

# Evaluation of the Costs through the Logistics Value Chain (LVC) in Vietnam: An AHP Approach

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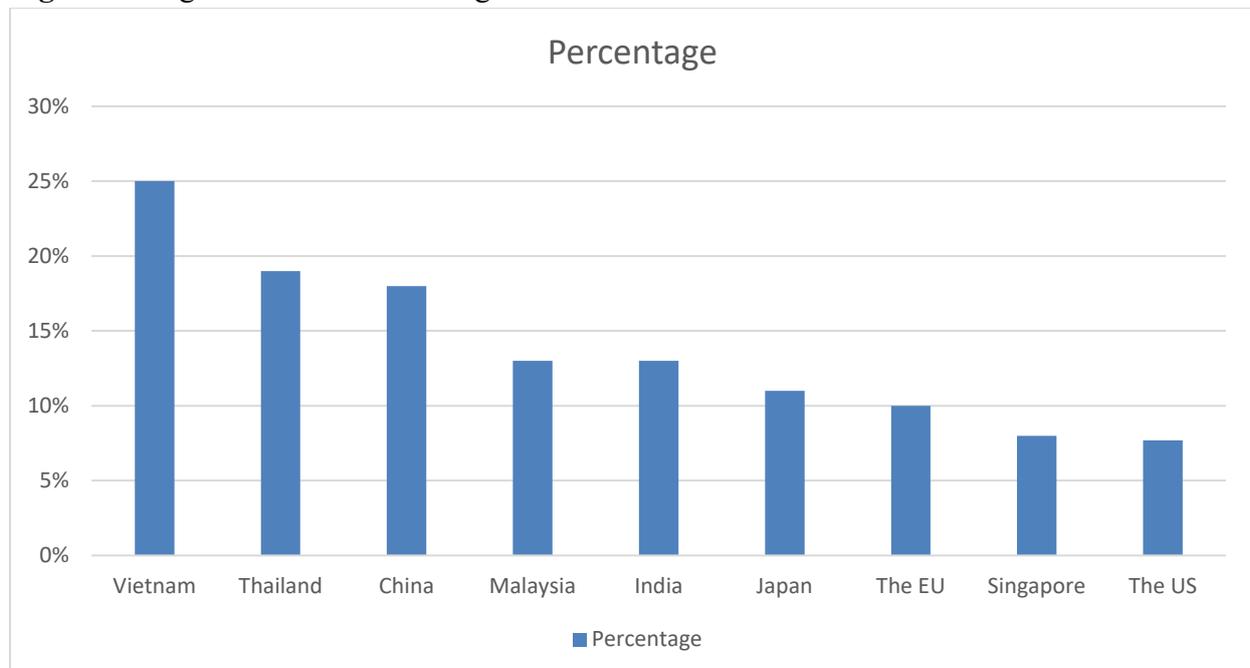
Globalisation has been helping the logistics industry in Vietnam grow quickly in recent years. Logistics costs in Vietnam are considered to be very high, however, very little quantitative evidence of this is shown in the existing literature. Therefore, this paper aims to evaluate logistics costs in Vietnam to see which costs are taking up the most cost, thereby helping managers and policy makers to be more accurate in their adjustments and decisions. To do so, the authors of this study have adopted the AHP method to build the research model that includes various costs in the logistics value chain and establish an expert questionnaire with the desire to collect data from experts in the given field. As a result, 20 experts were interviewed. The findings show that the costs of production and storage are the highest criteria, while costs of procurement and transportation also need to be reduced. Thus, the competitive advantage of costs in Vietnam seem not to be correct for the logistics industry. Managers need to further improve production capacity and technology in processing storage and transportation. Policymakers need to further break their policies in terms of cutting procedures, licenses, and calling for investment in infrastructure in the country.

**Keywords:** *Logistics Value Chain (LVC), Costs evaluation, Vietnam, The AHP.*

## Introduction

In recent years, Vietnam has been known as an attractive location for foreign direct investment. In line with this trend, Vietnam has also continuously joined various international economic organisations and signed bilateral or multilateral trade agreements. This has led to an increase in the volume of goods import and export from the country (Barai, Le, & Nguyen, 2017; General Department of Vietnam Customs, 2020). This has caused logistics activities in Vietnam to grow rapidly in recent years with the presence of many multinational companies such as DHL, DKSH, DB Schenker, etc. and thousands of local businesses operating throughout the value chain from suppliers, manufacturers, and warehouses to distributors (Binh, 2018). However, the reality shows that the logistics value chain in Vietnam is still relatively weak due to the weakness of infrastructures including transportation, information technology, roads, electricity, water, etc. together with the lack of high-quality workforce and the complicated policies (Binh, 2018). All of these determine the costs of logistics. According to statistics, logistics costs in Vietnam are much higher than the rest of the world (Banomyong, Huong, & Ha, 2017). In ASEAN, some countries such as Thailand or Singapore have reduced logistics costs, while in Vietnam costs remain at a high level. According to the World Bank (WB, 2018), logistics costs (transportation, warehousing, customs clearance, etc.) in Vietnam are about 20.9-25% of GDP. This cost is 6% higher than in Thailand, 12% higher than in Malaysia, and 3 times higher than in Singapore (see Figure 1) in which transportation accounts for about 50% - 60%, too high compared to other countries.

**Figure 1:** Logistics cost as Percentage of GDP



**Source:** The WB 2018

Thus, the paradox is that Vietnam is emerging as an attractive country in cost competition with other economies in the world. However, the logistics industry does not follow this trend. The logistics industry in Vietnam has not promoted all the advantages of logistics. Some businesses have not seen the important role of logistics in reducing production and business costs. Activities in logistics such as marketing, production, inventory, transportation, and distribution, seem not to link closely in order to create value.

This problem has also been pointed out by many articles or reports in forums, conferences, or professional journals. Very few studies have built the costs model throughout the logistics value chain. In addition, very little quantitative evaluations have been conducted with regards to those costs to see which costs are accounting for the highest proportion, which expenses are needed to be focused on settling. For these motivations, the authors decided to conduct a quantitative study using the AHP decision-making model to quantify expert assessments about costs incurred during the operation of a logistics system. To simplify this process, the researchers have grouped the costs based on the logistics activities in the order of purchasing, production, storage, and distribution process. The study is expected to be completed after providing the most comprehensive picture of the costs incurred in the logistics industry along with empirical evidence.

