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Logistics Performance Index (LPI) and insights on the Logistics Performance Improvement In the Arabian Region

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ABSTRACT: The World Bank firstly issued the Logistic Performance Index (LPI) in 2007, which analyzes six different aspects that influence the logistics Performance of different countries. These six indicators are based on two main important Categories. They are: Policy Regulation Areas, indicating key inputs to the supply chain, containing three Indicators: Customs Performance (the efficiency of custom clearance), National Infrastructure Quality and Internal Logistics Service Quality Delivery Performance Results, being the other three indicators: Punctuality of operations, Competitiveness of Prices for International Shipments, and Ease of Tracking and Tracing. At the macro level logistics performance could have a major impact in the country economic performance. In the Logistics performance index 2018,the UAE ranked first in the Arab world and 11th globally, followed by Oman, Saudi Arabia, Bahrain and Kuwait in the 2018 LPI report . while Egypt ranked seventh in the Arab standings, followed by Lebanon, Jordan and Djibouti, with 67, 79, 84 and 90 respectively. Tunisia, the Comoros, Morocco, Algeria, Sudan and Mauritania followed in the rank, while Syria, Yemen, Somalia, Iraq and Libya were placed in last regionally. In 1996 most of the Arabian countries signed a regional trade agreement GAFTA (Greater Arab Free Trade Area) to eliminate trade barriers between the Arab countries however the bilateral trade volume between the Arabian countries have been far behind the saturation level , At the macro level its generally accepted that the countries logistics performance has a major impact on the economic performance of the country economic, Few researchers have addressed the effect of the Arabian countries logistics performance in their economic development . The aim of this paper is to analyze the Arabian countries logistics performance to suggest solution that might asses' policy makers in developing the logistics performance of their countries , Also the paper examine the relationship between Arab countries economic performances and how it affect by theirlogistics performance .

Keywords: Logistics Performance Index (LPI) ,Bilateral Trade , Economic Development

I. INTRODUCTIONRD

The Arab region is rich in resources, with enormous oil and natural gas reserves however the region's instability has affected the country's economic performance , Arab countries are made up of twenty two Arab-speaking states which of the Arab League These countries have noticeable similarities in terms of language, cultural, historical, social and religious values. These factors along with geographic closeness facilitate the economic interaction and trade cooperation between member countries. The history of economic integrations in Arab world dates back to 1945, when the Arab League was founded (Neaime, 2005). The founding document of the Arab league included a number of legislative texts and institutional structures with an ambitious plan to promote economic cooperation and intra-Arab trade (Abu Hatab and Elkheshen 2015). Subsequently, in 1953, the Economic and Social Council of the Arab League has taken further step to promote intra-Arab trade by launching the first arrangements on Trade Facilitation and Organizing Transit Trade among Arab countries. In 1957, the same council approved an agreement on free movement of people and capital, as well as establishment of common customs area under the name "Arab Economic Union". The common market became effective in 1964 and a number of Arab states have joined this agreement in 1965. The main goal of that agreement included progressive reductions in tariffs and taxes and the removing of administrative barriers, with aim of achieving full-trade liberalization among the joining countries (Romagnoli and Mengoni, 2009). [19]

In 1981The Kingdom of Bahrain, the State of Kuwait, the Sultanate of Oman, the State of Qatar, the Kingdom of Saudi Arabia and the United Arab Emirates set up the Cooperation Council for the Arab States of the Gulf (GCC), The established and efficient air and sea connections and developed infrastructure significantly supported the country members economic reform programs

In February 2004 Egypt, Jordan, Morocco and Tunisia signed a free trade agreement named after the Moroccan city of Agadir, The Agadir Agreement is open to further membership by all Arab countries that are members of the Arab League and the Greater Arab Free Trade Area, and linked to the EU through an Association Agreement or an FTA. Its purpose is to facilitate integration between Arab states and the EU under the broader EU-Mediterranean process

In 2007 the World Bank published the Logistics Performance Index (LPI) to help countries to identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The report measures 160 countries

The Logistics Performance Index fit published biannually by the World Bank. The Logistics Performance Index helps countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The LPI consists of both qualitative and quantitative measures and helps build profiles of logistics friendliness for these countries. It measures performance along the logistics supply chain within a country and offers two different perspectives: international and domestic.

