

 <p>ISSN NO. 2320-5407</p>	<p>Journal Homepage: -www.journalijar.com</p> <h2 style="text-align: center;">INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)</h2> <p style="text-align: center;">Article DOI:10.21474/IJAR01/8034 DOI URL: http://dx.doi.org/10.21474/IJAR01/8034</p>	 <p>INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR) ISSN 2320-5407 Journal Homepage: http://www.journalijar.com Article DOI:10.21474/IJAR01/8034</p>
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RESEARCH ARTICLE

UNDERPERFORMING DIMENSION OF LOGISTICS PERFORMANCE INDEX (LPI) IN SRI LANKA.

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Manuscript Info

Manuscript History

Received: 06 September 2018

Final Accepted: 08 October 2018

Published: November 2018

Keywords:-

Logistics Performance Index,
Infrastructure, Trade and Transport,
Analytical Hierarchy Process, Logistics
Hub.

Abstract

Sri Lanka has designed key development agendas in recent years to uplift its trade facilitation. One of the main aims is to convert Sri Lanka into a logistics hub to facilitate international trade. The perception of the logistics sector in executing such agendas is indeed supportive in terms of proper policy planning. LPI was developed by the World Bank as an outcome of this scenario. As a multi-dimensional evaluation indicator, LPI has seemingly taken the interest of potential investors. However, the LPI scores of Sri Lanka have not been satisfactory when compared with major competing countries in the region. Therefore, assessing the logistics performance of the country has become a contemporary requirement. The role of freight forwarders is vital in such assessments. Particular to this context, this research mainly aims to analyze the reasons for the most underperforming dimension of LPI in Sri Lanka which was identified as the quality of trade and transport related infrastructure. The findings were based on a questionnaire survey from a sample of 60 professionals from 20 freight forwarding companies and personal interviews. Data were collected on the most underdeveloped areas of the infrastructure dimension of LPI. In addition, a prioritization of infrastructure development was identified through Analytical Hierarchy Process. The key findings highlighted that even though rail infrastructure was identified as the most underdeveloped area, the respondents ranked the priority order for development as port infrastructure, warehouse and transloading, ICT infrastructure, road infrastructure, airport infrastructure and rail infrastructure respectively. In addition, poor cargo handling facilities at ports and warehouses, road congestion, not having separate lanes for trucks, not implementing a national level single window system, unsuitability of the current railway network for freight operations, lack of collaboration between private sector and government, not revising the tax structure for cargo handling equipment imports and not having an independent regulatory body for logistics operations were recognized as major reasons for the poor quality of trade and transport related infrastructure in Sri Lanka.

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Introduction:-

The concept of logistics has been a critical component in world affairs ever since the construction of pyramids in Egypt, towards the military battles that take place even today and towards the development of global supply chains. Logistics plays a vital role in micro and macro-economic perspectives of a country. From a micro perspective, logistics ensures customer satisfaction through better logistics performance and from a macro-economic perspective, better logistics performance drives the economic development of a country. In the Sri Lankan context, the envision of establishing a logistics hub that connects international maritime and aviation routes has a direct impact with the excellence in Sri Lanka's logistics performance as a country. With the expansion of Colombo Harbour, development of Hambanthota Port and projects like Port City, Sri Lanka has the potential to become a logistics hub in South Asia. Throughout the past few years, Sri Lanka has attracted investments due to its unique geographical position. Moreover, the substantial increase in air and sea connectivity and cargo handling capacity have motivated the potential investors. As a country, the highly remarkable achievement is the end of civil war that provoked the potential to emerge as an economic centre of the world. One of the objectives of the Sri Lankan government is to bring about a significance improvement in logistics affairs in the country. The main aim of the government was to take the rank up the ladder into the top 30 countries with better logistics performance. Logistics industry in Sri Lanka currently contributes around three percent to the GDP and the target is to increase that up to 10 percent by 2020 (Board of Investment of Sri Lanka, 2016).

To review and evaluate the logistics affairs, measurement is a must. This is where Logistics Performance Index (LPI) becomes very important. It has been calculated every two years since 2007. LPI is defined as a benchmarking tool that helps the countries to evaluate their logistics performance and take steps to improve further (The World Bank, 2016). In order to conduct the LPI survey, it considers freight forwarders and express carriers spread across the world to obtain the feedback through questionnaires. LPI has two types of categories as International LPI and Domestic LPI. A much more detailed logistics environment along with constraints, institutional performance, core logistics processes and cost and time are evaluated in Domestic LPI. However, International LPI takes a different angle and evaluates the overall LPI with the weighted average of the country's scores on six key dimensions. It illustrates a comparative performance of the countries on a scale from lowest score 1 to highest score 5 (The World Bank, 2016). The six dimensions of International LPI are divided into two main categories as inputs and outputs (Arvis, et al., 2014). Accordingly, the inputs are customs, infrastructure and quality of logistics services. The outputs are timeliness, international shipments and tracking and tracing. Inefficiencies in logistics affairs have become an obstacle for countries in overall economic development and underperformances in dimensions have increased costs relating to international trade and hindered the opportunities for economic integration.

Infrastructure development has driven the accessibility and connectivity to gateways for many developing nations when considering the trend of LPI patterns since 2007 (Arvis, et al., 2014). However, in the Sri Lankan context the quality of trade and transport related infrastructure has shown poor performances ever since the inception of LPI survey. In general, the transportation system of a country comprises of transport infrastructure, transport superstructure and transport policies and procedures. Thus, any improvement in those areas will also improve the quality of the transport system, which is the quality of transport in general. Accordingly, the quality of trade will also improve as a consequence because transportation is an auxiliary service under logistics and it has a direct impact on the quality of trade in a nation. This gives a clear indication of the significance in identifying and analyzing the most underperformed dimension of LPI. Logistics Performance Index (LPI) gives the opportunity for countries to determine their investment decisions, identify challenges and take steps for further economic development. However, relative low performance of LPI in Sri Lanka has limited those opportunities and has not uplifted the relative competitiveness as expected.