Managers in logistics businesses can see the crucial role of reducing the costs of production and business. At the same time, policy makers will consult for decisions to reduce procedures and management processes which have been considering to be less effective in Vietnam.

## **Literature Review**

### ***Logistics value chain (LVC)***

The logistics value chain is a concept integrated by the meaning of logistics value and value-added in the chain (Rutner & Langley, 2000). The value chain is a concept of business management of which states that the greater the value an organisation generates, the higher the profits it receives (Porter, 1985). The value chain concept was used in place of several popular terms, such as supply chains, international production networks, global commodity chains, etc. owing to its possibility of sufficiently encompassing possible chain operations and final products (Gereffi & Kaplinsky, 2001). There are two components contributing to the value chain modelled by Michael (DATE) which are elementary activities (including internal logistics, operations, external logistics, marketing and sale, and service) and complementary activities (including procurement, technology, human resources and infrastructure) (Porter, 2011).

Along with the strong development of the world economy towards globalisation and regionalisation, the role of logistics has become increasingly significant to link activities in the value chain, from supplying, producing, to distributing and expanding markets for economic

activities. Logistics plays a responsibility in optimising the flows of product, service, and information from the input stage of raw materials and components to the finished goods and then to the final stage of having readily on-hand of customers at the right time and in the right place (Gleissner & Femerling, 2013). As the global market develops with technological advances, especially the opening of markets in developing and underdeveloped countries, logistics is considered as a tool and a means to connect different fields and areas of business strategy (Murphy & Knemeyer, 2018).

There have been conflicting opinions on whether logistics is considered a value creation activity. From the perspective of the business, most of the typical views stated that the value of logistics is related closely to the right place and time, consistency in service, defective minimising, shortest route and speed, and lowest cost. In the opposite perspective, logistics value focuses on generating value and willingness in listening and learning to customers as well as providing properly what customers expect (Rutner & Langley, 2000). In the findings of Lambert & Burduroglu (2000), logistics as a process of creating and adding value was evaluated through a model. Factors about exceed expectations, logistics value, additional services, and competitive advantages were found to build and develop value to the whole logistics operations of firms.

Due to the necessity in developing both value chain and logistics value, the concept of LVC was generated by Zhou and Zhang (2010) for representing a chain of a variety of inherent key logistics value. Logistics activities are implemented throughout the supply chain aiming to utilise, incorporate, and optimise all inputs and resources, while LVC is applied for establishing value-added activities through every logistics activity. The value chain in logistics operates based on the integration of intermediaries, from upstream to downstream and is considered to be the premise for establishing the supply chain. As to the traditional structure of the value chain, logistics activities were reflected through operations of inner logistics (e.g. production and selling) and outer logistics (e.g. transferring of raw materials and finished goods). These activities are also regarded to be a part of LVC (Zhou, 2013).

### ***Important Roles of LVC***

A study completed by Bhatnagar and Teo (2009) applied Porter's (1985) value chain concept to illustrate the role of logistics in enhancing the profitability of companies running a global supply chain. It was found that the competitiveness correspondingly increases. Nonetheless, in order to improve the competitive advantage, a business needs to not only provide efficient logistics activities in a unique manner which generates high customer satisfaction, but also perform such tasks with lower costs than rivals (Gourdin, 2006).

The logistics value chain takes an important responsibility in implementing the efficient supply chain because they are a catalyst as well as the linkage for uniting closely all channels in the whole supply chain (Zhou and Zhang, 2010). Management of the logistics value chain is contemplated as a strategy which aims to degrade logistics costs. This is achieved by upgrading the value of logistics operations so that all partners in the chain, from manufacturers, distributors, logistics enterprises to customers, may gain added value, i.e. logistics profits, from lower logistics costs (Zhou and Zhang, 2010).

In order to minimise the cost of final products, a company needs to integrate and leverage their respective value chains in co-operating with suppliers and channels so that all relevant parties would gain more opportunities to boost their cost position (Bhatnagar and Teo, 2009). Assessing the logistics value chain dramatically contributes to enhancing the value of the entire supply chain as well as successfully improving the potential benefits of an integrated and lean supply chain (Zeng & Rossetti, 2003; Taylor, 2005).

Additionally, the opinion of Lambert and partner (2000) determines that it is difficult for customers to determine the whole value being perceived from logistics providers so they would not easily pay for it. This is why logistics value was not being sold at a deserved standard. Therefore, evaluating properly the value of every logistics activity by determining the value of relevant costs will lead to the appropriate establishment of the chain of logistics value. From there, the value of the organisation will jointly be acknowledged by both top managers and customers in a more appropriate and worthwhile view (Lambert and Partner, 2000).

### ***Participants in LVC***

In the logistics value chain, there are three important supply chain-related collaborations which have been stated by Simchi-Levi and co-workers (2003). These include third-party logistics (3PL), retailer–supplier partnerships, and distributor integration. The choice of an appropriate partner in a logistics value chain for a strategic alliance, nonetheless, is not an easy decision and is fraught with ambiguity and difficulty (Büyüközkan, Feyzioğlu & Nebol, 2008).

In order to systematise the logistics costs basing on the flow of the supply chain, this paper will classify the stages or channels from the upstream to downstream of the basic supply chain of tangible products. The supply chain referred to logistics network was originally defined by Simchi-Levi, Kaminsky, and Simchi-Levi (1999) which emphasised the existence of main intermediaries including suppliers, manufacturing centre, warehouse, distribution centres, and retailers. However, this study concentrates on analysing the costs of suppliers, manufacturers, warehouses, and distributors which are frequently outsourced as a third party due to the evident existence of logistics activities operating by them. The logistics activities of retailers are the reduplication of operations in other channels including main activities such as purchasing

products from distributors, storing products for selling and shipping products to final customers and same relevant sub-activities.

### ***Costs in Logistics Value Chain***

It is generally agreed that logistics is a required business feature, however, the question arises as to whether logistics is more reflective of a value-added operation or simply an expense (Rutner & Langley, 2000). In the process of defining logistics value and logistics value-added, Rutner and Langley (2000) determined one key component taking a part in building these concepts which was the influence of costs. It was suggested and concentrated on reducing and optimising any possible costs. To receive adequate incentives for the company's inventions and logistics efficiency, managers need to calculate and market the value that customers obtain (Lambert & Burduroglu, 2000). Understanding the costs behaviour and the current and potential source of differentiation requires the organisations to break down their value chain into strategically appropriate activities (Porter, 2001).

