities and closed-loop supply chain adoption. **Methodology:** The collected data included 203 responses. Purposive sampling technique was used. This study targets the supply chain professionals of Karachi, Pakistan. **Findings:** The results showed that integration capability has significantly positive impact on adoption of CLSC activities (and product returns. In the similar context, recovery capability has significantly positive impact on adoption of CLSC activities and product returns whereby, product returns significantly and positively related to adoption of CLSC. However, manufacturing capability has significantly positive impact on adoption of CLSC activities and manufacturing capability has negatively insignificant impact on product returns. **Implications:** The findings of this research show that the volume of product return does not have mediating effects on the association between the capability of manufacturing and the adoption of CLSC. This shows that the capability of manufacturing has direct impact on the adoption of CLSC. Manufacturers do not have any incentives to make investment in the capabilities of manufacturing to manage the returns of products that can motivate to adopt CLSC. There is a need for firms too to develop associations with the institutions, NGO and also with their market competitors in order to manage the lifecycles of their products in a CLSC.

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INTRODUCTION

In the last ten years, manufacturing firms have focused on the product returns and managing recovery, acknowledging their importance and benefits to economy, society and environment. Relevant policies are adopted for the main goal of reduction of costs of operations and at the same time increasing profits (Rogers & Tibben-Lembke, 2001). The reason was to encourage models of business that can be sustained that focus on creating green markets, management of demand side, reducing waste, renewable energy and low emission of carbon. It will help in developing eco-friendly business and sustainable practices that decrease organizations dependency on natural resources (Bell *et al.*, 2013). Governments are recommending the private firms, manufacturing specifically, to create productive practices of waste management by creating ecological system in the industry to assist the sustainability of the environment (Mitra & Datta, 2014; Unit, 2010).

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Studies have shown the green competency that answers the customers and the stakeholders' environmental dissatisfaction as the important facilitator of closed-loop supply chain (Robotis *et al.*, 2012). However, fewer researches assessed the green capability in the closed-loop supply chain. Also, there are few studies that evaluate the capabilities that are specific to organizations that persuade adopting activities related to environment (Shaharudin *et al.*, 2019). Successful implementation of closed-loop supply chain does not depend on green capabilities alone but also on efficiency, quantity as well as quality of the reverse supply chain production (Guide Jr & Van Wassenhove, 2009). Nonetheless, the studies adding to reverse-supply chain are still small in number even though it is important in illustrating the value of prospect in operations in business (Wang *et al.*, 2013). The study aims to examine the mediating effects of product returns on the relationship between green capabilities and closed-loop supply chain adoption. The includes the recovery capability, integration capability and manufacturing capability as the green capabilities as well as independent variables, while the product returns as the mediating variables and the closed-loop supply chain adoption as the dependent variable in the research model. The methodology includes quantitative, explanatory, correlational research type.

The data will be collected from primary sources that include manufacturing firms in Karachi, Pakistan. The thesis organization includes background, problem statement, objectives and questions in the first chapter. Hypotheses and Literature Reviews included in the second chapter. The methodology included in the third chapter. Data analysis and results included in fourth chapter and conclusion and recommendations in the fifth chapter.

Literature Review: On the basis of resource-based view approach to competitive advantage (Wernerfelt, 1984); for achieving competitive edge in the marketplace, firms should focus on allocating and utilizing available and accessible resources for improving their performance and operational excellence (Barney, 1991). It cannot be declined that firms' capabilities and capacities to effectively utilize their available resources are core aspects and perspectives for achieving their ultimate objectives and improving their core competencies to manage uncertainties and dynamics (Grant, 1991). In this regard, the firms have leveraging possibilities to handle value-added tasks and opportunities to improve their supply chain sustainability through green capabilities. Due to such dynamic transformation in the supply chain operations ultimately result in reducing their costs, enhancing their performance, and leading to supply chain sustainability through effective product return mechanism and close-looped supply chain (Shaharudin *et al.*, 2015).

