

## Supply Chain Integration and Performance: The Effects of CPEC on Long Term Relationships, Information and Logistics Integration

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### Abstract

The study shows the effect of CPEC on supply chain integration, long term relationship of firms with suppliers and performance for the businesses operating in Khyber Pakhtunkhwa. The supply chain integration included the logistics integration and information integration. The information integration further consists of use of information technology and information sharing. The firms selected for this study include pharmaceutical, hospitality, light engineering, energy and construction operating in Peshawar, Khyber Pakhtunkhwa, Pakistan.

**Keywords:** CPEC (China Pakistan Economic Corridor); Supply chain integration; Long term relationship; Performance; Information technology and information sharing

### Introduction

The recent investment by the Chinese enterprises in Pakistan under CPEC is creating major change in the local business environment of the country especially Khyber Pakhtunkhwa [1]. The different projects under CPEC are creating a wave of change in the economic values of the country ranging from Gwadar in the South to Khunjab in the extreme North [2]. The dollar 46 billion investment in energy, rail, roads, Gwadar development, fiber optics and industrial zones manufacturing is equally affecting the local industry either in positive or negative ways [3]. It is very necessary to study the effects of this huge investment on the local industry and thus make the local investors aware of this fact that changes in the business activities is required due to upcoming CPEC projects in the country. The dollar 46 billion investment will affect different areas of the economy like human resources, manufacturing, use of technologies, use of new methods of productions and generations of energy, introduction of new financial management methods, the use of new engineering and medical techniques, use of innovative technologies in the field of construction, use of new internet and computer technologies for controlling and monitoring purposes and introducing new approaches for managing the supply chains [4,5]. Every part of the economy which is directly or indirectly affected due to CPEC should be studied and analyzed in details and there is a need of providing some concrete findings that can provide benefits to local industries, investors and investment under CPEC projects.

This research study is conducted for the purpose of finding effects on the supply chain integration of logistics and information, long term relationship with key suppliers and the overall performance of the local industry if the CPEC is implemented. The study is conducted for finding out the effects of CPEC on the supply chain integration of construction, energy, light engineering, hospitality and pharmaceuticals industry or businesses, the main reason for this study is that the supply chain concepts explain the performance of the organizations in terms of supply chain integration and information flow, that is there is a flow of materials and equally important information and the new investment under CPEC may effect this flow of materials and information along with the relationship of industries with their key suppliers either positively or negatively.

### The one belt one road initiative

The Chinese one belt one road concept is the outcome of US Army

Lt. Col. Eisenhower proposal who in 1956 signed a bill related to 41,000 miles' National system of Interstate and Defense Highways for safe and speedy travelling. The Chinese adopted this concept but with a different approach, that is they want to connect the whole China's businesses hub with the emerging economies of South Asia, Middle East Asia, Europe and Africa through safe, short and speedy road and rail networks along with the sea route. Thus, introduces a concept of one belt one road for the old existing Silk Road. The one belt and one road initiative passes through 62 countries including countries of South Asia, Middle East Asia, Europe and Africa. The projects included in this belt road initiative include roads, high speed railways, pipelines, ports, airports, and inland communication links across Eurasia. This concept will be greatly beneficial for China but the benefit will also be for the countries where this route passes through.

### The supply chain integration concept

Supply chain is the basis of every business, either small or large. Therefore, management of supply chain is very important for the success of the business. The supply chain included the initial part of the chain in form of supplier, then the manufacturer, the distributor and the final factor in form of customer [6]. The supply chain is an association of customers and suppliers; they work combined and thus buy, convert, distribute and finally sell the end products in form of goods and services for their better interest. The management of supply chain include different areas, like logistics, transportation, inventories, manufacturing, distributions, procurement, storing, ware-housing and information flow [6]. The supply chain consists of the abilities and working of the firm that can effectively and efficiently design, fabricate, distribute, sell, support, use and recycle a product. The successful supply chain can only result from the better integration system in each part of the supply chain. The integrated supply chain can produce results which are desirable to the business [6]. An integrated supply chain is the one which bring the supplier and customer together and

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optimize their overall performance to create, distribute and support an end product. The importance of supply chain integration is equally valued by the researchers and practitioners, and concluded its use in supply chain performance [7]. The supply chain integration is a vast concept and consists of so many areas and their integration in the supply chain, the most important of them is the logistics integration and information integration [7].