In research completed by Lambert and co-worker (2000), when analysing the value of logistics activities happening in the perception of manufacturers, they focused on the problem through logistics costs. They stated that there were 6 most popular factors used to measure the value of logistics in which total cost analysis was one among them. In their study, the total cost analysis was considered to demonstrate the internal and external efficiency of logistics as well as represent the company's value creation. In particular, the authors split the costs into sub-factors which consisted of the purchase price, transportation costs, inventory carrying costs, costs associated with alternative terms of sale, ordering costs, receiving costs, quality costs, returned goods costs, and other costs which would be depended on different situations.

A study implemented by Zeng and Rossetti (2003) also classified logistics costs into 6 categories comprising of transportation, inventory holding, administration, customs charges, risk and damage, and handling and packaging. Each of these 6 categories of costs contained a variety of sub-costs. In transportation, freight charge, fees for consolidation, transfer fee, pickup and delivery fees, these categories were considered to constitute the transportation costs while pipeline holding, and safety stock were elements making up the costs of inventory holding. The administration activities involved the fees of order processing, communication and overheads. Customs charges were costs related to customs clearance and brokerage fee. Risk and damage costs were composed by fees when in situations of damage/loss/delay and insurance fee. As for handling and packaging category, the terminal handling, material handling, in/out handling, disposal charge, packing/supplies materials and storage were activities that formed the costs of this category.

In an analysis of logistics role in improving competitive advantage by using a framework of the value chain for global supply chain, Bhatnagar & Teo (2009) referred to some logistics costs that contributed to their value chain analysis. All the costs mentioned were related to activities such as distributing (distribution costs, transportation costs, shipping costs), storing (inventory costs, backorder costs, shortage costs, lost sales costs), and inventory allocating (warehouse costs, facility operating costs, holding costs, handling costs, labour costs, technology costs, outbound logistics costs). Fahimnia, Molaei & Ebrahimi (2011) stated that in order to optimise the logistics planning, logistics costs could be grouped in 6 main parts as materials costs, production costs inventory or storage costs, transportation costs between vendors and manufacturers, between manufacturers and warehouses, and between warehouses, and customers. This group of researchers also divided the logistics system into 3 major activities including procurement, production and distribution.

Research completed by Engblom and co-workers (2012) measured the total logistics costs by classifying 6 particular factors which were transport, warehousing, inventory carrying, logistics administration, transport packaging and indirect costs of logistics. Additionally, customs, risk and damage, as well as handling and packaging, also were considered to identify the range of logistics cost components. Moreover, the study recapitulated other opinions of determining logistics costs in which identified some sub-costs supporting the above 6 factors, including the opportunity cost of capital and storage, risk costs, the possible costs of lost sales under inventory costs, and single out order-entry costs.

According to Spencer, Rogers & Daugherty (1994), third-party logistics or outsourcing requires vendors to fulfil the supply needs of a business, including transporting, warehousing, customer service, inventory control and communication/information specifications. Similarly, a research from Daugherty, Stank, & Rogers (1996) which provides an insight into the relationships between manufacturers and providers of international logistics services. This research also lists different logistics activities which were related to suppliers' capabilities including customer services, distribution communication, facility location, forecasting, inventory control, order management, packaging, MRO (Maintenance Repair Overhaul/Operation) purchasing, transportation and warehousing and storage. In order to implement all these activities effectively, firms need to carefully analyse accompanying costs. Another paper by Dong, Carter & Dresner (2001) developed a model which determined the ability to decrease logistics costs in case of using JIT (Just in Time) purchasing for both buyers and providers. Dong and partners referred to some logistics activities which need to be reduced relevant costs as inventory, transportation, purchases (for buyers only), and production (for suppliers only).

A paper by Kumar & Malegeant (2006) examined the elements that contributed to the growth of a closed-loop supply chain. The study stated that the closed-loop logistics cost model needs

to take into account different costs related to operations of acquiring, transporting, and setting up the remanufacturing facility. Kusumastuti, Piplani, & Lim (2008) also completed a study focusing on a computer manufacturer in the Asia-Pacific region as a case study for designing the closed-loop repair network. The researchers concentrated on costs components consisting of transportation costs, taxes, holding costs, repair costs, disposal costs, purchasing costs, and fixed costs for determining the optimal locations of local sub hubs, regional distribution centres and repair facilities. Additionally, when investigating the transportation contracts between manufacturer and transporter, Alp, Erkip & Güllü (2003) stressed the penalty costs, vehicle hiring costs, holding and backorder costs of the material, lateness and earliness costs, and transportation costs as core elements impacting to the ability of setting the transportation contracts for addressing the issue of transporting material from a supplier to a manufacturing plant.

Another key component of logistics and supply chain management is inventory management because the inventory choices are often a beginning point for other business activities, such as warehousing, transportation, and handling of materials (Murphy & Knemeyer, 2018). According to Murphy and Knemeyer (2018), the inventory costs involve 3 factors which exist the trade-offs among them, that are carrying costs, ordering costs and stockout costs. With regard to carrying costs, these researchers reckoned that it consists of many sub-costs related to different products and situations happening during storing and holding process. It could be listed as obsolescence costs, inventory shrinkage costs, storage costs, handling costs, insurance costs, taxes, interest costs, opportunity costs, and costs for keeping “products” alive (Murphy & Knemeyer, 2018).

Essentially, every partner in the supply chain would implement all of the related-logistics activities from procuring, producing, storing to transferring. Hence, the partnership in the logistics network is inherent between the one who provides service and the one who receives service. In other words, there is a relationship between the point-of-origin and the point-of-consumption (Simchi-Levi et al., 2003). Based on various logistics costs that are reviewed from previous papers, this research will group the costs into categories based on the main function of four above selected intermediaries (supplier, manufacturer, warehouse, and distributor) following the flow of the supply chain. From this classification, this study aims to determine the influence of costs in the logistics value chain for enhancing the value chain of firms.