The NRBV theory (Hart, 1995) correspondent the RBV through seeing perception of environmental. Lower costs while increasing efficiency and productivity it is recommend that the product stewardship, prevention of pollution and justifiable development and reducing the life cycle of the environmental costs of products. Furthermore, this can be motivate or encourage the adoption of CLSCs, development of green capabilities, and product return management (Robotis *et al.*, 2012). Manufacturing capabilities to counter doubts in the movements of product returns which can affect effective CLSC adoption and firms might also encourage green capabilities such as, integration, recovery. In this background, the NRBV offers a foundation for understanding these capabilities comparative to product stewardship (Hart & Dowell, 2011), and how handling returns CLSC adoption can increase product life cycle costs, value chain systems, and market repositioning (Miemczyk *et al.*, 2016). (Shaharudin *et al.*, 2019) performed a research on the mediating impact of return of products on the association between the green capabilities of firms and its acceptance by the closed-loop supply chain. Survey instruments were used for collection of data. Sample for this study were manufacturers in Malaysia who were ISO 14001 certified (EMS, Environmental Management System). The managers of 581 firms were selected through census sampling technique. To test the data gathered from this survey, the approach of two-step structural equation modeling was used. The results of this analysis showed that the integration capabilities and recovery have positive impact on the product returns. The study also showed that the integration capabilities, manufacturing and product returns have impact on the adoption of closed loop supply chain. It was also found in this study that the type, volume, quality and timing of the product returns have partial mediating relationship between the integration capabilities and the recovery. Also this has impact on the adoption of closed loop supply chain. (Coenen *et al.*, 2018) conducted a study to investigate the gaps of knowledge in the dynamic complexity and the deep uncertainty in a shift towards the management of closed loop supply chain, it also provided the challenges that had to be faced in future challenges. In order to study the papers, abductive approach was utilized. There were two concepts they studied. These were the deep uncertainty from decision support literature perspectives and the dynamic complexity from the complex adaptive system perspective and also from the literature of transition management. 64 research papers were examined in this regard. The study revealed that there are methodological gaps, process gaps and the conceptual gaps that are related to the CLSG management along with the deep uncertainty. This study explored the ideas of dynamic complexity and deep uncertainty for the management of CLSC and this study only first time explored this. The studied two concepts were very important for the analysis purpose of CLSC management.

For environment and economy, the closed loop supply chain network design (CL SCND) is a very serious activity. It is crucial to prepare healthy and reliable structures of supply chain and gather the configurations of network that can perform well in difficult cases of uncertainty and risk. In the same scenario, (Prakash *et al.*, 2018) proposed a network of generic closed-loop supply chain on the basis of mixed digit programming formulation with delivery to customers directly from the manufacturing sectors as well as the delivery through different distribution channels with the risk of supply, risk of transportation and the uncertainty in demand with the approach of robust optimization. Many different numerical tests were performed to study the model performance by using four uncertainty levels. These tests have shown that the supply chain networks with uncertainty and risk work more efficiently as compared to other networks that consider risks and uncertainty of supply chain as post-ante.

(Darbari *et al.*, 2019) investigated the closed loop network of supply for the laptop manufacturer in India. The study included a model of mixed integer linear programming problem based on the network configuration that included suppliers, manufacturers, third party logistics, customers, retailers and NGOs, along with the unclear goals to decrease impact on environment and increases the social impact and net profit. Profit was studied though the sale of products. Environmental dimensions were studied thought the emission rate of carbon. The social dimensions were studied by the total working hours, jobs creation, training hours and community service. Numerical weights were used in this paper. The results showed that the CLSC model has significance over the decision support tool in order to improve laptop manufacturer's performance. The results further revealed the theoretical and practical implications. It was stated that the generalized quantitative model of closed loop can be used effectively by other manufacturers of electronic products to improve competitiveness and profit. (Zeballos *et al.*, 2018) studied the network and product design for a multi echelon, multi-product and the multi period closed loop supply chain. The superstructure of network contains two customers' types, factories, raw material suppliers, customer demands, and distribution centers, recycle centers, recovery centers, redistribution centers and the final disposal locations. This study also considered the uncertainty in quality and quality related to the return flows. A detailed literature analysis was performed. Two staged approach of stochastic linear programming was used to examine the improvements in networks by utilizing the risk management in network and product design related problems. European consumer goods Company's case study was used to study the effectiveness of

this approach. The study showed that there is a great connection between network design and product design. Thus it was found that the network characteristics are dependent upon the selected product design. Manufacturers that are the market leaders of developed nations use green practices and have high awareness level regarding the environment. However it is still unknown that what and how the practices can be used in the sector of home appliances of the developing nations like Brazil. (Scur & Barbosa, 2017) conducted a study to analyze the green supply chain management practices used by the manufacturers of home appliances. For this analysis purpose in this industry, case studies of 2 professional association and 5 manufacturers were used. Two interviews were also conducted for collection of data. Results of this analysis have revealed that the good performance of green practices is connected with the large sized companies. Thus there is a positive relationship found between the size of company and their commitment to use environmental practices. This research is helpful for the emerging demands inn market to carry out the legal needs and to use practices relevant to the supply chain management.

