The Impact of Integration in Supply Chain Macro Processes on Supply Chain Performance with The Moderating Role of Information System Support

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Abstract

The objective of this study was to discover the impact of integration in Supply Chain Macro Processes and its effect on the supply chain performance with the moderating role of Information system support. For the purpose of data collection, questionnaires were distributed to targeted respondents and a total figure of 212 questionnaires duly filled has been incorporated in this study. Correlation and regression analyses were applied on the data collected for its further analysis. The results show that the integration in supplier, internal supply chain, and customer relationship in supply chain using information system support has a great impact on supply chain performance. Through this study, it has been revealed that in the emerging market economy of Pakistan, the suppliers and customers involvement in supply chain is very critical for the improvement of supply chain performance. The better the integration with suppliers and customers, the better will be the supply chain performance and as result the organization can progress and can increase its revenue. This study will also be helpful for supply chain execution in CPEC.

Keywords: Supplier integration, Internal supply chain, Customer relationship, Supply chain performance, Information system support, Pakistan.

JEL Classification: M300

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1.   Introduction

In the current decades, the improvement of the supply chain performance has grabbed attention of various researchers and supply chain managers. Enhancement of the supply chain performance has become one of the critical topics in various industries due to start of CPEC for achieving competitive advantages. Supply chain is the two-sided movement of data, material and money amongst the primary suppliers and end customers passing from various companies and the supply chain management comprises of the arrangement, execution and monitoring of this movement (Nurmilaakso, 2008).

Nowadays, many companies are head-to-head for improving their firm's effectiveness in order to compete in the 21st century global market. This market is electronically linked and it has a dynamic nature. In the perspective of a dynamic supply chain, the nonstop development in the performance has become a serious concern for the vendors, manufacturers, and the associated retailers to gain and maintain competitiveness. In practice, the various supply chain centered companies (e.g., Dell, Lenovo, Samsung, Wal-Mart, Toyota etc.) have used different perfor-mance enhancement practices for supporting of their organization's supply chain policies (Cai et al., 2009). Almost all managers are very much aware that the key to get success in market is shining in tailoring one's contributions to the explicit needs of each client although still upholding low costs and prices (Anderson & Narus, 1995).

Among the several areas of the supply chain improvement, information sharing has gained much attention of the scholars. As the information presented at each stage of the supply chain has a direct influence on assembly scheduling, inventory mechanism and distri-bution plans, information sharing has become the key driver of the functional performance. By the effective communication of information in the supply chain network, an organization can immediately find out the difficulties regarding the requirements of the customers, particu-larly once the customers need to have info focused on their specific demands and concerns at any time and everywhere. This type of information can support the organization to plan in advance for countering these demand shifts, and is essential for achieving its better working performance (Liu et al., 2013).

a)   What is the impact of Supplier Relationship (SR) on Supply Chain Performance (SCP)?
b)   What is the impact of Internal Supply Chain (ISC) processes on Supply Chain Performance (SCP)?
c)   What is the impact of Customer Relationship (CR) on Supply Chain Performance (SCP)?
d)   Does using information support system will moderate the effect of SR, ISC, and CR on SCP?

This study will aim the use of latest information support system practices applicable for the supply chain improvement, such as Electronic Data Interchange (EDI), Electronic Fund Transfer (EFT), Radio Frequency Identification (RFID) for logistics, World Wide Web (www.) order system and Order Management Software (OMS) linked through internet with supply chain partners.

The study expects that by application of information system support, the supply chain performance will boost up considerably as a result of better integration of supply chain macro processes. The findings of the study will guide the leaders and the senior management who are continuously devoting their managerial and financial resources to increase the organization's supply chain performance, hence increasing their business revenue. This study will also be helpful in supply chain execution in (China–Pakistan Economic Corridor) CPEC.

2.   Literature Review

According to the work of Chopra and Meindl (2003), all the supply chain processes can be classified into three major processes namely; Supplier Relationship Management (SRM), Internal Supply Chain Management (ISCM) and Customer Relationship Management (CRM). And these three major supply chain processes are termed as the Supply chain Macro Processes (Chopra & Meindl, 2007). This is also consistent with the study of Schoenherr and Swink (2012). Advances in IST have an enormous influence on the development of supply chain management. As an outcome of such technological developments, supply chain associates can now work in close-fitting direction for the optimization (Austin et al., 1995).