The final index is a weighted average of six main components, covering the following policy areas pertaining to logistics performance: efficiency of the clearance process, quality of infrastructure, ease of arranging competitively priced shipments, competence and quality of logistics services, ability to track and trace consignments, and timeliness of consignment

This paper is organized as follows , Section 1 gives a brief overview of the logistics and bilateral trade , The second section analyses the previous work in analyzing the countries logistics performance, the third section an analyses for the Arabian countries logistics performance ,in the fourth section we examine the effect of Arabian countries logistics performance in their GDP ,Our finding and conclusions are drawn in the final section.

II. LITRATURE REVIEW

logistics is defined by Asian Development Bank (2012) to refer to the process of planning, implementing, and controlling the efficient flow of products, information, and funds to conform to the client's requirements. Transport is a core component of logistics, moving goods between different points in the supply chain. Logistics encompasses the storage of raw materials, work-in-process parts, and finished products, as well as a variety of value-added services

(Leal 2012) uses the term Logistics as the functional system which consists in combining and coordinating the operations of different modes of transport as a fundamental pre-requisite forEnsuring efficient service .

In the literature usually logistics refers to as "part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related in formation from the point of origin to the point of consumption in order to meet customers' requirements" The trade facilitation is generally understood as simply the liberty of moving goods through ports or customs at the border . (The Council of Logistics Management)

Trade logistics is a crucial part of the modern, globalized economy (Arviset al. 2010). Better logistics performance enables firms to move goods across borders quickly, cheaply, and reliably. It helps reduce cost overheads by lowering inventory levels and making it possible to adopt 'just-in-time' techniques. Networked production of goods such as consumer electronics relies particularly heavily on logistics to coordinate the production and distribution of large numbers of parts and components, and their final assembly into a finished product [24]

Alberto Portugal-Perez et al (2010) proposed that trade facilitation is a way of measurement that could be taken along two dimensions: a "hard" dimension related to tangible infrastructure such as roads, ports, highways, telecommunications, as well as a "soft" dimension related to transparency, customs management, the business environment, and other institutional aspects that are intangible

Throughout this paper we use the term logistics performance and LPI interchangeably in accordance with the data published in the world bank "connecting to compete report 2018 ".

There is a considerable amount of literature on the analyses of the country Logistics performance to provide guidance to the policy makers in the ways for development , AnjuIlangasekara and WasanthaPremarathne (2018) in their review for

the logistics performance in Sri Lanka have used the LPI data(2007, 2010, 2012 and 2014) to analyze, , the researchers have identified port infrastructure, airport infrastructure, road infrastructure, rail infrastructure, warehousing and trans loading infrastructure and ICT infrastructure as the six components of the infrastructure dimension of the LPI. . According to the research results the development of the port infrastructure will enhance the customers satisfaction with the logistics services provided .

Several studies, to study the different factors affecting the LPI performance have been carried out relying on the LPI data available , for example (Varbanova 2017) An analysis of the Bulgarian logistics performance and the policy actions required to enhance the country ranking in the LPI index among the suggested actions were mainly directed to the development of the infrastructure and the Ability to track and trace consignments which will directly affect Timeliness of shipments in reaching destination and the Ease of arranging competitively priced shipments, (Lauri OJALA, Dilay Çelebi,2015) studied the effect of the policy actions, competitive forces, economic and political environment in turkey's logistics performance ,Although the Turkish port service charges were much lower than charges incurred in other major ports the cost advantage was surpassed by longer times spent at ports due to delays and longer and complicated import procedures, The research has suggested that the promotion of the single-window system will enhance the efficiency of customs clearance. Also the liberalization of the Turkish railway transportation will probably enhance the quality of rail transport services that will positively affect the competitively priced shipments. The political instability and wars in neighboring countries has been seen as one of the major reasons for delays in delivery times, Also (Hellen Xavier das Chagas etl,2014) overviewed the Brazilian logistics performance and its effect on trade , the efficiency of the clearance process and the ease of arranging competitively priced shipments were having the lowest ranking among the six LPI indicators which were seen to be affected by the very high tax burden ,The report has suggested the policy makers to reduce the average tax burden which were almost double the average tax burden of other countries that are part of the BRICS (the five major emerging economies Brazil, Russia, India, China and South Africa)