Table 1:- LPI Scores in Sri Lanka under each Dimension from 2007 to 2014

	2007	2010	2012	2014
Quality of trade and transport related infrastructure (Infrastructure)	2.1	1.9	2.5	2.2
Frequency with which shipments reach consignee within scheduled or expected time (Timeliness)	2.7	3.0	2.9	3.1
Efficiency of customs clearance process (Customs)	2.3	2.0	2.6	2.6
Ease of arranging competitively priced shipments (International Shipments)	2.3	2.5	3.0	2.6
Competence and quality of logistics services (Services Quality)	2.5	2.1	2.8	2.9

Ability to track and trace consignments(Tracking and Tracing)	2.6	2.2	2.7	2.8
Overall	2.4	2.3	2.8	2.7

Source: The World Bank (2014)

As shown in Table 1, the quality of trade and transport related infrastructure has shown a significant underperformance throughout the years. Accordingly, infrastructure dimension has achieved a score of 2.1 in 2007 but has experienced a significant reduction to 1.9 by 2010. Eventhough it has scored 2.5 and 2.2 in 2012 and 2014 respectively, when compared with other dimensions it has not been able to at least pass the average 2.5 score level throughout the years.

There have been significant ups and downs throughout the years in infrastructure dimension of LPI in Sri Lanka as per Figure 1. In comparison, all the other countries (excluding Bangladesh, where its 2012 LPI score has not been included in the survey) have shown a relative increase in infrastructure dimension of LPI since 2012 while Sri Lanka has shown a relative decrease.

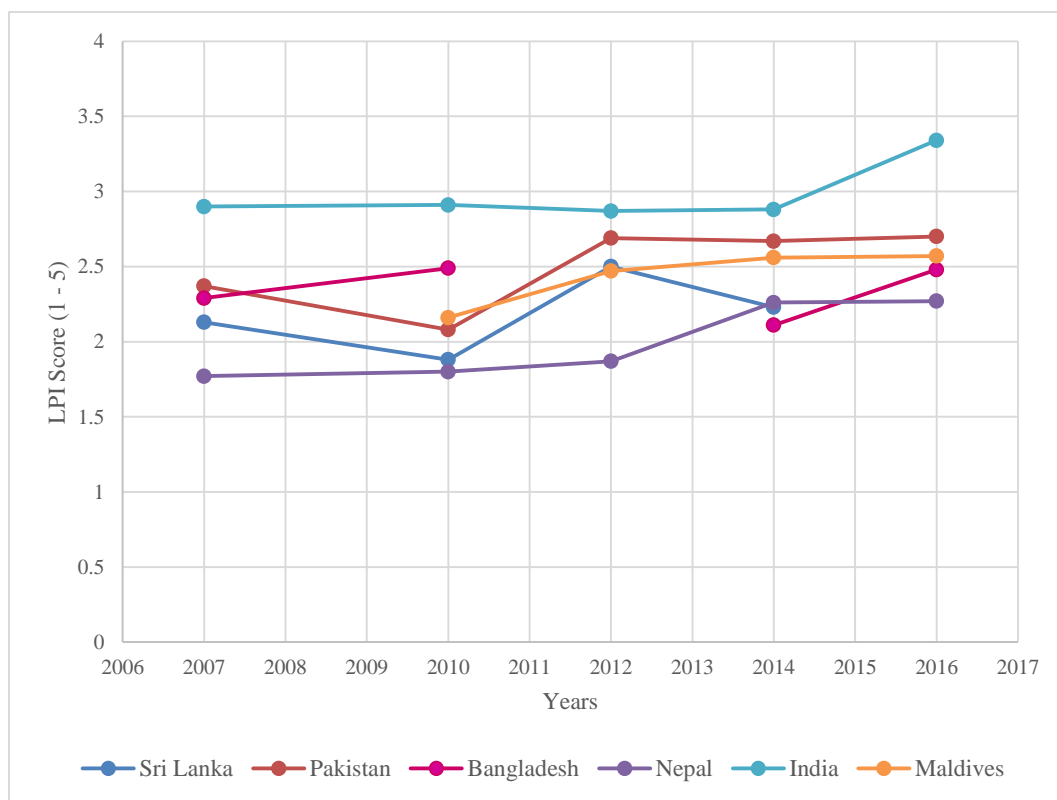


Figure 1:-Comparison of Sri Lanka's Infrastructure Score against South Asian Countries

Source: The World Bank (2016)

Therefore, the main objective of this study was to identify the main reasons for the low performance in the quality of trade and transport related infrastructure dimension of LPI in Sri Lanka. The specific objectives of this research were to identify the most underdeveloped areas in infrastructure dimension of LPI and to prioritize the areas to be developed under the infrastructure dimension of LPI. The major factor that limited this research was the exclusion of Sri Lanka from LPI rankings in 2016 since only few observations had been carried out during the LPI survey in 2016. Apart from that, data collection was limited only to freight forwarding companies registered with the Sri Lanka Logistics and Freight Forwarders Association (SLFFA).

Literature Review

Considering an overall overview of worldwide freight forwarders and express carriers, the Logistics Performance Index is a benchmarking instrument created by the World Bank that measures supply chain delivery performance.

Taking into consideration correlations crosswise over 160 nations, the record can help nations recognize challenges and opportunities to enhance their logistics performance (Arvis, et al., 2016). International LPI has six dimensions and they are being divided into two indicators as inputs and outcomes as shown in Figure 2. Accordingly, inputs (areas for policy regulations) are comprised of customs, infrastructure and service quality whereas outcomes (service delivery performance) are comprised of timeliness, international shipments and tracking and tracing.