In this study we investigate the effect of CPEC among information integration, logistics integration, long term relationship and the effect on performance. We use construct developed and verified by Prajogo and Olhager [8]. We review the relationships and present the hypotheses. Then, the survey methodology and results are presented. Finally the well organized and detailed implications for strategies makers and business owners are discussed. The innovative and new approach used in this study is never used before and to the best of our knowledge, this is the first study to include all of these variables and finding effect of these variables in a different way on different industries in Khyber Pakhtunkhwa due to CPEC [8].

## Literature Review

China Pakistan Economic Corridor shortly as CPEC is a structure of connectivity of different regions. There will be people to people contact through a vast network of roads, rails and air transportation, thus will increase the businesses and economy of the region through cultural, academic and regional knowledge integration between the people of both countries [9]. CPEC is related to cooperation and integration in transport including roads, rails and air transportation, energy and industrial parks [9]. CPEC will make Pakistan as a focal point for the convergence of civilizations of 21<sup>st</sup> century as it will help China trade with EU, Middle East, East Africa, Russia and Central Asian Republics and thus will create Afro-Eurasian integration [10]. Using Pakistan as a route for trade purpose, China can reduce the shipping cost and transit time, as China is the world's first exporter with a volume of \$2.25 trillion and the world's second importer with the volume of \$1.56 trillion [11]. Less shipping cost and transit time for the transportation of goods for the China imports and exports is related to the effective and efficient logistics integration and hence long term performance [11]. The need for integration in all aspects arises because this is a huge investment, the designed plan and implementation is very necessary so that disappointment of the smaller provinces is overcome through proper information sharing and logistics integration [12] because the performance is related directly to the supply chain integration, comprises of logistics and information integration [13]. The supply chain integration in form of material and information integration has direct effect on the performance of the businesses and projects involved in CPEC [9], as it supports the flow of soft and hard information flow mechanism after logistics integration activities including the flow of materials in both the directions [7], that is from supplier to customers and from customers to supplier [14]. The logistics systems of Pakistan will be affected because of CPEC projects, as it is considered as a game changer not only for Pakistan but will help Afghanistan, Tajikistan, Uzbekistan and Turkmenistan to approach the sea routes effectively. Thus the logistics of all nations along with the flow of information will occur from one end to the other which need mutual integration and their relationship will lead to performance [5]. The CPEC will benefit the local, national and international firms of all kinds operating in Pakistan and thus will create positive and long term relationship with the suppliers [1-5]. The multi million dollars investment by Chinese firms in different sectors of Khyber Pakhtunkhwa will have variable effects on the businesses operating on local basis [15]. The foreign

investment effect the local supply chain of the businesses directly and thus there is need of imitating strategy for local businesses in order to compete with the foreign enterprises [16]. The foreign direct investment has two types of effects, in short term the firms will have less benefit, because many companies will have to innovate and cooperate with foreign enterprises in order to stay in the business, in long term the businesses will become more efficient and more productive especially construction sector [17]. CPEC projects will create new jobs and will boost Pakistan's GDP, increased government revenue, and can increase international trade. On the other hand there may arise so many hurdles to the local businesses and enterprises, like unjust and unfair competition with Chinese industries due to special tax policies and rebates, concern of local industries regarding smuggling and trafficking associated with CPEC route, there are also chances of profit repatriation in form of dividends, management fees and transfer pricing due purchasing from Chinese Industries and then sell in local market at a margin, increase in inflation rate may also occur.

## Theoretical Background and Hypotheses

The theoretical background and hypotheses are based on the concept of integration, including logistics and information, the information integration further comprises of information technology and information sharing and their effect on performance. In the same way we discussed the long term relationship with supplier and its direct impact on performance. The subsequent development of hypotheses for linking long term relationship with suppliers, information integration, logistic integration and performance is also discussed in this section.

### Logistics integration

The world of today is innovative in the sense that, there is a need of bringing changes in the internal operations (such as managing inventory and controlling processes) and bringing suppliers and customers in the overall value chain process as an integrated part [7]. As a result of seamless logistics integration the connection between firms and suppliers create no boundaries and thus well-coordinated flow of materials from suppliers allow smooth production [14,18,19].