(RatkoStanković et al 2014) have relied on the LPI data during the 2007-2014 period to analyze the necessary actions needed to enhance the Croatian Logistics performance, The Logistics infrastructure and Customs clearance have been the lowest ranking component across the entire period, A research survey was designed to study the customer satisfaction with the current logistics infrastructure (Maritime transport, Air freight, Rail transport, Road transport) and Customs clearance, The survey has shown a general dissatisfaction with the Rail transport (78 %) and airfreight(53 %) and customs clearance (51 %).

A recent review of the literature on this topic found that an increasing number of studies have relied on the LPI data to examine the countries bilateral trade , (W. Hwang, et al,2017)have conducted a comparable analysis of the logistics performance of China, Japan, and Korea using the LPI 2015 and other relevant macroeconomic data to determine the critical factors affecting the three countries logistics performance, The research has analyzed the three countries Railways and port container traffics, Transportation infrastructure capacities , Telecommunications performance and third-party logistics provider 3PL market share in the Asia Pacific's region were the main factors affecting logistics performance .The research has also suggested the policy makers to implement more effective information management systems ,support green logistics initiatives and deregulate the logistics sector to enhance the three countries current logistics performance.

(Azmat GANI-2017)has used the LPI data to examine the effects of logistics performance in countries imports and exports , The research has relied on the LPI data for sixty countries in four time periods (2007, 2010, 2012 and 2014) and its correlation with the country's GDP to determine its effect on the countries international trade ,while (Vittorio d'Aleo,2015) has used the LPI data(2007-2010-2012-2014) as a Mediator variable to test the statistical significance of the relationship between the Global Competiveness Index(GCI) and Gross Domestic Product (GDP).

(WaiPeng Wong &ChorFoon Tang,2018) analyzed impact of economic and social indicators(corruption, political stability, infrastructures , technology readiness , education and training competitiveness , supply of labor)on the country's overall logistics performance, The study found that the level of infrastructure and technology development had the highest significant effect on the countries Logistics Performance .

(Dilay C¸ elebi, 2017)demonstrated the effect of logistics performance on the country's trade volume suggesting that the countries LPI had higher impact on the countries imports more than exports. The study found that upper-middle-income economies have the second highest coefficient for LPI on trade. More specifically, for every 10% increase in the LPI of a typical upper-middle-income exporter, bilateral exports increase by more than 41%, holding the influence of the remaining determinants of trade fixed. For every 10% increase in the LPI of a typical upper-middle-income country, bilateral imports increased by almost 59% on average. (TurkayYILDIZ , 2016) has used the LPI data to conduct a correlation analysis between the LPI indicators and the Economic Forum Global Competitiveness Index (WEF's GCI),The research has found that indicators in the global competitiveness indicators data are correlated with the ef-

ficiency of logistics and some variables in the global competitiveness indicators data contribute much higher to logistics performance than other variables via the canonical correlation analysis.
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(Luisa Martía, et al 2014) have compared the countries LPI data published in 2007 and the LPI data published in 2012 to study the effect of an enhanced logistics performance on the countries trade volume , The gravity model1 has been used to analyze the impact of the LPI and each of its components on the bilateral trade between countries with a maritime boundary.while(Daniel Saslavskya and Ben Shepherdb 2013) studied the effect of an enhanced logistics performance on the trade of the final products and semi-finished products, The research concluded that the trade in parts and components within international production networks is more sensitive to logistics performance than trade in final goods

(Jesus Felipe and Utsav Kumar,2012) examined the impact of the individual components of the LPI(customs, infrastructure, and logistics)and concluded that the improvement in infrastructure has more significant impact in the Central Asian countries exports however For the importing countries customs efficiency was the most important factor.