A manuscript shows the typology of remanufacturing on the basis of observations conducted on multiple decades on a number of industries relate to remanufacturing. This manuscript also shows that how the managers of different organizations adjust their operations of manufacturing and adjust their strategies to the characteristics of many different industries of remanufacturing. The typology explains four various typological groups on the basis of dimensions of strategic focus of firms and the philosophy design of the product. (Abbey & Guide Jr, 2018) prepared a manuscript that covered a remanufacturing typology that was derived from the observations taken first hand in a number of industries for more than two decades of extensive work. This manuscript by the researchers was the first one that brought awareness and provided a detailed typology related to remanufacturing on the basis of many decades' direct observations in manufacturing industries. The manuscript provides information on how the managers perform their remanufacturing operations and strategies.

The changes in economies is affecting the overall supply chains. The supply chain now is getting closed loop that merges reverse as well as the forward flows of materials and the products. The concept of reverse supply chain was basically known as the solution to manage waste and recover the residual value. This supply chain technique also plays an important role to bring firm competitive advantage. Thus, (Larsen *et al.*, 2018) examined the arrangement between reverse supply chain and the firms' competitive strategies. The study included seven case studies of equipment manufacturers. Semi structured interviews were conducted for primary data collection. The results showed that how RSC can develop three different alignment levels with the competitive strategies of firms. Also it showed the alignment of RSC with the operation, tactical and labeled strategies of the firms. The mechanisms of value creation were ranging from lower cost of manufacturing to the innovation. (Batista *et al.*, 2018) performed a study to identify that how the existing research discussion regarding the supply chain sustainability have contributions on the understanding related to the supply chain configurations' circularity that sustains the regenerative and restorative processes as taken up by the ideal circular economy. To find out the answers of these questions, they performed a detailed literature analysis on the basis of the contents to develop a theoretical model related to the knowledge and conceptualized the idea of circular supply chain. The major perspective of supply chain studied in this paper included the closed loop supply chain, reverse logistics, green supply chains and the wider views of SSCM. Total 49 papers were selected for the review purpose. The review analysis suggested that there is a possible impact of political, scientific and social concerns on the supply chain. The sustainability perspectives of supply chain were seen having balance between the close loop, reverse and wider SSCM. An increase in customization, customer expectations and competition along with the disruptions from supply side create big challenges to the operations of firms. There are many new emerging problems related to flexibility including the uncertainty and risk management, optimal strategies in competition, and environmental sustainability optimal operations with the consumer behaviors that are being studied. (Ivanov *et al.*, 2018) performed an overview related to a detailed literature review of critical issues of research. Further it studied the related research papers. This study classified four major drivers of flexibility that are: resilience, risks, disruption and the supply chain ripple effects, closed loops and sustainable supply chains, smart operations, digitalization and electronic supply chain and the supplier integration and behavioral flexibility. The extensive literature analysis was performed in order to study the mentioned perspectives. The study showed that the innovative and new concepts of flexibility and the models provide a potential way for the operational improvements.

(Shaharudin *et al.*, 2017) conducted a study to investigate the degree to which the manufacturing firms are motivated by the product returns to adopt activities of closed-loop supply chain that effect on the impacts of reverse supply chains. The data for this study was gathered from 150 environmental management system ISO 14001 the certified companies of manufacturing in the Malaysia. The sample was conducted through census sampling method. The data was analyzed through structural equation modeling using LISREL 8.70. The findings of this study showed that there are effects of institutional forces on the closed loop supply chain activities' adoption and on the effectiveness that can be gathered from adoption by the manufacturing firms. These results have added the findings to the previously conducted researches with the help of empirical survey verification on the product returns' importance in the adoption of activities related to closed loop supply chain, that affects the effectiveness of firms in reverse supply chain.