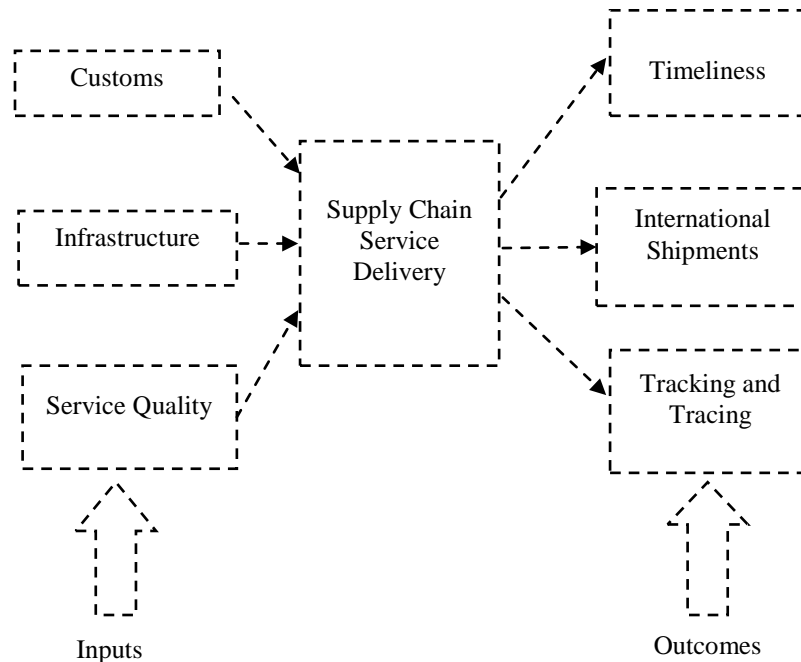


Figure 2:-Inputs and Outcomes of LPI
Source: Arvis, et al. (2016)

The quality of trade and transport related infrastructure is determined by port infrastructure, airport infrastructure, road infrastructure, rail infrastructure, warehousing/ transloading facilities and telecommunication infrastructure and IT services (Arvis, et al., 2016). Sri Lankan rail transportation is considered to be less effective in terms of freight transportation. As a matter of fact, rail infrastructure is rated low when compared with other areas and it has a general dissatisfaction almost everywhere (Arvis, et al., 2014). With road transportation being the most common method of inland freight transportation in Sri Lanka, a large sum of money is invested on road infrastructure development. The development of a high mobility road network and further investment in road network are urgent necessities since it attracts new investments (Board of Investment of Sri Lanka, 2016). Current developments in port and aviation infrastructure is indeed an essential requirement in terms of generating the real benefit out of the geographical strategic advantage that the nature has given to Sri Lanka. Those developments should focus on expanding the capacity and enhance the efficiency of existing ports while establishing new ports and airports in strategic locations (Board of Investment of Sri Lanka, 2016). Improving the logistics performance has become a key policy in government development objectives since it is clear that logistics has a major impact on an economy (Arvis, et al., 2010).

Jayaweera (2011) identifies freight transport as the back bone of an economy and highlights the importance of infrastructure development to fulfill the economic objectives. Jayaweera (2011) points out that policy makers should revise the taxation system upon importation of freight transport equipments, identify ideal locations to establish logistics centres with a close proximity for railways, roads, ports and airports and integrating the roads, rail network and highways in Sri Lanka.

Ojala and Celebi (2015) highlighted that capacity management on investment in infrastructure dimension of LPI has been indicated as a mandatory requirement. Further, inaccurate policy decisions will lead to reduction in overall logistics performance. Also, strong private sector involvement is a key success factor in provision of better logistics services. Table 2 presents the indicators to assess the components of Infrastructure dimension of LPI.

Table 2:-Indicators to Assess the Components of Infrastructure Dimension of LPI

Infrastructure	Indicators
Port Infrastructure	Container traffic: inbound and outbound, loaded and empty, traffic growth (twenty foot equivalent units), number of berths and ship to shore gantry cranes, available draft, yard storage area, public or private operator, turnaround times and processing of electronic manifests and loading plans (local)
Airport Infrastructure	Runways and length, traffic volume (passengers, cargo, and aircraft movements), scheduled freighter services and belly cargo operations, private sector involvement, cargo storage facilities and ground handling companies
Road Infrastructure	Breakdown of road network by type and length of links, road freight volume, national fleet by type (wheels or tonnage, fixed axle and articulated), large third party fleet operators, use of standard waybills (consignment notes), allocation of capacity (long term contracts, urban brokers for trucking services, electronic market)
Rail Infrastructure	Network description including gauge, number of lands, length of network and border crossings, volume of freight traffic (bulk, loose, container or trailer), scheduled unit container trains (local), number and location of loading yards with container gantries (local), number and location of rail inland container depots and allocation of capacity (long term contracts, urban brokers for trucking services, electronic market)
Warehouse Infrastructure	Large third party operators and major truck terminals and distribution centers
ICT Infrastructure	Electronic payments for bank transactions and payments to government, legislation for e-signatures, business to business (domestic, international), typical terms of payment (invoice, CAD) and access to foreign exchange accounts

Source: The World Bank (2016)

Methodology:-

As per the research philosophy, the researchers have used positivism since it investigates through a scientific and quantitative manner. Concerning the research approach, the researchers have used deductive approach and when considering the research strategy, the researchers have followed survey method and interview method. As per the choice of the research, mixed method has been used by the researchers. The time horizon of the research was focused on cross sectional.

As per the problem statement the most underperformed dimension of LPI in Sri Lanka is the infrastructure dimension and the researchers have identified port infrastructure, airport infrastructure, road infrastructure, rail infrastructure, warehousing and transloading infrastructure and ICT infrastructure as the six components of the infrastructure dimension of LPI as indicated by Figure 3. The researchers have considered the infrastructure dimension of LPI and have excluded the other dimensions of LPI as per the core objective of the research.