The integration of supply chain processes and their impact on supply chain performance has been studied by various researches in the recent years (Mackelprang et al., 2014; Qrunfleh & Tarafdar, 2014; Huo, Wang, & Zhao, 2014). A number of past studies have also revealed that the introduction of information technology for integrated supply chain control could lead to improved productivity and effectiveness of the firm, compared to the current logistics systems (Goldhar & Lei, 1991). For instance, under the existing warehouse management system, it is necessary to have appropriate space to preserve a large inventory for in-time supply. Integrated supply chain management employing information systems and a common supply chain databank can enable the firm to classify ideal inventory levels, decreased warehouse space and growth in inventory's overall gross revenue (Kaeli, 1990).

2.1   *Supplier Relationship Management and Supply Chain Performance*

Establishing and retaining valuable relations with suppliers has turned out to be more critical for the organizations for staying competitive in the market (Prajogo et al., 2012).

Choosing the right suppliers considerably reduces the acquiring cost and increases business efficiency (Choy, lee, & Lo, 2003). A main factor of the customer's profitability is the measuring of the amount of money spent on goods and for their services. Hence the importance of outsourcing has increased radically in the past years. Therefore, customers demand for low procurement costs but trying not to compromise on the quality. Making good relationships with suppliers is one of the techniques of achieving price reductions (Walter et al., 2003) and therefore increasing the supply chain performance. SRM initiates cost reductions by empowering updated business practices and enhanced flow of the information (Herrmann & Hodgson, 2001). A mixture of practices, approaches along with the use of technologies which the enterprises commonly used to accomplish and scrutinize client's relationship throughout the client lifecycle (Chakravorti, 2006).

In business markets, long-term coordination has become one of the key concerns in associations among customers and their suppliers (Ganesan, 1994). Long-lasting relations with designated suppliers are seen as a basis of a stronger practical position. Continuing affiliations with suppliers' support firms to be more effective in procurement along with more realistic in providing quality and in decreasing business costs (Sheth & Sharma, 1997). As a result, companies are starting to officially recognize and compensate differences among their qualified suppliers so as to develop and sustain supportive relationships (Dorsch et al., 1998). To create a set of relations with qualified suppliers who fortify the competitive position, consumers should be capable of knowing the important differences among these suppliers. Dorsch et al. (1998) establish in their study that linkage quality can be regarded as a base for the enlargement and execution of effective and desired supplier programs. Cost lessening approaches in supply chain management emphasis on the discovery of the most effectual and inexpensive ways to procure and store products and transport them from point 1 to point 2 to ensure the customer contentment (Christopher, 1999). Maloni and Benton (2000) have established a model of influence in the supply chain. Their study suggests that a stronger customer–supplier bond increases the overall performance in the supply chain.

Hypothesis 1: A good supplier relationship management will have a positive impact on the supply chain performance.

2.2   *Internal Supply Chain Management and Supply Chain Performance*

By the integration of internal supply chain processes, the internal functions of the firm are well organized and result in the betterment of supply chain performance (Schoenherr & Swink, 2012). According to the study of Gunasekaran, Patel, and Mc-Gaughey (2004), the elements through which supply chains run into a competition, flexibility is considered as a the most critical one. In the perspective of supply chain

management, the internal information sharing has been found to improve the process of information exchange among the participants in supply chain network and adds to the profitability (Rai, Patnayakuni, & Seth, 2006). The objective of global manufacturing is to make the most of through the design and control of material flows within the system (Cohen et al., 2013). The purpose of the supply chain management does not finish once the product is delivered to the customer. After-sale transaction activities play a vital role in customer facilitation and provide important feedback that can be utilized for additional improvement in the supply chain performance (Gunasekaran et al., 2004). A decision making needs to be founded on the complete business details of technology and expertise to be used for the best business practices (Kaltwasser, 1990). In contemporary business practices, competition is no longer among companies, but amongst supply chains (Wu, Chuang, & Hsu, 2014).

From the several models discussed in this section, and their impact on internal supply chain processes for cost reduction and performance improvement, it can be concluded that;

Hypothesis 2: An efficient internal supply chain management will have a positive impact on the supply chain performance.

2.3   *Customer Relationship Management and Supply Chain Performance*

According to Christopher (2016), the building of good relationships with customers will result in the increase of customer satisfaction and lowering the associated costs, hence increasing the supply chain performance. Customer relationship consist of the complete range of actions which are engaged for the handling of customer complaints, formation of long-lasting affiliations with customers, and increasing the customer satisfaction (Claycomb, Dröge, & Germain, 1999). Various firms view CRM mainly as investing software and latest technology, while others see the CRM role for typically developing extended and fruitful relationships with customers (Reinartz , Krafft, & Hoyer, 2004).