The findings of Li et al., [20] are about the significant relationship between supply chain integration and performance. The hypothesis for logistics integration is formulated as:

**H1.** There is a positive relationship between logistics integration and performance.

### Supply chain information integration

The supply chain information integration consists of information technology and information sharing and they are viewed as an example for the logistics integration [7]. The information technology deals in the technical part that is IT connection of the supply chain information integration and information sharing part covered the social portion including sharing of information and trust.

**Information technology:** As per studies of Chen and Paulraj [8] information technology play active role in three aspects like it increases firms volume of information communicated to partners, it also allows firms to plan its activities related to supply chain including managing inventory level, timings of the production and condition of the end to end delivery, another aspect of IT is facilitating the smoothness between firms and suppliers operation for best output. The hypothesis for information technology is formulated as:

**H2.** The use of information technology and logistics integration is related positively.

**Information sharing:** Along with the technological aspects of the information, the quality, quantity and frequency of the information in the supply chain integration also play vital role in improving the outcomes of the firms and thus managing them increases the performance [7]. The operations of partners in the supply chain depend on the strategic decision and information sharing gives the strategic capabilities to firms to share their information in order to make strategic decision [20]. The hypothesis for information sharing is given as:

**H3.** The sharing of information and logistics integration are positively related

### Long term relationships

In the present days of the supply chain integration mechanism the literature suggests three important uses of long term relationship with the suppliers. The first included building long term relationship with the key suppliers, secondly, use of short base of suppliers and thirdly stating key suppliers as a strategic part of the firms operations [7,8,20].

The remaining hypotheses for long term relationship are given as under:

**H4.** Long term relationship and information technology are negatively related;

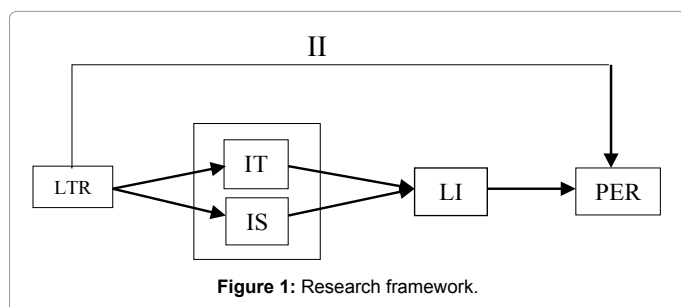
**H5.** Long term relationship and information sharing are negatively related;

**H6.** Long term relationship and performance are related in a negative way.

### Research framework

The model uses for this study is based on the analysis of supply chain integration, including logistics integration and information integration. The model shows the systematic approach in relating long term relationship of the key supplier with the firm and integrating their material flow from one end to the other end, integrating information technology and information sharing for improving the long term performance [7]. The difference in this model is its application on a real life scenario, which is to check all these aspects of businesses operating in Khyber Pakhtunkhwa province of Pakistan and finding the effect of China Pakistan Economic Corridor CPEC on these variables in a new way. The framework developed for the study is shown as under, this includes all the six hypotheses in the form of a diagram.

According to given research framework the long-term relationship (LTR) of supplier and firms with one another is linked to performance (PER), the same long term relationship is linked to information sharing (IS) and technology (IT) subparts of information integration (II) and material flow in other words logistics integration (LI), which in turn increases long term performance of the firms? (Figure 1).



## Methods

### Sample and procedures

The data for this research was collected from owners and managers of construction, pharmaceuticals, hospitality, energy and light engineering firms of Peshawar Khyber Pakhtunkhwa, Pakistan in the start of 2017. The list of the firms from which responses were generated is collected from industrial estate of Hayatabad and the names present on the internet. In total 40 questionnaires were distributed, 8 questionnaires in each sector, that is construction, energy, pharmaceuticals, light engineering and hospitality.

The basis for the construction of questionnaire was taken from Prajogo and Olhager [7] and the concept was applied in a new way to show the effect of CPEC investments on these local businesses as a whole. The respondents included owners, supply chain managers, procurement managers, operation managers and other employees on managerial posts from the light engineering, construction, energy, hospitality and pharmaceutical firms. The percentage of employees is different in different organization, 55% of the responses came from firms with below 100 size, 42.5 % responses came from firms with size in between 100-500 and 2.5% responses are generated from organization with more than 500 employees. In terms of qualification, 12.5% holding bachelor degree, 77.5% holds master's degree and 10% of the respondents holds MS/MPhil degree. According to position in the company 65% responses came from owner/CEO of the business, 12.5% responses came from supply chain manager, 2.5% responses came from procurement manager and the remaining 20% responses came from manager operations.