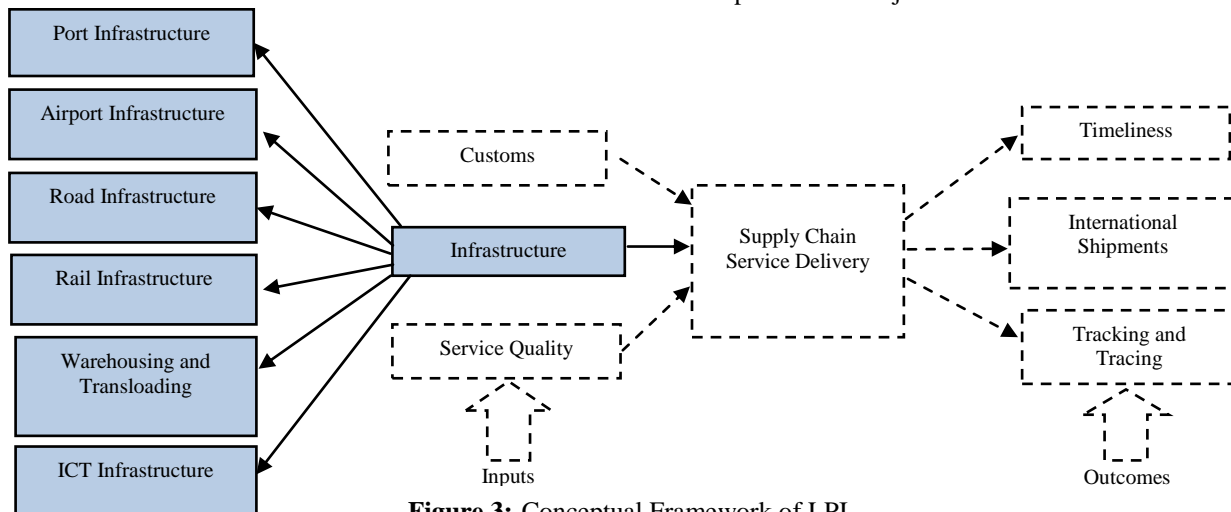


Figure 3:-Conceptual Framework of LPI
Source: The World Bank (2016)

As per Figure 3, the conceptual framework depicts the relationship between the six components: port infrastructure, airport infrastructure, road infrastructure, rail infrastructure, railway infrastructure, warehousing and transloading and ICT infrastructure and the infrastructure dimension of LPI.

The researchers have selected Freight Forwarding Companies registered in Sri Lanka Logistics and Freight Forwarders Association (SLFFA) and 60 respondents were selected as the sample using simple random sampling method. Apart from the questionnaire survey method, in depth interviews were carried out with three prominent industry professionals. Gathered data were screened before the analysis and the reliability was tested using Cronbach's Alpha. For AHP calculations, an excel template called "BPMSG AHP excel template with multiple inputs" developed by Goepel (2013) was utilized. In this excel template, to calculate the final priorities/ rankings, Eigen Vector Method (EVM) was applied. The priorities of each individual input work sheets were calculated using the Row Geometric Mean Method (RGMM).

Results:-

According to Figure 4, the highest number of respondents are under the Operations Department which is 14 and it is followed by Transport Department with 11 respondents. Ocean Freight and IT departments comprise 7 respondents each while Board of Directors and Air Freight Department include 5 respondents each. Clearance and Forwarding unit, Fumigation Department and Logistics Department consist of 4 respondents, 3 respondents and 2 respondents respectively. Survey and Purchasing departments are the lowest with 1 respondent each.

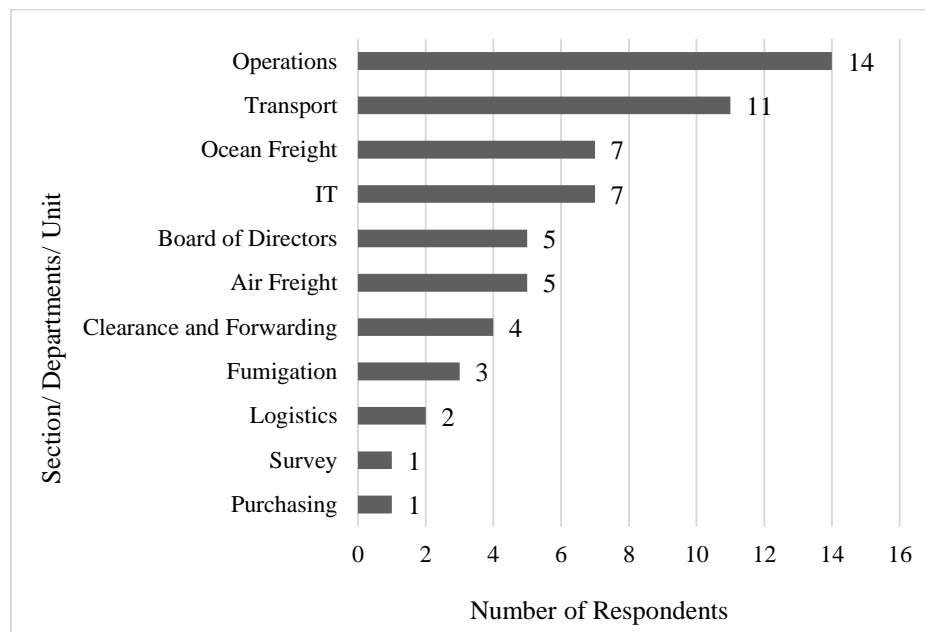


Figure 4:-Frequency of the Different Sections/ Departments/ Units in the Sample
Source: Survey Data (2016)

Awareness about LPI and participation for the LPI survey were assessed using two separate questions in the survey questionnaire. Figure 5 represents relationship between the awareness about LPI and the participation for the LPI survey which is conducted by the World Bank.