Customer relationship management (CRM) has turned into a very essential module in the competitive and economical industry environment in the 1990s and at present it has become a multi-million-dollar industry (Choy et al., 2003). Fundamental sources for increasing customer satisfaction comprise of manufacturing constantly good quality products in addition to the provision of excellent customer service. CRM is a practice through which a firm makes the most of consumer information in the struggle to increase faithfulness and preserve consumers' trade for the lifetime (Choy et al., 2003). It was discovered how novelties surrounded by supply chain communication systems affect network relations & market performance (Kim et al., 2006).

The main objectives of CRM are (a) to form extended and gainful relations with preferred customers, (b) become closer to these selected customers at each single place of interaction, and, (c) take full advantage to increase the share of the company in the customer's wallet (Shaw, 1999).

Hypothesis 3: A good customer relationship management will have a positive impact on the supply chain performance.

2.4   *Moderating Role of Information System Support and Supply Chain Performance*

It has been discovered in the past studies that by the use of Information Technology (IT) systems, the supplier's relationship will be more organized and will result in an improved supply chain performance (Prajogo & Olhager, 2012). In the study of Cannon and Homburg (2001), they describe supplier information sharing as the degree up to which the supplier willingly shares data about the upcoming events that could be valuable for good customer relationships. They include (1) significant cost savings, (2) improved approachability and adaptability to customer needs, and (3) considerably more rapid order cycles. Collectively these advantages can result in significantly much less duration to increase the market segment based on the consumer's demand (Choy et al., 2003).

According to the study of Schoenherr and Swink (2012), the use of Information Technology (IT) will improve the collection, distribution and presentation of important information obtained through supplier's and customer's integration processes, and eventually will result in the improvement of operational and supply chain performance of the firm. The majority of the earlier researches presented in this study show that the induction and deployment of Information System in value chain practices will ultimately improve the firm's supply chain effectiveness by the well-organized association and collaboration of different supply chain activities (Hewitt,1994). Technology includes novel developments to decrease main process times and lead times ominously for the optimization (Schroeder & Flynn, 2002). The selected purchasing practices and client relation practices are strongly related with the apparent monetary and market achievement of companies (Tan, Kannan, & Handfield, 1998).

The findings of Prajogo and Olhager (2012) showed that the use of Information Technology (IT) systems will significantly harmonize the planning and execution stages of supply chain operations between the firm and its customers, consequently increasing the supply chain performance. Customer relationship management (CRM) is considered much significant in competitive professional organizations since late 1990s and has now become a multimillion-dollar industry (Choy et al., 2003). The fundamental components for increasing customer satisfaction comprises of manufacturing constantly good quality products and

delivering high quality of customer support. CRM is a route through which a corporation makes the most of the available customer information for the purpose to maximize trust and preserve customers' trade for the lifetime (Choy et al., 2003). Supply-chain optimization is the application of different processes and tools to make ensure that the optimal operation of a manufacturing and distribution takes place (Poirier & Reiter, 1996).

Past studies conclude that well developed cooperation within the supply chain insist on all the supply chain members to implement e-business linkages or a joint IT setup for information sharing (Horvath, 2001).

Hypothesis 4: Information system support will moderate the positive effect of supplier relationship management on supply chain performance.

Hypothesis 5: Information system support will moderate the positive effect of internal supply chain management on supply chain performance.

Hypothesis 6: Information system support will moderate the positive effect of customer relationship management on supply chain performance.

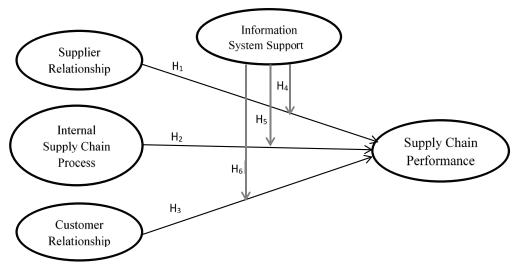## 2.5   *Research Model/ Conceptual Framework*

Figure 1: Research Model

3.   Research Methodology

3.1   *Research Design*

A quantitative approach has been used to examine the effect of supply chain macro processes (supplier relation, customer relation & internal supply chain processes) on supply chain performance was measured. The fundamental theme of this study is the usage of information system support for integration of supply chain macro processes and then analyzing their impact on overall supply chain performance. The research on these study variables was conducted on the basis of self-reported questionnaires involving respondents related directly to the supply chain process. This is basically a line of work study because the participants i.e. the industry persons were contacted on their job to fill out the questionnaires in their regular work environment.