(SametGuner* and ErmanCoskun 2012) have used the 2010 LPI data to examine the correlation of the countries logistics performances with their economic(World Bank ,OECD) and social(human development index) indicators. The research has found a weak relationship between GDP and logistics performance also the logistics performances of the surveyed countries wasn't significantly correlated with the countries spending on transport infrastructure However a significant relationships with government effectiveness and control of corruption, "This result causes from the nature of the LPI survey. LPI is a questionnaire that applied to the logistics firms' managers. Questionnaire consists of qualitative statements which depend on personal experiences and interpretation rather than quantitative data. Participants contributed this study by their own experiences in each country. So it can be accepted that LPI is mostly Subjective and measures the perceptions of participants. Accordingly, countries with high social indicators can be perceived better by participants. Because successful social indicators allow logistics service providers to operate smoothly and formally within a country. As a result, perspectives of Logistics can determine the country scores".

(Jane Korinek, Patricia Sourdin,OECD,2011) have studied the effect of the quality of logistics services on trade , Using indicators such as the World Economic Forum's Enabling Trade Index and the Logistics Performance Index the research found that an enhancements in the quality of logistics services are associated with a strong increases in trade," All the components of the LPI are strongly positively correlated with each other so that countries with high quality logistics will also have a strong ability to ensure timely delivery of shipments. The reporting country indicators are weakly negatively correlated with the partner country indicators suggesting that countries trade somewhat more withothers that have a similar quality of logistics services.while (Bernard Hoekman, Alessandro Nicita 2011) have used the LPI data 2010 to study the effect of trade policies on the trade volume of the countries , The research results indicated that an enhancement in the logistics performance would likely generate large trade gains, especially in terms of exports.

(Stephen W. Hartman,2010) have studied the trade restrictions including tariffs ,quotas, regulations and other procedures that negatively affect the bilateral trade between developing and developed countries ,The research concluded that Countries having the highest LPI rating are the major global transport and logistics hubs or the base for a strong logistics service industry while the low performing countries were often the landlocked, geographically isolated, or having severe governance issues that make trade difficult, and time consuming causing high transportation costs. This, in turn, causes "limited access to competitive markets for logistics services and dependence upon the performance of other transit countries. Thus, transportation logistics plays a significant role in international trade performance.
(Muster et al, 2007) relied on the 2007 LPI data to conduct a regression analysis over a sample of 100- 110 countries to examine the effect of Logistics performance on bilateral trade , According to the research results a positive relationship were existed between the exports of a country and its LPI accumulated ranking , "a one-unit rise in the exporter's logistics index would raise its exports by 77.2%".

Based on literature, the results of the previous study(Luisa Martía, et al 2014, Muster et al, 2007, Bernard Hoekman, Alessandro ,Nicita 2011 Dilay C¸ elebi, 2017 ,Azmat GANI-2017) support that that an enhancement in the logistics performance would likely generate large trade gains, An increasing number of studies(Turkay Yildiz,2014, Vivek Roy, et al,2017,) have found that the LPI score is highly correlated with their score in the Global Competiveness Index(GCI) and their Gross Domestic Product (GDP), on the other hand some other researchers Jane Korinek, Patricia Sourdin,OECD,2011) suggest that countries trade somewhat more with others that have a similar quality of logistics services or (Lauri OJALA, Dilay Çelebi,2015) The political instability and wars in neighboring countries has been seen as one of the major reasons for delays in delivery times.

[1]The gravity Model assumes that trade between two countries is an increasing function of the each country's gross domestic product (GDP) and a decreasing function of the distance between them—hence the name (like the force of gravity between two objects that are some distance apart).