The supply chain stages have been proposed in numerous frameworks in which practically present the same flows starting from the supplier and ending at end users. In the logistics network or the supply chain, if a partner is responsible to provide the flow of materials, inventory or product, that partner takes the function of being a supplier and the destination would be a customer (Gourdin, 2006). Any partner in the supply chain would also need to produce their own product or service for supplying to the next stage so they would play the

role of a manufacturer. In any industry, storing and preserving always happen for preparing the condition of orders so that the facility would provide a number of products anytime and satisfy any requirement. That is considered to be the main function of a warehouse (Zhou and Zhang, 2010). Finally, in order to serve the next stage which can be any other partners or end customers in the supply chain, the transporting activity would take place and the facility takes the role of distributor.

In order to concentrate on four chosen intermediaries and their main functions, which basically illustrate the supply chain, this study will analyse the logistics value chain. This will be based on procurement costs (represent the procurement function of supplier), production costs (represent the production function of manufacturer), storage costs (represent the storage function of warehouse) and transportation costs (represent the transportation function of distributor). The sub-costs of these four cost elements are indicated in Table 1.

**Table 1:** Costs through the Logistics value chain

Partner	Costs category	Sub-cost category	Explanations
Supplier	Procurement costs	<b>Material costs</b> (Zeng & Rossetti, 2003), (Fahimnia, Molaei, & Ebrahimi, 2011)	Costs for forecasting, analysing and determining types and number of materials which need to be purchased
		<b>Purchasing costs</b> (Daugherty, Stank & Rogers, 1996), (Lambert & Burduroglu, 2000), (Dong, Carter & Dresner, 2001), (Kusumastuti, Piplani & Lim, 2008)	Costs for purchasing raw materials, processed materials, components, supplies, work-in-process from vendors
		<b>Communication costs</b> (Spencer, Rogers & Daugherty, 1994), (Daugherty, Stank & Rogers, 1996), (Zeng & Rossetti, 2003)	Costs for orders processing, costs for contacting and communicating about demand and requirements between stages, costs for exchanging information
Manufacturer	Production costs	<b>Ordering costs</b> (Daugherty, Stank & Rogers, 1996), (Lambert & Burduroglu, 2000),	Costs for verifying inventory availability,

		(Murphy & Knemeyer, 2018)	costs for forecasting and preparing purchase requisitions and orders, costs for planning and arranging the labors required to inspect goods when they are received, costs for getting goods once they arrive, costs for processing invoice, costs for issuing payments, costs for entering orders into the system
		<b>Manufacturing costs</b> (Dong, Carter & Dresner, 2001), (Kumar & Malegeant, 2006), (Fahimnia, Molaei, & Ebrahimi, 2011)	Costs for setting up the equipment and machines to produce products, costs for implementing and producing finished products from materials
Warehouse	Storage costs	<b>Inventory carrying costs</b> (Spencer, Rogers & Daugherty, 1994), (Daugherty, Stank & Rogers, 1996), (Lambert & Burduroglu, 2000), (Dong, Carter & Dresner, 2001), (Zeng & Rossetti, 2003), (Kusumastuti, Piplani & Lim, 2008), (Bhatnagar & Teo, 2009), (Fahimnia, Molaei, & Ebrahimi, 2011), (Engblom, Solakivi, Töyli & Ojala, 2012), (Murphy & Knemeyer, 2018)	Costs for holding items for a period of time, obsolescence costs, inventory shrinkage costs, costs for keeping “products” alive, costs for disposal charge
		<b>Stockout costs</b> (Alp, Erkip & Güllü, 2003), (Bhatnagar & Teo, 2009), (Murphy & Knemeyer, 2018)	Costs for dealing with shortage situations, costs for making up products to shortage situations, costs of backing up orders,

			costs of cancelled orders, costs of losing customers
		<b>Damage costs</b> (Zeng & Rossetti, 2003), (Kusumastuti, Piplani & Lim, 2008), (Engblom, Solakivi, Töyli & Ojala, 2012)	Costs of settling situations such as equipment damage, fire, flood, theft, losses, any risks which could happen during storing
		<b>Warehousing costs</b> (Spencer, Rogers & Daugherty, 1994), (Daugherty, Stank & Rogers, 1996), (Bhatnagar & Teo, 2009), (Engblom, Solakivi, Töyli & Ojala, 2012)	Costs for managing and controlling the warehouse, costs for accumulating, allocating, assorting and sorting out products, costs for maintaining the facility, interest costs
		<b>Opportunity cost</b> (Engblom, Solakivi, Töyli & Ojala, 2012), (Murphy & Knemeyer, 2018)	Cost of capital and facility, costs of taking a position in the wrong products
Distributor	Transportation costs	<b>Handling and packaging costs</b> (Daugherty, Stank & Rogers, 1996), (Zeng & Rossetti, 2003), (Alp, Erkip & Güllü, 2003), (Bhatnagar & Teo, 2009), (Engblom, Solakivi, Töyli & Ojala, 2012), (Murphy & Knemeyer, 2018)	Costs for handling and packaging products during moving and transferring goods, costs for terminal handling, costs for loading and unloading goods
		<b>Transporting costs</b> (Spencer, Rogers & Daugherty, 1994), (Daugherty, Stank & Rogers, 1996), (Lambert & Burduroglu, 2000), (Dong, Carter & Dresner, 2001), (Alp, Erkip & Güllü, 2003), (Kumar & Malegeant, 2006), (Kusumastuti,	Costs for hiring vehicles, Costs for moving or transferring materials between intermediaries in the supply chain, Costs of freight charge, tolls, fuel costs, Costs of consolidation