3.2   *Population and Sampling*

This research survey consists of the population of the industry persons related to the supply chain process in the private and public sectors of the five big cities of Pakistan (Islamabad, Lahore, Faisalabad, Peshawar and Karachi). The study was based on the field survey. Cross sectional sampling technique was used in this research. These techniques were used for appropriate results with randomized responses of participants and to avoid any type of biasness. The respondents were mostly sales managers, area managers, product managers, procurement managers and also their immediate juniors from different industries of Pakistan.

For the purpose of data collection, 250 questionnaires were distributed from which 217 were received back. Same figure was analyzed, from which 212 were found complete/correct. Response rate was 84 %, and it is quite favorable as only targeted respondents were consulted for the data collection rather than generalized public. To increase the spectrum and range of this research, the primary data used in this study has been collected from various organizations of different sectors. Having in consideration the title of study, the data has been critically gathered only from those companies that incorporate supply chain in their businesses.

4.   Data Analysis and Results

In the first step scale consistency was measured for each scale individually, in the second step Pearson coefficient of correlation was checked. Furthermore, multiple regression analysis was conducted to check the strength of association between variables. In the last step moderation analysis was done to check the moderation effect of Information support system. For knowing the reliability of the scales used, the Cronbach Alpha of each variable scale was calculated using SPSS.

According to Hair et al. (2006) and George and Mallery (2003), the value of Cronbach Alpha above 0.70 is considered acceptable. The reliability of each variable's scale is given below.

Table 1
Reliability Analysis (Cronbach Alpha)

	No. of Items	Cronbach Alpha
Supplier Involvement	6	0.76
Customer Involvement	7	0.78
Internal Supply Chain	7	0.77
Information Support Sys.	6	0.81
Supply Chain Management	10	0.80

4.1   Correlation Analysis

Table 2
Moderating Regression Analysis

		Mean	SD	1	2	3	4	5
1	SI	4.160	0.429	1				
2	ISC	4.105	0.446	.618**	1			
3	CI	4.165	0.423	.692**	.737**	1		
4	ISS	4.221	0.443	.64 3**	.640**	.605**	1	
5	SCP	4.189	0.388	.663**	.628**	.665**	.681**	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
  Sample Size, N = 212

Table 4.7 revealed that there exists a strong relationship between Supplier Involvement (SI) and Supply Chain Performance (SCP) at correlation r = 0.663 (significance value of $p \leq .01$**). The Customer Involvement (CI) has also strong relationship with Supply Chain Performance (SCP) at r =0.665 at value of $p \leq .01$**. Internal Supply Chain integration (ISC) has also positive correlation with the dependent variable, i.e. Supply Chain Performance (SCP) with r=0.628 and $p \leq .01$**. Similarly, the moderator, Information System Support (ISS), also indicated a strong relationship with the dependent variable i.e. Supply Chain Performance (SCP) having correlation r =0.681 and significance $p \leq .01$**.

In correlation analysis, it is found that all study variables are correlated with each other, which also indicates the acceptance of overall research model.

4.2   Regression Analysis

Table 3
Moderating Regression Analysis

Predictor(s)	Supply Chain Performance		
	B	R^2	ΔR^2
Step-I			
Control Variables		.026	
Step-II			
Supplier Involvement	.234**		
Customer Involvement	.215**		
Internal Supply Chain	.322**		
Information System Support	.382***	.598	.573***
Step-III			
SI x ISS	.321***		
ISC x ISS	.299***		
CI x ISS	.302***	.621	.615***

*P<0.05, **P<0.01, ***p<.001, ns= none-significant.
SI x ISS = Interaction Term (Product of Supplier Involvement and Information System Support), ISC x ISS = Interaction Term (Product of Internal Supply Chain and Information System Support), CI x ISS = Interaction Term (Product of Customer Involvement and Information System Support).

R2 and ΔR2 will be the same for IV and Moderator in whole step (Step-II), so this will be treated for both IV and Moderator. The same will be applicable in Step-III. For the testing of hypotheses, moderated regression analysis was utilized in this study.

The first hypothesis (Hypothesis 1) proposed that "A good supplier relationship management will have a positive impact on the supply chain performance". The results of regression analysis have shown that Supplier Involvement had a significant positive influence on the supply chain performance and the beta value was found to be β = 0.234 and significance level was **p<0.01. So, the Hypothesis 1 is validated.

The second hypothesis (Hypothesis 2) proposed that "An efficient customer relationship management will have a positive impact on the supply chain performance". The results of regression analysis have directed that the customer relationship management have a significant effect on the supply chain performance ($\beta = 0.215$, p <0.01ns). Therefore, Hypothesis 2 is supported.