III. Analysis Of The Arabian Countries Economic And Logistics Performances

They (Ebaidalla M. Ebaidalla, et al,2018) draw our attention to focus on the efforts have been done to promote trade relations and economic integration among Arab countries, the performance of intra-Arab trade is the lowest when compared to other regional integrations blocs such as ASEAN and NAFTA (Harrigan 2014, Abu Hatab and Elkheshen, 2015). That is to say despite the relative homogeneity in terms of religion, culture and language along with the preferential market access, the regional integration in the Arab region is far less than its potential.

They(Ebaidalla M. Ebaidalla, et al,2018) also observed that French-speaking countries exhibit weak trade relations. Moreover, they pointed out that GCC and AMU trading arrangements have no significant effect on promoting integration amongMember countries. In contrary, the Mashreq sub-regional arrangement is found to be hasAchieved considerably higher levels of regional integration among member countries.

Which conclude that beside the core variables of conventional gravity model, the influence of country specific socio-political-institutional factors concerning Arab countries is responsible for a large portion of the mean of total variation in the trade level.

During the last decade the economic performance among the Arabian countries had observed dramatic changes due to political instability and wars in some countries which might affect the countries logistics performance and bilateral trade .in the following section we will provide an analyses for the Arabian countries logistics performance and how it affect their bilateral trade.

Despite immense hydrocarbon wealth, strategic location, and a youthful workforce, the Middle East faces profound economic challenges. The immediate geopolitical risks are obvious: cascading conflicts in Syria and Yemen, ongoing strife in post-uprising countries such as Egypt and Tunisia, and the lingering financial strain of the 2014 collapse in oil prices. But these pressing issues mask a more fundamental challenge facing the region

Polarizing economies exist in the Arab world as major gaps between the rich and the poor exist among nations and societies alike. Based on latest figures and estimates, the Arab League has a total GDP of approximately Int$7.695 trillion (6.0% of the world) at purchasing power parity, or US$2.841 trillion (3.55% of the world) at nominal values. The member state with the highest total GDP is Saudi Arabia at Int$1.921 trillion (PPP), or 759.219 billion in current US dollars (nominal). Comoros has the lowest GDP at Int$1.45 billion (PPP), or US$781 million at nominal. The country with the highest GDP per capita is Qatar, at Int$133,357 (PPP), or US$68,977 (nominal). Yemen has the lowest, with a nominal GDP per capita of US$551 or $1,494 (PPP). Therefore, Qatar's nominal GDP per capita is around 125 times as high as that of Yemen

Country	GDP
Saudi Arabia	795,580
United Arab Emirates	455,590
Egypt	298,150
Iraq	250,070
Qatar	204,310
Algeria	200,170
Kuwait	152,370
Morocco	122,460
Oman	86,530
Syria	77,460
Lebanon	59,730
Libya	51,330
Jordan	43,990
Tunisia	42,280
Bahrain	41,610
Sudan	34,370
Yemen	34,320
Palestine	12,766
Somalia	7,820
Mauritania	5,240

Djibouti	2,390
Comoros	750

Source:https://www.imf.org/external/datamapper/NGDPD@WEO/OEMDC/ADVEC/WEOWORLD/DZA
Table(1-1) shows the nominal GDP for the Arabian countries in 2017

According to the world bank most recent LPI data published in 2018 ,UAE ranked first in the Arab world and 11th globally, followed by Oman, Saudi Arabia, Bahrain and Kuwait in the 2018 LPI report . while Egypt ranked seventh in the Arab standings, followed by Lebanon, Jordan and Djibouti, with 67, 79, 84 and 90 respectively. Tunisia, the Comoros, Morocco, Algeria, Sudan and Mauritania followed in the rank, while Syria, Yemen, Somalia, Iraq and Libya were placed in last regionally.