### Measure

The questionnaire construct was mostly based on the items used by Prajogo and, Olhager [7] and thus its validity is ensured in this way. The questions were based on responses using a concept of 5 point Likert scale, showing 1 as strongly disagree, 2 as average disagree, 3 as neutral, 4 as average agree and 5 as strongly agree.

## Data Analysis

### Scale validity and reliability

The validity measurements of all the items used in this research are checked using confirmatory factor analysis CFA. The analysis shows that all the items are significant, acceptable and uni-dimensional convergent with the actual measures. The internal consistency and reliability of the items used in the study is checked through the values of Coefficients of Alpha generally referred as Cronbach's Alpha ranging from 0.00 to 1.0, showing that 0.00 is negative consistency and 1.0 is the perfect realistic data consistency. The values near to 70% and above are reliable values and remaining 30% shows the error variance. The values of coefficient of Alpha calculated for this data is reliable for all 25 items, as the value is greater than 70% as shown in the Table 1. The lower value of Cronbach's Alpha for performance is due to the nature of items used in it, such as speed of deliveries, variety products or services, flexibility and cost related performance of the firms. This lower value is due to actual well performance, which when deleted gives the value of .952, which is valid and reliable now.

### Structural model

The structural model of the study hypothesized different effect of CPEC on the long term relationship, supply chain integration and performance of pharmaceuticals, hospitality, light engineering,

Scales	Items	Cb A'	Cb A
Long term relationship	Last long time relationship with key supplier	0.925	0.968
	Collaboration with key supplier to improve quality in long run	0.925	
	Long term alliance	0.927	
	Supplier as an extension	0.926	
Information technology	Direct computer to computer link with key suppliers	0.891	0.976
	Inter-organizational electronic link with supplier	0.890	
	It enabled transaction processing	0.890	
	Electronic mailing capabilities with suppliers	0.889	
	Electronic transfer of purchase orders funds and or invoices	0.890	
	Advanced information system for tracking and expediting of shipments.	0.890	
Information sharing	Sharing of sensitive information with key supplier	0.889	0.981
	Providing information to key supplier	0.888	
	Frequent timely and informal information exchange with key supplier	0.888	
	Provision of information effecting third party	0.890	
	Face to face planning and or communication with key supplier	0.888	
Logistics integration	Inter-organizational activities	0.891	0.966
	Yours and suppliers logistics activities	0.890	
	Maintaining seamless integration with key suppliers	0.889	
	Distribution transportation and or warehousing activities	0.892	
	Inbound and outbound distribution of goods with key supplier	0.891	
	Well performance	0.927	
	Speed of deliveries	0.892	
Performance	Capacity flexibility	0.891	0.410
	Degree of product variety	0.890	
	Production cost	0.889	

Cb A\*: Cronbach's alpha.

Table 1: Scale validity and reliability.

construction and energy firms. The results of hypotheses are shown as under. The ratio of  $\chi^2$  to degree of freedom  $df$  is less than the standard value of 3.0 and thus shows the fitting of this model to the collected data. The ratio of  $\chi^2$  to  $df$  is 2.44 calculated from  $\chi^2=657.402$  and  $df=269$ . The hypotheses are proved from the path analysis of the above fit model and assumptions are given as under:

For hypotheses 1 the findings are given as: The logistics integration of all firms is positively related to performance as shown with a beta value of 0.78 and is significant

For hypotheses 2 the findings are given as: The information technology and logistics integration of all firms are related positively with a beta value of 0.25, and is significant

For hypotheses 3 the findings are given as: The sharing of information and logistics integration of all firms are related positively with a beta value of 0.55, and is significant

For hypotheses 4 the findings are given as: The long-term relationship and information technology of all firms are related negatively with a beta value of -0.94, and is insignificant

For hypotheses 5 the findings are given as: The long-term relationship and information sharing of all firms are related negatively with a beta value of -1.02, and is insignificant

For hypotheses 6 the findings are given as: The long-term relationship and performance of all firms are related negatively with a beta value of -0.32, and is insignificant (Figure 2).