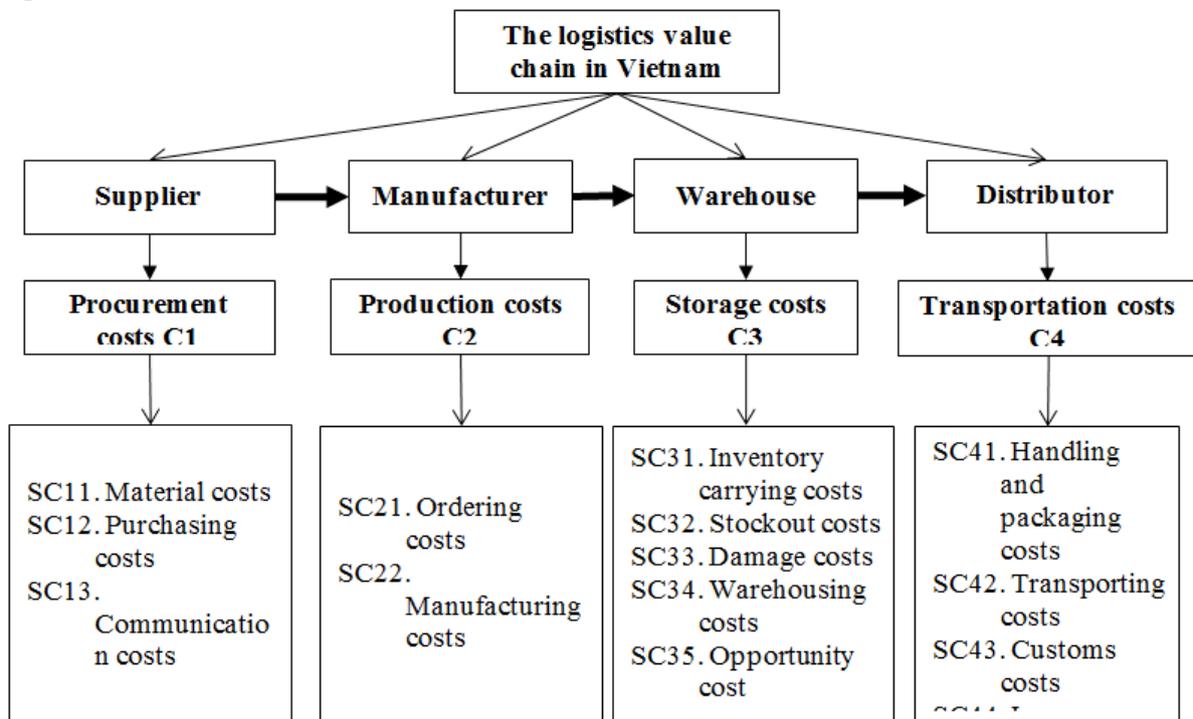
		Piplani & Lim, 2008), (Bhatnagar & Teo, 2009), (Fahimnia, Molaei, & Ebrahimi, 2011), (Engblom, Solakivi, Töyli & Ojala, 2012)	
		<b>Customs costs</b> (Zeng & Rossetti, 2003), (Engblom, Solakivi, Töyli & Ojala, 2012)	Customs clearance, brokerage fee, allocation fee, tariff, currency exchange costs
		<b>Insurance costs</b> (Engblom, Solakivi, Töyli & Ojala, 2012), (Murphy & Knemeyer, 2018)	Costs for assuring the safety of products during transporting in such dealing with situations such as fire, flood, theft, accidents, any types of perils and risks in transportations

## Methodology

### *The Selection of the Analytical Hierarchy Process (AHP)*

In order to assess costs in the LVC of industry in Vietnam, this paper chose the AHP method which allows to arrange all horizontal and independent costs based on the activities in the LVC from suppliers, manufacturers, warehouses, to distributors. These arrangements are convenient for experts in assessing the level of cost generation. In addition, there are many additional costs at each logistics activities, so this method also evaluates those additional costs. As a result, an AHP model has been established as shown in Figure 2. This is a very effective model for evaluators to give their opinions over selected costs.

**Figure 2:** The AHP Model for Costs in LVC.



**Expert Questionnaire and Data Collection**

The results in Table 2 show that the data gathered from 20 experts in the field of logistics are drawn from reliable sources since these experts are actually working in the medium and large-scale companies. Moreover, most of participants are managers or seniors in their field with high levels of education. Therefore, their opinion on the costs incurred in the logistics value chain in Vietnam is considered reliable and can be relied upon to make relevant comments, analysis, and recommendations.

**Table 2:** Expert information

Expert No.	Gender	Age	Education	Position	Company field	Company size
1	Female	20-30	MSc	Lecturer	Education	300-500
2	Female	20-30	BSc	Manager	Healthcare	50-100
3	Female	20-30	BSc	Senior	Logistics	> 3000
4	Female	20-30	BSc	Senior	Logistics	> 3000
5	Male	31-40	BSc	Senior	Logistics	> 3000
6	Male	31-40	BSc	Senior	Logistics	> 3000
7	Male	31-40	BSc	Senior	Logistics	> 3000
8	Male	41-50	BSc	Manager	Logistics	> 3000
9	Male	31-40	Msc	Manager	Logistics	100-300

10	Male	31-40	Msc	Manager	Logistics	300-500
11	Male	31-40	Msc	Manager	Logistics	100-300
12	Male	31-40	Msc	Manager	Logistics	100-300
13	Male	31-40	Msc	Manager	Logistics	100-300
14	Male	41-50	Msc	Manager	Logistics	100-300
15	Male	41-50	Msc	Manager	Logistics	100-300
16	Male	41-50	Msc	Manager	Logistics	100-300
17	Female	31-40	Msc	Senior	Logistics	50-100
18	Female	31-40	Msc	Senior	Logistics	50-100
19	Female	31-40	Msc	Senior	Logistics	50-100
20	Female	31-40	Msc	Senior	Logistics	50-100

## Data Analysis and Results

### Consistency Testing

Before analysing the data collected, the first stage to do is to check the reliability of the data through the consistent ratio. According to the AHP theory, when dealing with rising number of pair-wise comparisons (AHP scale from 1, 3, 5, 7, 9), the possibility of consistency error increases. Thus, Saaty (1980) suggested using the CR (consistency ratio) to test if the errors exist. The collected data is considered acceptable if CR is not higher than 0.1 (Saaty, 1980).

The results in Table 3 show that, the values of CR drawn from the Expert Choice software of 20 experts are all smaller than 0.1. Therefore, the data collected from experts is available for further analysis in the next section.