Country	Score	Ranking
United Arab Emirates	3.96	11
Qatar	3.47	30
Oman	3.20	43
Saudi Arabia	3.01	55
Bahrain	2.93	59
Kuwait	2.86	63
Egypt, Arab Rep.	2.82	67
Lebanon	2.72	79
Jordan	2.69	84
Tunisia	2.57	105
Comoros	2.56	107
Morocco	2.54	109
Algeria	2.45	117
Sudan	2.43	121
Syrian Arab Republic	2.30	138
Yemen, Rep.	2.27	140
Somalia	2.21	144
Iraq	2.18	147
Libya	2.11	154

Table(1-2) shows the Arabian countries LPI ranking in 2018

Egypt performed the best, reporting a score similar to the upper-middle-income average; Lebanon and Jordan scored higher than the lower-middle-income average, and Iraq and the Syrian Arab Republic performed badly, scoring lower than the low-income group. Lastly, Djibouti, the Comoros and the Sudan reported the highest numbers among the least developed countries (LDCs), exceeding the low-income average; while Mauritania, Somalia and Yemen performed the worst, scoring below the low-income group

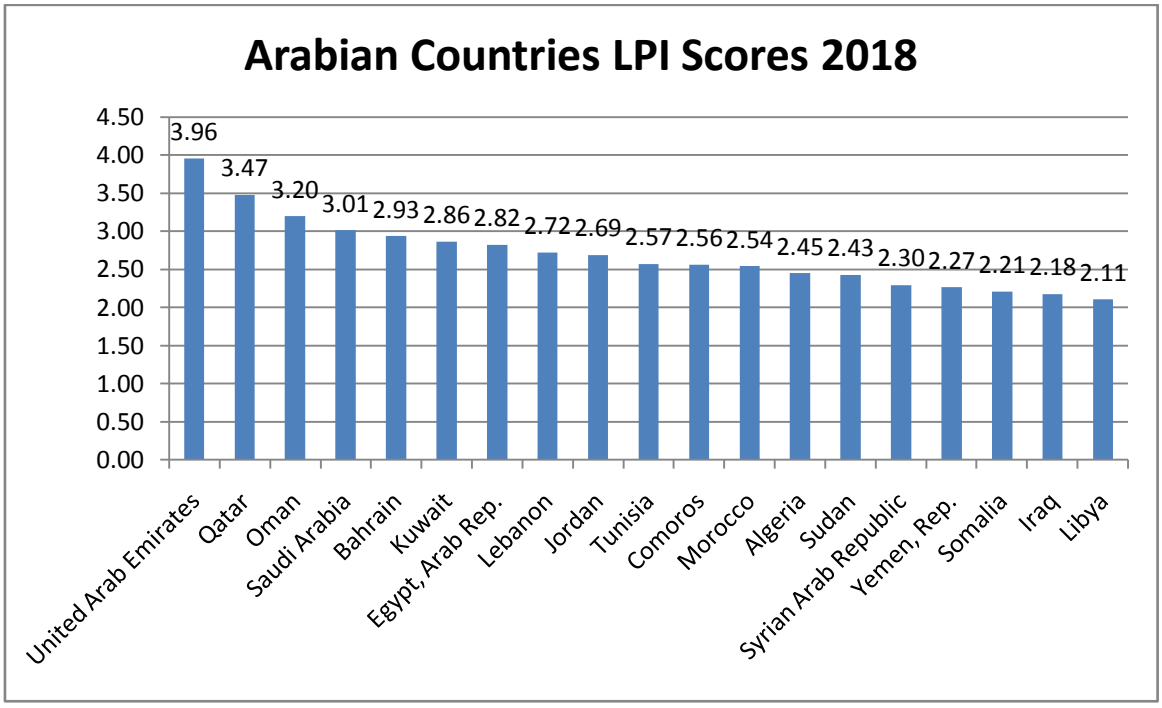

Figure (1-1)
Figure (1-1) shows Arabian countries overall LPI scores in the 2018 LPI report .