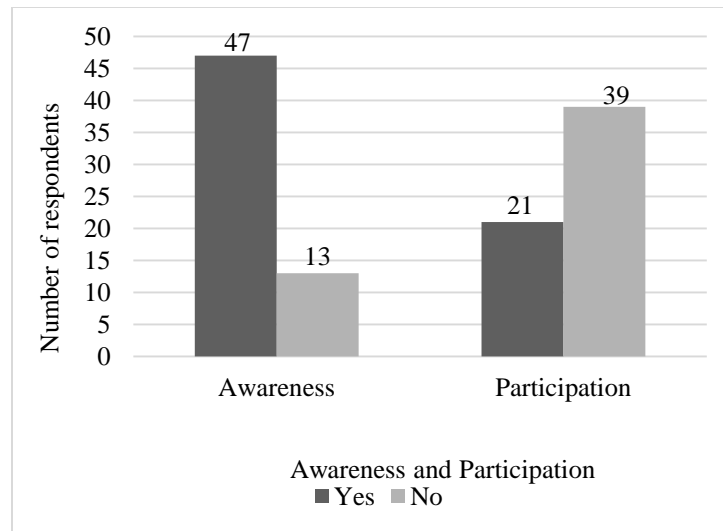


Figure 5:-Relationship between Awareness and Participation towards LPI Survey
Source: Survey Data (2016)

The respondents of the sample deal with freight transport modes and Figure 6 shows the operation of different freight modes by those organizations.

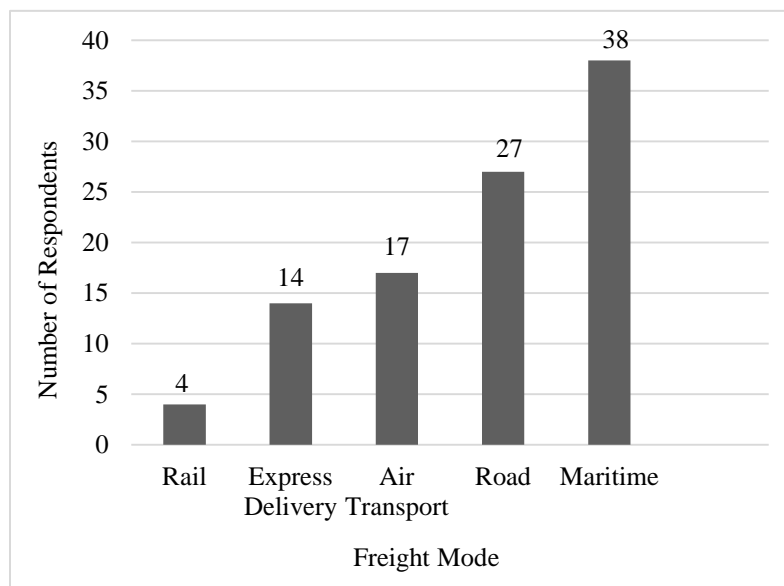


Figure 6:-Freight Modes Operated by Freight Forwarding Companies
Source: Survey Data (2016)

According to Figure 6, the highest freight mode operated is maritime with 38 respondents and it is followed by road, air transport and express delivery with 27, 17 and 14 respondents respectively. The least operated freight mode is rail with only 4 respondents. Figure 7 represents the direction of trade and transport that the respondents deal with.



Figure 7:-Direction of Trade and Transport of Freight Forwarders
Source: Survey Data (2016)

As per Figure 7, export has the highest number with 40 respondents engaging in export trade while 34, 21 and 17 are engaging in import, domestic and international transit trade respectively. Figure 8 illustrates the main line of work that the freight forwarding companies in the sample deal with.

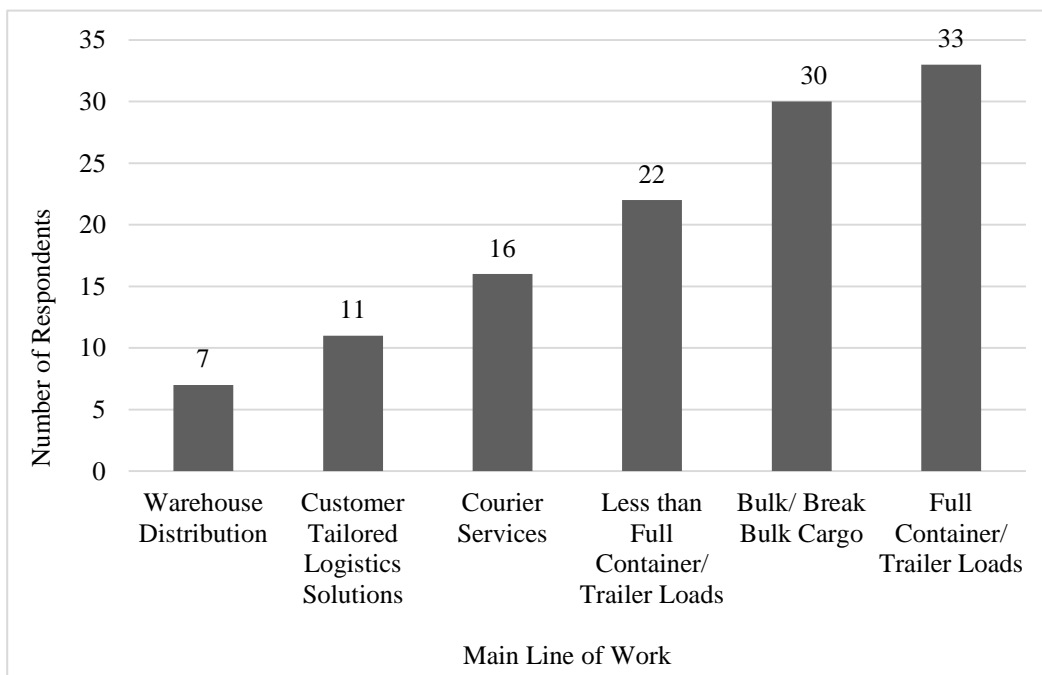


Figure 8:-Main Line of Work of the Respondents
Source: Survey Data (2016)

According to Figure 8, full container/ trailer loads is the highest number with 33 respondents. In export trade, 30 respondents while less than full container/ trailer loads have 22, courier services have 16, customer tailored logistics solutions have 11 and warehouse distribution has 7 respondents.