**Table 3:** Consistent ratio (CR).

Experts	Criteria				Total weight & Consistency Ratio(CR)	
	Procurement costs	Production costs	Storage costs	Transportation cost		
	Weight	Weight	Weight	Weight	Total	CR
1	0.579	0.068	0.104	0.249	1.000	0.08
2	0.272	0.085	0.379	0.263	1.000	0.10
3	0.194	0.411	0.317	0.078	1.000	0.05
4	0.183	0.483	0.229	0.105	1.000	0.08
5	0.221	0.395	0.310	0.073	1.000	0.09
6	0.499	0.155	0.297	0.060	1.000	0.09
7	0.213	0.569	0.173	0.046	1.000	0.08

8	0.104	0.301	0.539	0.057	1.000	0.10
9	0.143	0.288	0.505	0.064	1.000	0.07
10	0.147	0.080	0.500	0.273	1.000	0.06
11	0.065	0.377	0.422	0.136	1.000	0.07
12	0.176	0.247	0.483	0.094	1.000	0.08
13	0.177	0.576	0.187	0.061	1.000	0.07
14	0.229	0.604	0.106	0.061	1.000	0.06
15	0.273	0.407	0.244	0.075	1.000	0.08
16	0.282	0.533	0.140	0.045	1.000	0.09
17	0.494	0.154	0.270	0.082	1.000	0.09
18	0.386	0.123	0.404	0.087	1.000	0.05
19	0.347	0.419	0.147	0.087	1.000	0.02
20	0.205	0.450	0.240	0.105	1.000	0.08

\*  $CR \leq 0.1$ , it is acceptable.

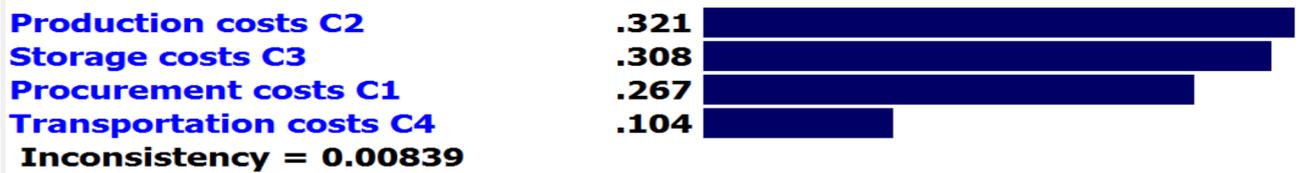
### *Establishment of Weight Value*

The evaluation results of 20 experts are combined as shown in Table 4 and summarised in Figure 3. The final results show that in the LVC in Vietnam, the production costs are the largest proportion with 32.1%, the second is storage costs accounting for 30.8%, while the cost for procurement is 26.7%, followed by transportation costs.

**Table 4:** Pairwise comparison between costs.

Overall goal (G)	Priority	Procurement costs (C1)	Priority	Production costs (C2)	Priority	Storage costs (C3)	Priority	Transportation cost (C4)	Priority
C1	<b>0.267</b>	SC11	<b>0.555</b>	SC21	0.285	SC31	0.084	SC41	0.338
C2	0.321	SC12	0.244			SC32	0.241	SC42	<b>0.193</b>
C3	0.308			SC13	0.202	SC22	0.715	SC33	<b>0.190</b>
C4	0.104	SC34	<b>0.281</b>					SC44	0.309
		SC35	<b>0.204</b>						
Total	<b>1</b>	1		1		1		1	

**Figure 3:** Criteria Priority with respect to the costs in Logistic Value chain



**Priority Weights of Costs and Sub-Costs**

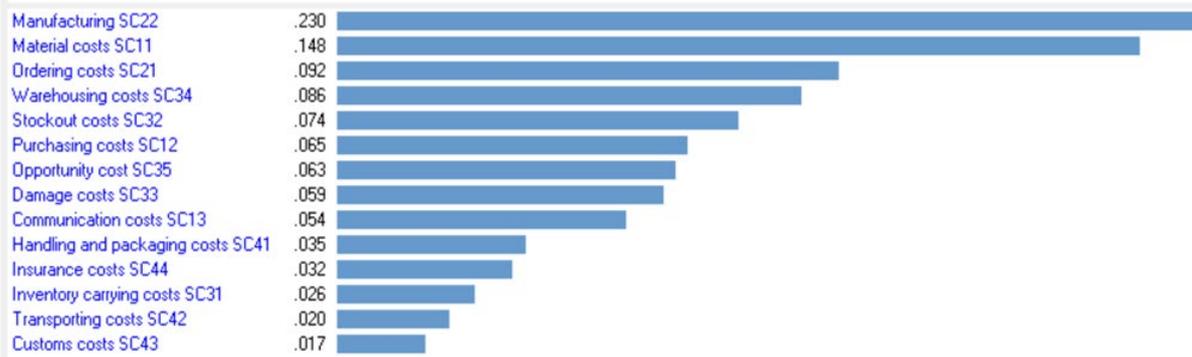
More specifically, the costs assessed in Table 4 are used to calculate the global weight, which is convenient for ranking costs and sub-cost in this stage. As shown in Table 5, 6, and Figure 4, manufacturing costs (weight = 0.23) and materials costs (weight = 0.148) in logistics operation are very high. These two criteria accounted for 37.8% of the total. The following is ordering costs (weight = 0.091), warehousing costs (weight = 0.087) and stockout costs (weight = 0.074), which account for 25.2% in the experts’ opinions. While the purchasing costs (weight = 0.065), opportunity cost (weight = 0.063), damage costs (weight = 0.059) and communication costs (weight = 0.054) account for 24.1%. Finally, 13% of the costs count for handling and packaging costs (weight = 0.035), insurance costs (weight = 0.032), inventory carrying costs (weight = 0.026), transporting costs (weight = 0.020), and insurance costs (weight = 0.017). These results are discussed in the next section.