The closed loop supply chain and reverse logistics are the internal parts of the process of waste management. The most important product of reverse logistics and closed loop supply chain is the waste electronic and electrical equipment or e-waste. There are a number of researches conducted on the CLSC and RL with a focus on WEEE however no research publication focused on the product related issues. Thus, (Islam & Huda, 2018) conducted a literature review for 157 papers written from 1999 to 2017. They categorized them and then analyzed them with the help of content analysis method. There were four steps in this method that are descriptive analysis, material collection, material evaluation and the category selection. Four major research types in RL and CLSC fields of e waste were reviewed namely, decision making and performance evaluation, designing and planning of reverse

distribution, qualitative studies and the conceptual framework. The gaps in literature were diagnosed and future study recommendations were suggested. The subject of green supply chain management is still in its emerging age and this concept has been used so far only in limited context. The strategic orientation is an important element that has affected green supply chain management implementation. Still there is no valid and reliable strategic orientation for green supply chain. (Liu & Chang, 2017) introduced closed loop orientation as the suitable strategic orientation for the green supply chain management practices that successfully implement it. Data for this analysis was gathered from 296 manufacturing firms of China with the help of empirically designed questionnaire and the collected data was analyzed with the help of structural equation modeling technique. The method was used to study the relationship among GSCM, CLE and the economic and environmental performance. The results of this study indicated that GSCM and CLO, both have positive impact on the economic and environmental performances and that the CLO has positive effects on the GSCM implementation.

The economic system of globalization includes complex supply chain system where the social and environmental effects are administered in arrangement with diverse expectations of stakeholders and to alleviate the risks of sustainability. The quantitative approach of modeling to have supply chain management sustainability has increased attention given on it. (Rebs *et al.*, 2018) conducted a literature review of the models related to SSCM and SD. Total 102 research papers were selected by the process of well documented sampling. The papers were collected through Web of Science. The papers used for the analysis were published from 1998 to 2017. The content analysis of these past studies investigated the closed loop, reverse and forward supply chain that further included the social and environmental sustainability aspects. It was revealed that the majority models concentrate on the macroscopic analysis levels while the inter-organizational and intra organizational supply chains are less famous. The SD model is connected with the environmental and social sustainability. The importance of close loop supply chains has increased due to different factors such as scarcity of natural resources, the need to focus on societal concerns, the development of regulations by new government and the need to increase economic profit. (Zeballos *et al.*, 2017) focused on the network and product design problems for a multi-echelon, multi-product and the multi period closed loop supply chain. They developed a two staged integration linear model that included uncertainty on the quantity and quality of the return. The performance function of model was dependent upon the concept of conditional value at risk to profit. Thus this approach was used and could avoid the changes in the quantity and quality of the return flows that creates significant variations in the economic performance. The results showed that the decision of network and product design is highly related. The features of majority of the network entities are dependent upon the design of product.

Following are the model hypotheses of the present study.

H1.Recovery capability has significant impact on (a) product returns and (b) closed-loop supply chain adoption.

H2.Integration capability has significant impact on (a) product returns and (b) closed-loop supply chain adoption.

H3.Manufacturing capability has significant impact on (a) product returns and (b) closed-loop supply chain adoption.

H4.Product returns has significant impact on closed-loop supply chain adoption.

RESEARCH METHODOLOGY

Quantitative research focused in developing accurate model and figure to clarify of what is observed. In quantitative research data were gathered in numerical form and quantifiable, tables containing information gather as numbers and statistics. On the other hand, Quantitative study principally have the objective to assess the causal relationship amid variables which is based on specific phenomenon related to the measureable and statistical expressions, Newman and Benz (1998). Therein, in our research quantifiable and numerical data have been gathered for the empirical analysis. Hence our research has used quantitative research approach.

The patterns exploration of phenomenon identified as exploratory purpose. Exploratory research refers to research that has not look into an issue that has not been studied before clearly, also make operational definitions, increase the previous research design, and builds up priorities Marczyk *et al.* (2005); McMillan (1996). In our study context, the explanatory purpose has been directed to re-examine the previously well-known and recognized phenomenon with some sort of changes for enriched outcomes (Babbie & Rubin, 1989). This research has been used explanatory purpose as it aligns well with the research objective and purpose of the study. There are mainly two sorts of data sources namely Primary and Secondary. Information source of the primary data is a unique that is one of only the information was collected by the firsthand for the reason of particular task. Data were gathered in numerous ways in primary source. The utmost well-known procedures stay self-regulated overviews, field perception, interview, and experiments. When gathering primary data, cost is very high and requires great amount of time as compared by the secondary data. If primary data assembly influence be the key suitable plan for a insufficient categories of research,

Sampling technique defines as the assortment of small share of social performers from the whole population to conclude the findings and outcomes as a whole. There are primarily two comprehensive categories of sampling techniques consisting of probability sampling and non-probability sampling. Purposive sampling is one of the commonly used in non-probability sampling techniques Marczyk *et al.* (2005); Scandura and Williams (2000). In our research, Purposive sampling technique has used. In this study, primary data has been collected from the target population. This study targets the population of supply chain professionals. Their feedback gives us the relevant research related information. Human research survey a field of applied statistics, methodology of survey studies the connected survey data gathered techniques and the sampling of individual units from a population, such as methods for improving the number and accurateness of responses to survey and questionnaire structure Mackey and Gass (2015); Marczyk *et al.* (2005). Survey methodology has been used to collect data in this research. This research has used five-point Likert scale questionnaire which has been adapted from previous researches, whereas the scale denoted 1 as strongly disagree and 5 as strongly agree.