According to Table 3, the respondents have not strongly disagreed on the items Water Depth, Berth Length and Port Protection Measures while have not strongly agreed on the items Terminal Size, Cargo Handling Facilities and Accessibility. Moreover, the most agreed item in general is Accessibility with 75 percent by adding agreed percentage (45.7 percent) and strongly agreed percentage (33.3 percent). Furthermore, 50 percent of the respondents have given a neutral opinion on Accessibility and it is the item which is given a most neutral opinion. The most disagreed item in general is Cargo Handling Facilities with 43.3 percent by adding disagreed percentage (30 percent) and strongly disagreed percentage (13.3 percent).

Table 3:-Percentages of the Respondents' Opinion on the Quality of the Items of Port Infrastructure Component

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Water Depth	-	3.3	21.7	41.7	33.3
Berth Length	-	13.3	18.3	38.3	30
Berthing Facilities	3.3	11.7	31.7	40	13.3
Terminal Size	8.3	15	43.3	33.3	-
Terminal Connectivity	3.3	15	40	35	6.7
Repair and Maintenance Facilities	5	23.3	31.7	36.7	3.3
Fresh Water Supply Facilities	6.7	16.7	36.7	35	5
Cargo Handling Facilities	13.3	30	45	11.7	-
Port Protection Measures	-	16.7	38.3	33.3	11.7
Accessibility	13.3	16.7	50	20	-
Distance to City-Centres	3.3	18.3	46.7	30	1.7

Source: Survey Data (2016)

As per Table 4, the only strongly disagreed item is Cargo Handling Facilities while only the items that were not strongly agreed are Cargo Handling Facilities, Number of Check-in Points and Accessibility. Moreover, the most agreed item in general is Number of Runways with 96.7 percent by adding agreed percentage (50 percent) and strongly agreed percentage (46.7 percent). Furthermore, the most neutrally viewed item is Cargo Handling Facilities with 53.3 percent. The most disagreed items in general are Cargo Handling Facilities and Accessibility with 16.7 percent by adding their relative disagreed percentage and strongly disagreed percentage.

Table 4:-Percentages of the Respondents' Opinion on the Quality of the Items of Airport Infrastructure Component

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Number of Runways	-	-	3.3	50	46.7
Terminal Size	-	1.7	15	51.7	31.7
Number of Gates	-	5	36.7	48.3	10
Distance to City-Centres	-	5	33.3	45	16.7
Number of Check-in Points	-	11.7	48.3	40	-
Length of Runways	-	-	11.7	45	43.3
Terminal Connectivity	-	8.3	28.3	55	8.3
Repair and Maintenance	-	8.3	36.7	48.3	6.7
Cargo Handling Facilities	1.7	15	53.3	30	-
Accessibility	-	16.7	35	48.3	-

Source: Survey Data (2016)

According to Table 5, the respondents have not strongly disagreed on Accessibility and Weight and Height restrictions items while the only item not strongly agreed is Number of Lanes. Moreover, the most agreed item in general is Accessibility with 80 percent by adding the agreed percentage and strongly agreed percentage. Furthermore, 51.7 percent of the respondents have given a neutral opinion on Number of Lanes and it is the item

which is given a most neutral opinion. The most disagreed item in general is also Number of Lanes with 43.4 percent by adding the disagreed percentage and strongly disagreed percentage.

Table 5:-Percentages of the Respondents' Opinion on the Quality of the Items of Road Infrastructure Component

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Accessibility	-	5	15	41.7	38.3
Number of Lanes	6.7	36.7	51.7	5	-
Width of Roads	3.3	18.3	46.7	30	1.7
Quality of Road Surface	5	18.3	43.3	31.7	1.7
Weight and Height Restrictions	-	8.3	40	40	11.7
Traffic Management Systems	5	20	36.7	33.3	5

Source: Survey Data (2016)

According to Table 6, all the respondents have strongly disagreed on all the six items while none of the respondents have strongly agreed on any of the six items. The most disagreed item in general is Railway Network with 98.3 percent by adding the disagreed percentage and strongly disagreed percentage. Furthermore, the most neutrally viewed item is Accessibility with 43.3 percent.

Table 6:-Percentages of the Respondents' Opinion on the Quality of the Items of Rail Infrastructure Component

Item	Strongly Disagree	Disagree	Neutral	Agree
Railway Network	65	33.3	1.7	-
Loading and Unloading Facilities	30	50	18.3	1.7
Accessibility	3.3	51.7	43.3	1.7
Quality of Rail Tracks	55	36.7	8.3	-
Wagon Capacity	20	41.7	36.7	1.7
Wagon Condition	40	30	28.3	1.7

Source: Survey Data (2016)

According to Table 7, all the respondents have strongly disagreed on all the six items while the strongly agreed items are Warehouse Condition and Safety and Security. The most agreed item in general is Warehouse Capacity with 41.6 percent by adding the agreed percentage and strongly agreed percentage. Furthermore, 48.3 percent of the respondents have given a neutral opinion on Number of Warehouses and it has the most neutral percentage. Moreover, the most disagreed item in general is Warehouse Condition with 63.3 percent by adding the disagreed percentage and strongly disagreed percentage.