**Table 5:** Composite priority weights for costs and sub-costs

Ranking	Criteria	Original weight	Sub-criteria	Local weight	Global weight (Local weight of sub-criteria * original weight criteria)
3 <sup>rd</sup>	Procurement costs (C1)	0.267	SC11	0.555	0.148
			SC12	0.244	0.065
			SC13	0.202	0.054
1 <sup>st</sup>	Production costs (C2)	0.321	SC21	0.285	0.091
			SC22	0.715	0.230
2 <sup>nd</sup>	Storage costs (C3)	0.308	SC31	0.084	0.026
			SC32	0.241	0.074
			SC33	0.190	0.059
			SC34	0.281	0.087
			SC35	0.204	0.063
4 <sup>th</sup>	Transportation cost		SC41	0.338	0.035
			SC42	0.193	0.020

	(C4)	0.104	SC43	0.160	0.017
			SC44	0.309	0.032
Total		1.00			Total =1.00

**Figure 3:** Sub-criteria Priority with respect to the costs in Logistic Value chain.



**Table 6:** Sub-costs ranking

Rank	Sub-criteria (Overall Inconsistency = 0.00)		Global weight
	Name		
1 <sup>st</sup>	SC22	Manufacturing costs	0.230
2 <sup>nd</sup>	SC11	Material costs	0.148
3 <sup>rd</sup>	SC21	Ordering costs	0.091
4 <sup>th</sup>	SC34	Warehousing costs	0.087
5 <sup>th</sup>	SC32	Stockout costs	0.074
6 <sup>th</sup>	SC12	Purchasing costs	0.065
7 <sup>th</sup>	SC35	Opportunity cost	0.063
8 <sup>th</sup>	SC33	Damage costs	0.059
9 <sup>th</sup>	SC13	Communication costs	0.054
10 <sup>th</sup>	SC41	Handling and packaging costs	0.035
11 <sup>th</sup>	SC44	Insurance costs	0.032
12 <sup>th</sup>	SC31	Inventory carrying costs	0.026
13 <sup>th</sup>	SC42	Transporting costs	0.02
14 <sup>th</sup>	SC43	Customs costs	0.017
Total			1

## Results Discussion and Conclusion

The purpose of using expert judgments on the proportion of costs incurred in the LVC in Vietnam including costs of suppliers, manufacturers, warehouses, and distributors. The research utilises the AHP method to build the expert model and questionnaire with the cost criteria selected from the existing literature. After collecting and processing data from 20 industry experts, the results show that, in the LVC in Vietnam, production costs account for the highest proportion, which is reflected in component costs, manufacturing costs, and ordering costs. The second costs are also very high and almost equivalent to production costs. This result is shown in the component costs of warehousing costs and stockout costs. Thirdly, procurement costs accounted for 26.7%, which is mostly reflected in the material costs. Finally, transportation costs accounted for 10.4% of the total, consist of handling and packaging costs, insurance costs, inventory carrying costs, and transporting costs.

Thus, this study once again confirm that the costs incurred in the LVC in Vietnam are evaluate very high. The imperfect reality of logistics issues in Vietnam is not completely familiar with most of the proposed solutions from experts and state agencies which mainly focused on issues of business capacity, technology, infrastructure and legal systems (Bui, 2018; Pham, 2019; KL, 2019; Nguyet 2019). Particularly, this study seeks to propose solutions in the micro perspective of businesses to help to solve operational cost problems.

As classified in this study, the business capacity as well as infrastructure problems, are represented by reducing material costs, ordering costs, manufacturing costs, and warehousing costs. Specifically, the operations of forecasting, analysing and determining materials, planning and arranging labour, setting up equipment and machines, products implementing and producing, warehouse managing and controlling, and facility maintenance are considered to mostly depend on the internal and core operative ability of firms. In fact, these four types of costs are correspondingly ranked as the top four important costs which are indicated in the result of this finding. This leads to a significant highlight of production costs. Hence, in order to concretise the solutions from experts and government representatives, this study recommends instantaneous solutions which require an interest from businesses in focusing on minimising the expenditure types related to materials, ordering, manufacturing and warehousing activities.

As for material costs, companies need to re-structure the quantity and type of materials by applying commodity classification systems to minimise errors in demand forecasting. In addition, they need to keep a firm grip on market movements, especially focus on industries that have great potential for the economy.



Regarding ordering costs, one of the most prominent factors in this type of cost is costs for planning and arranging labour. This is due to manpower in both quantity and quality in the logistics field still experiencing a dramatic shortage. A positive point in this matter has now been overcome of which most of the Vietnamese universities have started to organise to deeply educate the major of logistics and supply chain which deeply concentrate on specialist knowledge as well as train advanced technical skills. Therefore, in the near future, a large number of highly qualified and well specialised human resources will enrich the human resources for this industry. Businesses also need to focus on controlling and keeping track of their personnel capacity to make timely appropriate adjustments in balancing between output objectives and available resources.

As for manufacturing and warehousing costs, firms will need to notice in investing and improving the facilities related to producing, storing and maintaining the products. In order to implement this solution, entrepreneurs need to enhance the efficiency of management and use of investment capital in infrastructure construction in which capital restructuring is a necessary strategy and requires wise calculation. What needs to be done is to balance and allocate investment capital sources, budget capital, and Official Development Assistance capital for projects in order to enhance the connectivity between different logistics activities, prioritise concentrated investment in construction, and upgrade important and urgent works.

### **Limitations and Future Direction**

Although the study was successful in finding out the proportion of costs in the LVC in Vietnam, there are still many gaps for future research. Firstly, an in-depth analysis of costs incurred in the LVC, especially the additional activities in the chain such as Marketing, personnel, etc must be considered. Secondly, it is necessary to consult experts in many fields due to differences in logistics costs in different type of business. Finally, other quantitative methods such as the ANP could be applied to examine the cross-links between the costs criteria in the chain since these relationships are likely to exist.

## REFERENCES

- Alp, O., Erkip, N. K., & Güllü, R. (2003). Outsourcing logistics: Designing transportation contracts between a manufacturer and a transporter. *Transportation science*, 37(1), 23-39.
- Banomyong, R., Hương, T. T. T., & Ha, P. T. (2017). A Study of logistics performance of manufacturing and import-export firms in Vietnam. *Tạp chí Kinh tế Đối Ngoại*, 94(94).
- Barai, M. K., Le, T. A. L., & Nguyen, N. H. (2017). Vietnam: achievements and challenges for emerging as a FTA hub. *Transnational Corporations Review*, 9(2), 51-65.
- Bhatnagar, R., & Teo, C. C. (2009). Role of logistics in enhancing competitive advantage: A value chain framework for global supply chains. *International Journal of Physical Distribution & Logistics Management*, 39(3), 202-226.
- Bình, A. (2018). *Công bố Top 10 Công ty uy tín ngành Vận tải và Logistics năm 2018* [Announcing Top 10 Prestigious Companies in Transport and Logistics in 2018]. (Ministry of Information and Communications). Retrieved from VietNamNet: <https://vietnamnet.vn/vn/kinh-doanh/vef/cong-bo-top-10-cong-ty-uy-tin-nganh-van-tai-va-logistics-nam-2018-497368.html>
- Bui, D. (2018). *10 giải pháp tổng thể để phát triển logistics* [10 general solutions for logistics development]. (Ministry of Finance). Retrieved from Electronic Journal of Finance: <http://tapchitaichinh.vn/su-kien-noi-bat/tin-tuc/10-giai-phap-tong-the-de-phat-trien-logistics-138143.html>
- Büyüközkan, G., Feyzioğlu, O., & Nebol, E. (2008). Selection of the strategic alliance partner in logistics value chain. *International Journal of Production Economics*, 113(1), 148-158.
- Daugherty, P. J., Stank, T. P., & Rogers, D. S. (1996). Third-party logistics service providers: purchasers' perceptions. *International Journal of Purchasing and Materials Management*, 32(1), 23-29.
- Dong, Y., Carter, C. R., & Dresner, M. E. (2001). JIT purchasing and performance: an exploratory analysis of buyer and supplier perspectives. *Journal of operations Management*, 19(4), 471-483.
- Engblom, J., Solakivi, T., Töyli, J., & Ojala, L. (2012). Multiple-method analysis of logistics costs. *International Journal of Production Economics*, 137(1), 29-35.