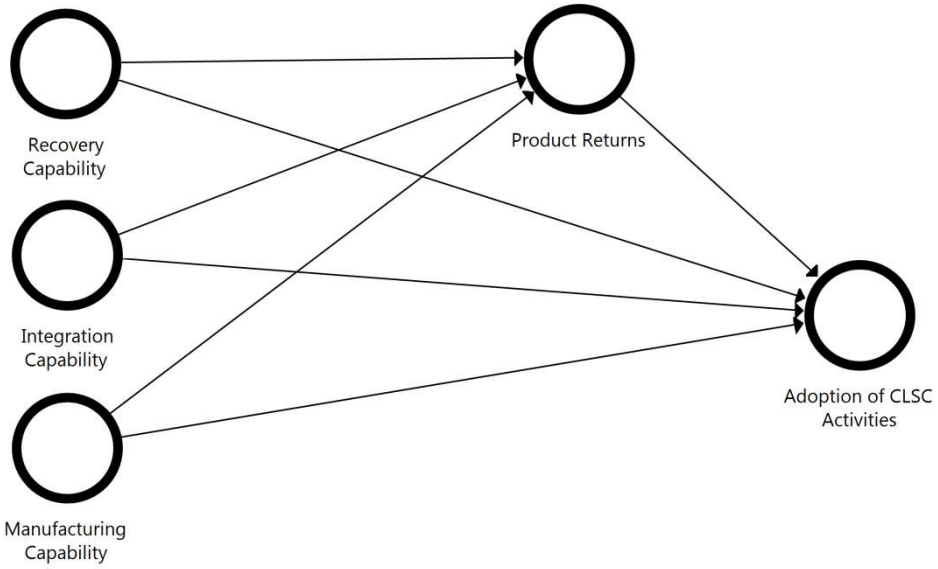

Figure 1. Conceptual Framework

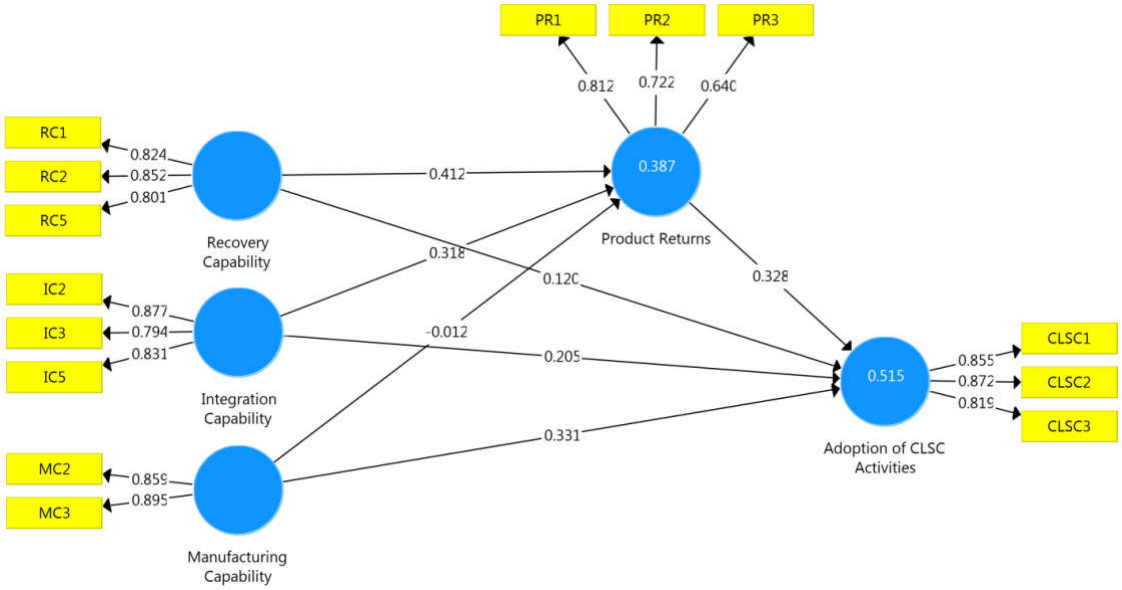

Figure 2. PLS Algorithm using Smart PLS version 3.2.8

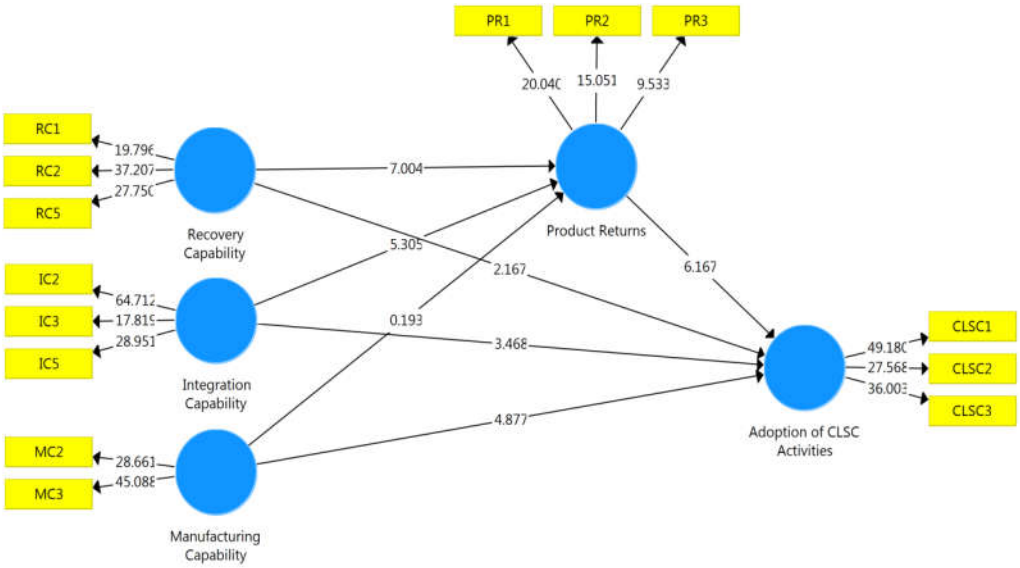

Figure 3. PLS Bootstrapping using Smart PLS version 3.2.8

Table 1. Pilot Study (n = 50)

	N Items	Cronbach's Alpha
Adoption of CLSC Activities	7	0.893
Integration Capability	6	0.773
Manufacturing Capability	5	0.827
Product Returns	5	0.753
Recovery Capability	5	0.810

Table 2: Demographic Profile (n = 203)

		Frequency	Percent
Gender	Male	171	84.2
	Female	32	15.8
Age Groups	21-30	156	76.8
	31-40	47	23.2
Job Position	Manager	20	9.9
	Executive	183	90.1
Qualification	Bachelor	100	49.3
	Master	90	44.3
	MPhil/PhD	13	6.4
Experience	1 year or Less	18	8.9
	2-4 years	118	58.1
	5-8 years	40	19.7
	More than 5 years	27	13.3

This research used Structural equation modeling (SEM) analysis. By using SEM analysis, it is commonly used in the social sciences researches because of its capability to impute complex relationships models amongst unobserved variables constructs (latent variables) from observable variables. SEM includes set of different statistical models and techniques and computer algorithms which is fit for the networks of constructs variables to data (Peffers *et al.*, 2007). As in comparison to regression and factor analysis, Structural Equation Modeling (SEM) is relatively new field in the marketing research. Though, its roots can be traced back in late 1960s but it has emphasized implications in the contemporary research horizon.

Data Analysis

Prior to collect main study data from the target population, it has been emphasized by numerous researchers that variables should provide adequate reliability statistics. It provide considerable grounds that substantiate the main study (Bell, 2014; Edwin & Hundley, 2001; Maldaon & Hazzi, 2015; Saunders, 2011; Wu *et al.*, 2010). Therefore, the study has conducted pilot study with 50 responses from the target population. The result of Cronbach's Alpha reliability analysis for pilot study has been provided in the following table 1. The above tabulation provides reliability coefficients of individual variables as well as reliability statistics of the overall instrument. For assessing reliability, threshold value of 0.70 or above had been considered (Baron *et al.*, 2016; Rangarajan *et al.*, 2016; Rubio Monroy, 2016). The results provided that all the variables had met threshold value of 0.70 and therefore, all the variables found statistically sound for full-study analysis.