Table 7:-Percentages of the Respondents' Opinion on the Quality of the Items of Warehouse Infrastructure Component

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Warehouse Capacity	3.3	10	45	33.3	8.3
Warehouse Condition	13.3	50	35	1.7	-
Safety and Security	8.3	43.3	36.7	11.7	-
General Cargo Storage	5	25	46.7	21.7	1.7
Liquid Bulk Storage	10	18.3	46.7	23.3	1.7
Number of Warehouses	1.7	18.3	48.3	30	1.7

Source: Survey Data (2016)

According to Table 8, the respondents have not strongly disagreed on Online Accessibility, Adequacy of Facilities and User-friendliness items while the only item not strongly agreed is System Automation. Moreover, the most agreed item in general is Online Accessibility with 80 percent by adding the agreed percentage and strongly agreed percentage. Furthermore, 46.7 percent of the respondents have given a neutral opinion on Current System Adequacy and System Automation items and they have the most neutral opinion percentages. The most disagreed item in general is also System Automation with 18.3 percent by adding the disagreed percentage and strongly disagreed percentage.

Table 8:-Percentages of the Respondents' Opinion on the Quality of the Items of ICT Infrastructure Component

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Online Accessibility	-	-	20	45	35
Adequacy of Facilities	-	11.7	36.7	46.7	5
User-Friendliness	-	3.3	23.3	45	28.3
Current System Adequacy	3.3	11.7	46.7	36.7	1.7
Information Gathering	3.3	6.7	31.7	46.7	11.7
System Automation	3.3	15	46.7	35	-

Source: Survey Data (2016)

Table 9 indicates the aggregate percentages of 60 respondents' opinion on the quality of the infrastructure dimension of LPI. As per Table 9, Airport Infrastructure has the highest percentage and it is followed by ICT Infrastructure, Road Infrastructure, Port Infrastructure, Warehouse Infrastructure and Rail Infrastructure.

Table 9:-Aggregate Percentages of the Respondents' Opinion on the Six Components

Component	Very Low	Low	Average	High	Very High
Port Infrastructure	5.7	19	33.5	29.1	12.7
Airport Infrastructure	7	9.5	29.9	39.5	20.4
Road Infrastructure	2.5	17.8	35.7	29.3	14.6
Rail Infrastructure	30.1	44.4	24.8	8	-
Warehouse Infrastructure	7.2	29.7	38.4	21	3.6
ICT Infrastructure	1.4	10.3	33.8	37.2	17.2

Source: Survey Data (2016)

The output in Figure 9 was obtained by utilizing the BPMSG AHP excel template with multiple inputs which utilize Eigen Vector Method (EVM) and Row Geometric Mean Method (RGMM) to obtain priorities of each component in Infrastructure dimension.

AHP Analytic Hierarchy Process (EVM multiple inputs)

K. D. Goepel Version 07.06.2015

Free web based AHP software on:

<http://bpmsg.com>**Only input data in the light green fields and worksheets!**

n= Number of criteria (2 to 10) Scale:

N= Number of Participants (1 to 20) α : Consensus:

p= selected Participant (0=consol.) 2 7

Objective Identify the prioritization in developing the Infrastructure dimension of LPI

Author Date Thresh: Iterations: EVM check:

Table	Criterion	Comment	Weights	Rk
1	PI	Quality of Port Infrastructure	25.9%	1
2	AI	Quality of Airport Infrastructure	13.9%	5
3	RoI	Quality of Road Infrastructure	14.5%	4
4	RaI	Quality of Rail Infrastructure	5.6%	6
5	WI	Quality of Warehouse and Transloading	20.9%	2
6	ICTI	Quality of ICT Infrastructure	19.3%	3
7			0.0%	
8			0.0%	
9		for 9&10 unprotect the input sheets and expand the	0.0%	
10		question section ("+" in row 66)	0.0%	

Result Eigenvalue lambda:

Consistency Ratio 0.37 GCI: CR:

Matrix

	PI	AI	RoI	RaI	WI	ICTI	0	0	0	0
PI	1	2	2 4/7	4 2/9	1	1 1/8	-	-	-	-
AI	1/2	1	2 5/6	2/3	2/3	-	-	-	-	-
RoI	2/5	1	3	3/4	5/6	-	-	-	-	-
RaI	1/4	1/3	1/3	1	1/3	1/3	-	-	-	-
WI	1	1 1/2	1 1/3	3 1/4	1	-	-	-	-	-
ICTI	8/9	14/9	1 1/5	3 1/6	1	-	-	-	-	-
0	-	-	-	-	-	-	1	-	-	-
0	-	-	-	-	-	-	-	1	-	-
0	-	-	-	-	-	-	-	-	1	-
0	-	-	-	-	-	-	-	-	-	1

normalized principal Eigenvector

(25.86%)

13.87%

14.46%

5.59%

20.89%

19.33%

0.00%

0.00%

0.00%

0.00%

Figure 9:-Summary of the AHP Output

Source: Compiled by the Authors (2016) based on BPMSG AHP Excel Template with Multiple Inputs

AHP measures the Consistence Ratio (CR) to reduce the inconsistency characteristics in the decision process. If the CR value is 0.10 or less, it emphasizes that the decisions are evidence of informed judgments. The CR value should be 10 percent or less (Saaty, 1988). According to Figure 9, the CR is 0.8 percent and therefore, there is evidence of

informed judgments. The consensus is 92.3 percent which emphasize that the rate of agreement the outcome make sense in all circumstances (BPMSG, 2013). To obtain total consistency, Lambdamax value should equal to the number of criteria used in the matrix. According to Figure 9, the number of criteria are six ($n=6$) and the lambda value is 6.051. Thus, it is clear that the lambda value equals to the number of criteria.