- Fahimnia, B., Molaei, R., & Ebrahimi, M. H. (2011). 18 Integration in Logistics Planning and Optimization. *Logistics operations and Management: Concepts and Models*, 371.
- Gereffi, G., & Kaplinsky, R. (2001). Introduction: Globalisation, value chains and development. *IDS Bulletin*, 32(3), 1-8.
- Gleissner, H., & Femerling, J. C. (2013). The principles of logistics. In *Logistics* (pp. 3-18). Springer, Cham.
- Gourdin, K. N. (2006). *Global Logistics Management*. 2nd ed. Wiley-Blackwell.
- KL (2019). *Kế hoạch cải thiện Chỉ số Hiệu quả Logistics của Việt Nam [Vietnam's plan to improve the Logistics Performance Index]*. Retrieved from Government Information Electronic: <http://tphcm.chinhphu.vn/ke-hoach-cai-thien-chi-so-hieu-qua-logistics-cua-viet-nam>
- Kumar, S., & Malegeant, P. (2006). Strategic alliance in a closed-loop supply chain, a case of manufacturer and eco-non-profit organization. *Technovation*, 26(10), 1127-1135.
- Kusumastuti, R. D., Piplani, R., & Lim, G. H. (2008). Redesigning closed-loop service network at a computer manufacturer: A case study. *International Journal of Production Economics*, 111(2), 244-260.
- Lambert, D. M., & Burduroglu, R. (2000). Measuring and selling the value of logistics. *The International Journal of Logistics Management*, 11(1), 1-18.
- Murphy, P. R., & Knemeyer, A. M. (2018). *Contemporary logistics*. 12th ed. Pearson Education.
- Nguyet, B. (2019). *Đẩy mạnh ứng dụng công nghệ trong logistics [Promote the application of technology in logistics]*. (Communist Party of Vietnam and the voice of the Party, State and People of Vietnam). Retrieved from Nhan Dan (People) newspaper: [https://www.nhandan.com.vn/khoahoc-congnghe/thong-tin-so/item/39803402-day-manh-ung-dung-cong-nghe-trong-logistics.html?fbclid=IwAR3cUi51CEwv\\_ft1xC5gBFrVUUhvsS5t\\_u2S6G1qyOVdcTiv1TnuBS1eJk](https://www.nhandan.com.vn/khoahoc-congnghe/thong-tin-so/item/39803402-day-manh-ung-dung-cong-nghe-trong-logistics.html?fbclid=IwAR3cUi51CEwv_ft1xC5gBFrVUUhvsS5t_u2S6G1qyOVdcTiv1TnuBS1eJk)
- Pham, T.,H. (2019). *Phát triển ngành dịch vụ logistics tại Việt Nam [Developing logistics service industry in Vietnam]*. (Ministry of Finance). Retrieved from Electronic Journal of Finance: <http://tapchitaichinh.vn/nguyen-cuu-trao-doi/phat-trien-nganh-dich-vu-logistics-tai-viet-nam-306129.html>



- Porter, M. E., (1985). *Competitive advantage, creating and sustaining competitive performance*. 1st ed. New York: The Free Press.
- Porter, M. E. (2001). The value chain and competitive advantage. *Understanding Business Processes*, 2, 50-66.
- Porter, M. E. (2011). *Competitive Advantage of Nations: Creating and Sustaining Superior Performance*. Simon and Schuster.
- Rutner, S. M., & Langley Jr, C. J. (2000). Logistics value: definition, process and measurement. *The International Journal of Logistics Management*, 11(2), 73-82.
- Saaty, T. L., (1980). *The analytic hierarchy process*. New York: McGraw-Hill.
- Simchi-Levi, D., Kaminsky, P., & Simchi-Levi, E. (1999). *Designing and managing the supply chain: concepts, strategies and case studies*. Tata McGraw-Hill Education.
- Simchi-Levi, D., Kaminsky, P., Simchi-Levi, E., (2003). *Designing and Managing the Supply Chain*, 2nd ed. Irwin, McGrawHill, New York.
- Spencer, M. S., Rogers, D. S., & Daugherty, P. J. (1994). JIT systems and external logistics suppliers. *International Journal of Operations & Production Management*, 14(6), 60-74.
- Taylor, D. H. (2005). Value chain analysis: an approach to supply chain improvement in agri-food chains. *International Journal of Physical Distribution & Logistics Management*, 35(10), 744-761.
- Zeng, A. Z., & Rossetti, C. (2003). Developing a framework for evaluating the logistics costs in global sourcing processes: An implementation and insights. *International Journal of Physical Distribution & Logistics Management*, 33(9), 785-803.
- Zhou, X. (2013). Research on Logistics Value Chain Analysis and Competitiveness Construction for Express Enterprises. *American Journal of Industrial and Business Management*, 3(2), 131-136.
- Zhou, X., & Zhang, Q. (2010). Research on construction and generation of logistics value chain. In *ICLEM 2010: Logistics for Sustained Economic Development: Infrastructure, Information, Integration* (pp. 1025-1031).
- World Bank (2018), *World Development Indicators (database)*, World Bank, Washington, DC.