Measurement Model: The construct validity has significant importance in PLS-SEM technique for structural modeling analysis. It was stated by Hair *et al.* (2016) that construct validity refers to the assessment of construct development with its measures. Following table 3 shows results of construct validity encompassing outer loadings of measures to their respective constructs. It was stated by Hair *et al.* (2016) that factor loadings should be atleast 0.60 or higher for adequate construct formation. In the above table, it was found clearly that all the items were loaded appropriate to their particular constructs and their factor loadings were also greater than 0.60. Therefore, the construct validity has been achieved for the study. Another important statistical confirmation technique is popularly known as convergent validity. It refers to assess the extent of correlation or degree of convergence among measures of particular construct that have theoretical linkages for conformation (Hair et al., 2016). Following table 4 shows result of convergent validity comprising two measurement parameters i.e. average variance extracted and composite reliability.

It was suggested by Hair *et al.* (2010); Hair *et al.* (2016) that AVE should be greater than 0.50 and composite reliability should be atleast 70 percent for an adequate degree of convergence among measures. Therefore, convergent validity has been achieved. It is another important statistical validity that refers to assessing the degree of differences amongst variables or constructs in the model to secure their distinct characteristics (Hair *et al.*, 2010). Following table 5 shows result of discriminant validity. It was proposed by Fornell and Larcker (1981a, 1981b) that squared-root of AVE for particular variable should be greater than its corresponding other variables of structural model to achieve discriminant validity. This method of discriminant validity has been popularly recognized as Fornell and Larcker (1981a) criterion. In the above table, it was shown clearly that all the constructs have distinct characteristics and role in the model and thus, discriminant validity has been achieved. Following table 6 provides result of Heterotrait-Monotrait (HTMT) ratio for assessing discriminant validity. Above tabulation showed HTMT ratio for all the study constructs. Threshold to fulfill HTMT criterion for discriminant validity, as suggested by Henseler *et al.* (2015), should be below than 0.85. In this case, all the constructs have met the threshold value as HTMT ratio values found below than 0.85. Therefore, all the constructs have met HTMT ratio criterion for discriminant validity.

Structural Model: Following table 7 provides hypothesis testing using path analysis and estimations were evaluated at 95 percent confidence interval. Above table showed that integration capability has significantly positive impact on adoption of CLSC activities (0.205, $p < 0.05$) and product returns (0.318, $p < 0.05$). In the similar context, recovery capability has significantly positive impact on adoption of CLSC activities (0.120, $p < 0.05$) and product returns (0.412, $p < 0.05$); whereby, product returns (0.328, $p < 0.05$) significantly and positively related to adoption of CLSC activities. However, manufacturing capability has significantly positive impact on adoption of CLSC activities (0.331, $p < 0.05$) but interestingly, manufacturing capability has negatively insignificant impact on product returns (-0.012, $p > 0.05$). In addition, the results have also unvieled that recovery capability has most influence on product returns, followed by integration capability; whereas adoption of CLSC activities in the pharmaceutical companies of Pakistan has been most influence by manufacturing capability, followed by product returns and least influenced by recovery capability. These results and findings postulated the significance of reverse logistics and closed-loop supply chain activities in the pharmaceutical firms of Pakistan. The combination of manufacturing capability, integration capability and recovery capability can explain variability in product returns upto 38.7 percent while all explanatory latent constructs can cumulatively predict change in the adoption of CLSC activities upto 51.5 percent.

Table 3. Outer Loadings

	Adoption of CLSC Activities	Integration Capability	Manufacturing Capability	Product Returns	Recovery Capability
CLSC1	0.855				
CLSC2	0.872				
CLSC3	0.819				
IC2		0.877			
IC3		0.794			
IC5		0.831			
MC2			0.859		
MC3			0.895		
PR1				0.812	
PR2				0.722	
PR3				0.640	
RC1					0.824
RC2					0.852
RC5					0.801

Table 4. Construct Reliability and Validity

	Composite Reliability	Average Variance Extracted (AVE)
Adoption of CLSC Activities	0.885	0.720
Integration Capability	0.873	0.697
Manufacturing Capability	0.869	0.769
Product Returns	0.770	0.530
Recovery Capability	0.866	0.682