Table 10 presents the weightages and the rankings of each component in identifying the prioritization in developing the infrastructure dimension. As per Table 10, the most weighted criterion is Port Infrastructure with 25.9 percent weightage. Therefore, it is the first priority in ranking. The second most weight weighted criterion is Warehouse Infrastructure with 20.9 percent weightage. It is the second priority in ranking. ICT Infrastructure has a weightage of 19.3 percent and it is the third priority in ranking. Road Infrastructure has the fourth highest weightage with 14.5 percent indicating it as the fourth priority in ranking. Airport Infrastructure is the fifth priority in ranking with a weightage of 13.9 percent. The least weighted criterion is Railway Infrastructure with 5.6 percent and it is the last priority in ranking.

Table 10:-Final Weights and Rankings of the Prioritization of Infrastructure Development

Criterion/ Component	Weights	Rank
Port Infrastructure	25.9%	1
Warehouse Infrastructure	20.9%	2
ICT Infrastructure	19.3%	3
Road Infrastructure	14.5 %	4
Airport Infrastructure	13.9%	5
Railway Infrastructure	5.6 %	6

Source: Constructed by the Authors (2016)

Conclusion and Recommendations:-

Since the logistics industry of a country is vital for global competitiveness, measuring the countries logistics performance is indeed mandatory. With the government's objective to convert Sri Lanka into a leading logistics hub in the region, the logistics performance should be enhanced in all the possible aspects. The World Bank's Logistics Performance Index (LPI) is an acceptable indicator to measure the logistics performance of a country. Thus, the study was initiated to analyze the most underperforming dimension of the LPI in Sri Lanka. When examining the LPI scores of Sri Lanka, it was revealed that since the beginning of LPI calculations by the World Bank, throughout the years, Sri Lanka was underperforming compared to other countries who are competing to initiate the logistics hub concept in the region. Taking these facts into account, the six dimensions of LPI were compared year-wise and country-wise to identify the most underperforming dimension: quality of trade and transport related infrastructure. In the literature, it was highlighted that even though Sri Lanka is strategically benefitted, without having favorable LPI scores and sufficient investment on infrastructure, attracting potential investors and establishing a logistics hub would be problematic.

The core objective of the study was focused on identifying the reasons for the poor performance in infrastructure dimension of LPI. Insufficient investment, lack of collaboration between the government and the private sector, lack of transparency in policy implementation, not realizing the right infrastructure development prioritization, not having a separate regulatory body for logistics and not focusing on the expectations and solutions forwarded by traders were identified as the general reasons. The reasons behind poor port infrastructure were inadequacy of cargo handling facilities, port congestion, insufficiency of the currently operated gates, inadequate space accommodations, and absence of dry port facilities and underutilizing the available infrastructure facilities. The respondents rated port infrastructure as average in quality. Quality of airport infrastructure was identified as good by the respondents. However, they recognized check-in points being crowded and insufficiency of the technology of the scanning equipments as poor performing facilities. Road infrastructure was rated as average in quality and insufficiencies in number of lanes, width of the roads, quality of road surfaces, traffic management, inconveniences with height and weight restrictions, not having separate lanes for trucks and road congestion were pointed out by the respondents. Warehouse and transloading was rated average in quality and respondents identified poor conditions in the warehouse, lack of safety and security measures, inadequacy of storage facilities and cargo handling equipments and outdated equipments as the reasons. Quality of ICT infrastructure was rated good in quality by the respondents. However, the inadequacy of the current IT systems, fully automation of IT systems and the need for a national level single window concept was highlighted. In the qualitative assessment, it was pointed out that there are issues with

online accessibility and internet speed. As per the first specific objective rail infrastructure was identified as the most underdeveloped component in the infrastructure dimension of LPI. The respondents highlighted that current railway network does not fit for freight operations and furthermore, lack of loading and unloading facilities, poor quality of rail tracks and poor condition of rail wagons were pointed out.

The second specific objective was to identify the prioritization in trade and transport infrastructure development in Sri Lanka. Despite the fact that rail infrastructure was identified as the most underperforming infrastructure component, the respondents identified port infrastructure to be the first priority in infrastructure development. The main reason behind this is the relative importance of port infrastructure improvement since port performances play a vital role in freight operations. Warehouse and transloading was the second in priority ranking and it is followed by ICT infrastructure, road infrastructure, airport infrastructure and rail infrastructure. This indicates that freight forwarders expect the authorities to develop the most important infrastructure components for their operations according to the rankings obtained.

The study highlights that policies should be reformed, and expectations of the trades should be taken into consideration. The private and public collaboration should be strengthened. The study suggests that a separate regulatory body for logistics will ease the complex decision making. For the issues in port infrastructure, more gates should be opened. The authorities must concern selecting the most feasible locations for airport constructions in the future. Since airport infrastructure is quite good in Sri Lanka what must be done is to improve the areas where current benefits can be enhanced. Concerning the importance of inland freight transport, an immediate remedy should be given to control the urban congestion that hinders the freight transport within the major cities. Rail transportation is indeed cost-effective. Therefore, the authorities must realize the real potential of rail freight transport and upgrade the current railway network. Furthermore, developing a multi-modal transport system is a solution to involve rail transportation. Due to the high cost of equipments used in warehouse and transloading facilities, the taxes on cargo handling equipment imports should be reduced. The current study recommends improving the facilities of the available warehouses and container depots. Therefore, there is a need for a national level single window system to develop ICT infrastructure to facilitate trade. The authorities must therefore take these into consideration in policy planning, investment decisions and policy implementations.

Eventhough trade and transport related infrastructure was identified as the most underperforming component, the other five dimensions of LPI in Sri Lanka are also having low LPI scores when compared with the competing countries. Therefore, in that manner, a research can be conducted to cover all the six dimensions of LPI in Sri Lanka. Moreover, a research can be carried out by comparing the performance of the infrastructure dimension of LPI in Sri Lanka with the developed countries' performances of the same dimension in order to develop a benchmark to evaluate the quality of trade and transport infrastructure. The researchers highlight the need to identify the impact of government policies and activities of regulatory institutions towards the quality of trade and transport related infrastructure in Sri Lanka.

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