## Discussion

From above findings and analysis it is deduced that the China Pakistan economic corridor has a positive effect on the logistics

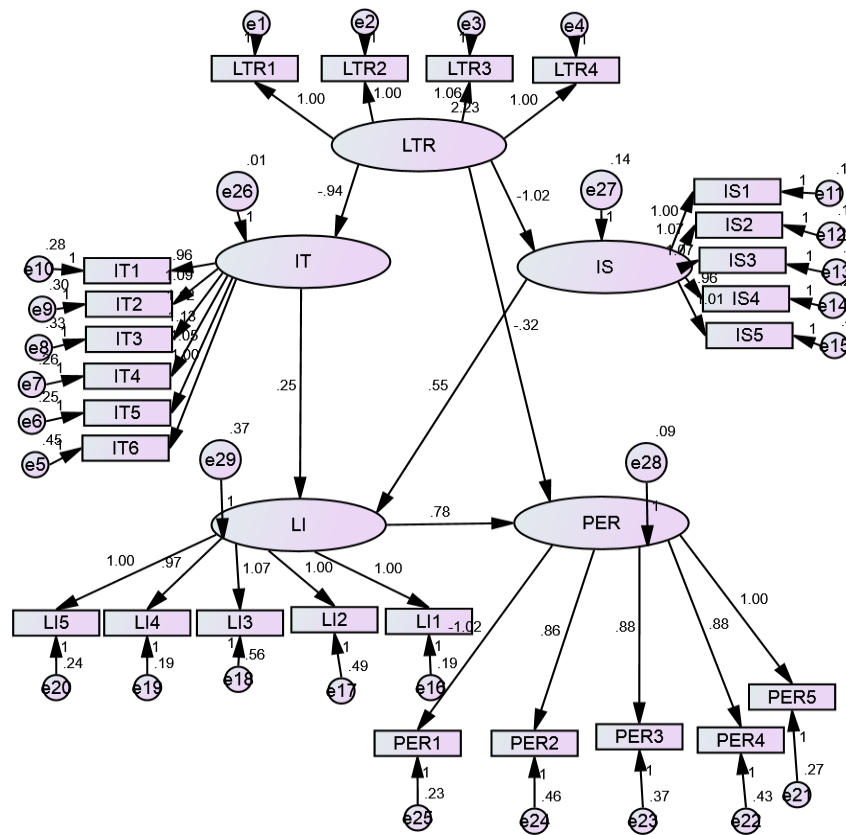
integration and performance of all firms including hospitality, pharmaceutical, light engineering, construction and energy thus local businesses need to improve their activities in terms of increased and innovative methods for logistics integration. There is a positive effect of CPEC on the logistics and information technology of all the firms and the same positive effect on the sharing of information with key suppliers and logistics integration due to CPEC. There is a negative effect of CPEC on the long term relationship, information technology of all firms. There is a negative effect of CPEC on the long term relationship and information sharing and there is a negative effect of CPEC on the long term relationship and performance of all firms.

## Limitations and Further Research

In this study the effect of CPEC was analyzed only for the businesses of Peshawar, Khyber Pakhtunkhwa. The study finds the effect of CPEC on only construction, energy, pharmaceuticals, light engineering and energy businesses thus so many other aspects can be seen across Pakistan. This study targeted the supply chain integration, long term relationship of firms with their suppliers and performance of the firms, taking idea from Prajogo and Olhager [7]. Time is another limitation in this study. The questionnaire was distributed to 40 respondents from different businesses.

As the CPEC is contemporary topic and no detailed research work is done on this topic related to supply chain management and integration, so there is a need of exploring new dimensions and relationships in this area. There is a chance of findings numerous other effects of CPEC on the local industry of Pakistan like banking and educational sectors. Beside supply chain, one can go for analyzing effect of CPEC on Pakistan economy and finding its positive and negative on local investments.





LTR: Long Term Relationship; IT: Information Technology; IS: Information Sharing; LI: Logistics Integration; PER: Performance.

Figure 2: Path flow diagram and path loadings.

**Conclusion**

From above discussion effects the supply chain l... pharmaceutical, hospitality, and light engineering, construction and energy firms. There is a need of innovation and improvement in the logistics activities in order to compete with the Chinese firms dealing in logistics. CPEC has a positive effect on information technology, information sharing and logistics integration of all the above mentioned firms, thus there is a need of making new arrangements in order to improve these firms regarding information technology, information sharing and logistics integration. The long term relationship, information sharing, technology and performance of pharmaceutical, hospitality, light engineering, construction and energy firms are negatively affected due to CPEC activities.

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