The third hypothesis (Hypothesis 3) proposed that "A well internal supply chain management will have a positive impact on the supply chain performance". The results of regression analysis have illustrated that the Internal supply chain management had a significant positive influence on the supply chain performance and the beta value was found to be $\beta = 0.322$ and significance level was **p<.01. So, the Hypothesis 3 is supported.

The fourth hypothesis (Hypothesis 4) stated that "Information system support will moderate the positive effect of supplier relationship management on supply chain performance such that the relationship will be stronger with the information system support". The results of regression analysis have indicated that the moderating role of Information System Support between the Supplier relationship management and supply chain performance have a significant effect ($\beta = 0.321$, ***p<.001). Therefore, Hypothesis 4 is supported.

The fifth hypothesis (Hypothesis 5) states that "Information system support will moderate the positive effect of internal supply chain management on supply chain performance such that the relationship will be stronger with the information system support". The results of regression analysis have revealed that the moderating role of Information System Support between the Internal supply chain management and supply chain performance have a significant effect ($\beta = 0.299$, ***p<.001). Therefore, Hypothesis 5 is supported.

The last hypothesis (Hypothesis 6) stated that "Information system support will moderate the positive effect of customer relationship management on supply chain performance such that the relationship will be stronger with the information system support". The results of regression analysis have revealed that the moderating role of Information System Support between the customer relationship management and supply chain performance have a significant effect ($\beta = 0.302$, ***p<.001). Therefore, Hypothesis 6 also supported.

5.   Discussion, Practical Implications, and Directions for Future Research

5.1   Discussion

This study was focused on the measures to be taken for the improvement and enhancement of the supply chain performance. This study is conducted in Pakistan, which is a developing market in the developed market economies of the world.

The aim of this study was to find out the impact of integration of supply chain macro processes on the supply chain performance with the moderation of information system support. The method used in this study for the testing of hypotheses by applying the moderated regression analysis method, developed by Cohen and Lee (1989). The data analysis results have provided support for this hypothesis and revealed that the supply chain performance will boost up when an effective and efficient supplier relationship management is done. The positive relationship exists among these variables and they are also strongly correlated to each other. These results are consistent with the studies of Wilson (1995), Sheth and Sharma (1997), Maloni and Benton (2000), Herrmann and Hodgson (2001), Choy et al. (2003), Walter et al. (2003) and Prajogo et al. (2012).

The results of this study revealed that the more a company focuses on the Supplier relations and Customer relations in the developing economy of Pakistan, the better will be the performance of the supply chain. Here the missing link was the focus on the internal supply chain processes of a company and also the use of information system support for the supply chain integration.

5.2   *Practical Implications*

If the companies are strongly linked with their customers, they can timely convey all the required information to their integrated suppliers which they need to line up their manufacturing and distribution plans. The synchronization between demand and supply and timely communication with suppliers and customers will minimize the bullwhip effect (Danese, Romano, & Formentini, 2013). However, as the company's resources are constrained and the leaders should prefer the most beneficial use of these available resources, the results of this study propose that for the objective of increasing the supply chain performance in the developing countries, the managers must spend in to improve the communication among suppliers and customers instead of investing within the company.

These cooperative actions among with suppliers and customers will enable the organization to mutually buildup a better estimation of the future demand, create more accurate plans to fulfill that demand, and organize its actions in a more efficient way to complete the job (Barratt, 2004).

5.3   *Theoretical Contribution of the Study*

This study contributes to the body of knowledge of the supply chain management and also provides support to past theories. The results of this study are in line with the Structural contingency theory (SCT) proposed by Lawrence and Lorsch (1967).

5.4   Directions for Future Research

1. These results were of the emerging market economy; a similar study in developed market economies may reveal different results where commercial, societal, political and industrial trade systems are different.
2. Results of this study maybe coupled with the cultural effects, a cross-cultural study can be performed to find out the cultural effects on the supply chain performance.
3. About 57 (27%) questionnaires were collected using Online Internet Survey (google forms) for the convenience sample of companies and its results may contain bias, therefore it is advised to take it into account when applying these results on a specific population.
4. The data collected was from food manufacturing industry, pharmaceutical industry and electrical parts manufacturing industries. A future study can be conducted on different type of industries such as the services industry, architecture and construction industry, software industry, power & energy sectors.
5. In this study, the supply chain performance was measured with respect to the Information driver only. Besides the Information driver, there are five other supply chain drivers too such as, Facilities, Transportation, Inventories, Sourcing and Pricing. The effect of these other five drivers on supply chain performance can also be studied and it may reveal useful results.

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