Table 5. Fornell-Larcker Criterion

	CLSC	IC	MC	PR	RC
Adoption of CLSC Activities	0.849				
Integration Capability	0.581	0.835			
Manufacturing Capability	0.493	0.471	0.877		
Product Returns	0.554	0.503	0.172	0.728	
Recovery Capability	0.425	0.463	0.082	0.558	0.826

Table 6: Heterotrait-Monotrait Ratio (HTMT)

	CLSC	IC	MC	PR	RC
Adoption of CLSC Activities					
Integration Capability	0.731				
Manufacturing Capability	0.649	0.631			
Product Returns	0.740	0.744	0.276		
Recovery Capability	0.529	0.588	0.186	0.807	

Table 7. Hypothesis Testing using PLS-SEM

	Est.	S.D.	T-Stats	Prob.
Integration Capability -> Adoption of CLSC Activities	0.205	0.059	3.468	0.001
Integration Capability -> Product Returns	0.318	0.060	5.305	0.000
Manufacturing Capability -> Adoption of CLSC Activities	0.331	0.068	4.877	0.000
Manufacturing Capability -> Product Returns	-0.012	0.062	0.193	0.847
Product Returns -> Adoption of CLSC Activities	0.328	0.053	6.167	0.000
Recovery Capability -> Adoption of CLSC Activities	0.120	0.055	2.167	0.030
Recovery Capability -> Product Returns	0.412	0.059	7.004	0.000

Table 8. Predictive Relevance

	R Square	R Square Adjusted	Q Square
Adoption of CLSC Activities	0.515	0.505	0.350
Product Returns	0.387	0.378	0.192

DISCUSSIONS AND CONCLUSION

The research findings shows that there is a partial mediationn of prduct returns on the association between the capabilithy of recovery and the adoption of CLSC having no direct impact between the two shows the significance of the manufacurers and motivates the retuns of product. With no sufficient returns volume, organizaions will not go for making a new investment or will not reassign the available resources away from the activities that are known to develop higher and better benefits (Batista *et al.*, 2018).

Adding with the direct impact discussed earlier, the product returns having partial mediating effects shows the indirect effects of the capabitliy of integration on the adopiton of CLSC. Having this capabitliy, the organizations develop a position to gain the policies for return and warranty and also the policies and processes for the design, quality and manufacturinng related to the product that can affect the timing and volume of product returns that results in the adoption of CLSC (Islam & Huda, 2018).

The results tha the **volume** of product return has no mediating effects on the association between the capabilit of manufacturing and the adoption o fCLSC shos that the capability of manufacturing has direct impact on the adoption of CLSC. Manufacturers do not have incentives in Malaysia to make investments in the capabilities of manufacturing to manage product returns that can develop motivationn for the adoptionn of CLSC (Ivanov *et al.*, 2018). Thus they will continuously rely on the new materials having very limited focusing on the remanufacturing recycling or reusing the used parts. There must be a collaboration of supply chain members with the external partners develop a complete design of CLSC and to gain the sustainability and joint green objectives (Larsen *et al.*, 2018). Organizations are also required to develop their associations with the instituions, NGOs and also with the market competitors to develop their product's lifecycle in a CLSC (Mackey & Gass, 2015).

The Closed loop supply chain ensures the reduction of waste in any production system and it further ensures the consumption of this waste by the help of different strategies by combining the repairing, remanufacturing, refurnishing, reusing and the recycling process of the product. The results gathered from this study showed that the activities of closed loop supply chain were affected positively and significantly by all variables of the study. Thus, these factors need to be focused by the managers in order to maintain the closed loop supply chain activities within their supply chain management. Further the study has identified that the product returns is negatively affected by the manufacturing capabilities of an organization. The more authentic and accurate the manufacturing capability a company has, the less of its products would be returned from the market. Defects in the manufacturing techniques make it common for a company to get continuously returns of the damaged goods from the market. This increase in the product returns is not a good sign for company's image in the market and thus the managers have to take this issue very seriously and must make certain policies in order to reduce this product returns. The manufacturing side must be focused first as the majority of the defects come from the technical side of the product. After detecting the fault in the manufacturing side, the managers not only have to take immediate actions to resolve the issue at a time, but they also have to make sure that the problems do not occur again. This study provides various recommendations for the future researchers as well. Firstly, the sample size gathered and determined in this study is very small; therefore it is not possible to generalize the findings of the study. Hence, it is recommended to increase the sample size in order to escalate the chances to generalize the findings of the study in future. Secondly, this study follows the correlational research design; however by following causal design in future should help to understand about the indicators that may behave as a cause to effect the CLSC adoption and product returns.

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