Except Egypt, the Arab spring countries, have reported a decline in intra-Arab tradeduring the period (2000-2015), which can be attributed to the conflicts and political instability inThese countries. That is, countries like Libya, Syria, Tunisia and Yemen have witnessed aDecreasing trend in intra-exports and imports during 2000-2015. Strikingly, the contribution ofSyria in Arab trade has declined from 9.02% in 2000 to 0.7% in 2015. Overall, Oman, SaudiArabia and UAE were the most active trading partners amongst Arab states, as their contributionto total trade in 2015 accounted for more than 10 percent. Within the Arab countries, Djiboutiand Morocco were the highest importers while Bahrain, Saudi Arabia and UAE are among thetop exporters. The remarkable increase of both exports and imports for most of Arab countriebetween 2000 and 2015 implies that the creation of the Greater Arab Free Trade Area (GAFTA)

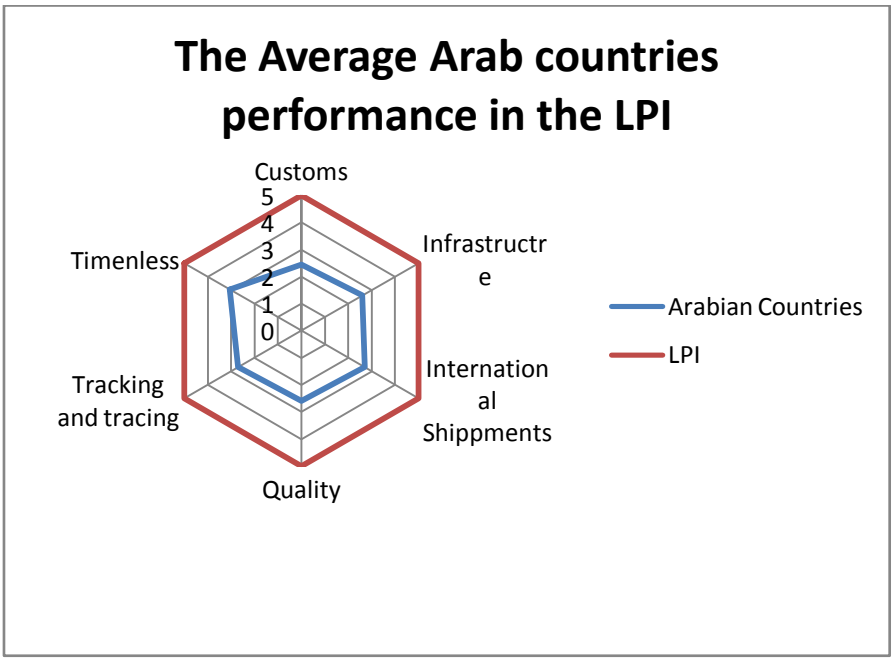

Figure (1-2)

Figure (1-2) shows the average performance of the LPI in each component ,although some Arabian countries had relatively very high score in the LPI for example for UAE accumulated score 3.96 and Qatar 3.47 but for the whole region the logistics performance is just within the average , the highest average score was the timeless of consignment (3.06) and the lowest average score was the efficiency of the clearance process (2.4),(Appendix B includes the whole LPI scores of the Arabian countries in each component)

(Turkay Yildiz,2014) has used the 2014 LPI data to examine the correlation between the countries LPI score and their GDP per capita and Doing Business (DB) scores , A moderately strong correlations was found between the logistics performance variables and the country's GDP also the countries' DB scores were found correlated with the six LPI variables as well. "This finding implies that the lower the GDP or the DB score of a country, the more likely it is to have a low logistics performance score and vice versa" .A clustering algorithm was used to indicates the connections between the countries economic development and their logistics performance to provide policy recommendations to achieve a higher logistics performance
In an attempt to analyze the efficiency of economic indicators as the country GDP to predict the country logistics performance, the research will deploy the Linear Regression Analysis to test the following hypothesis

H0:The country GDP isn't enough predictor for the country logistics performance
H1: A country with a high GDP at nominal values will perform better in the logistics performance index LPI

A Linear regression analysis is used to study the linear relationship between a dependent variable Y (GDP) and one or more independent variables X (LPI). The initial judgment of a possible relationship between two continuous variables encourage us in Performing a linear regression .

The slope b of the regression line is the regression coefficient. It provides a measure of the contribution of the independent variable X toward explaining the dependent variable Y. If the independent variable is continuous (GDP), then the regression coefficient represents the change in the dependent variable (LPI) per unit of change in the independent variable (GDP)

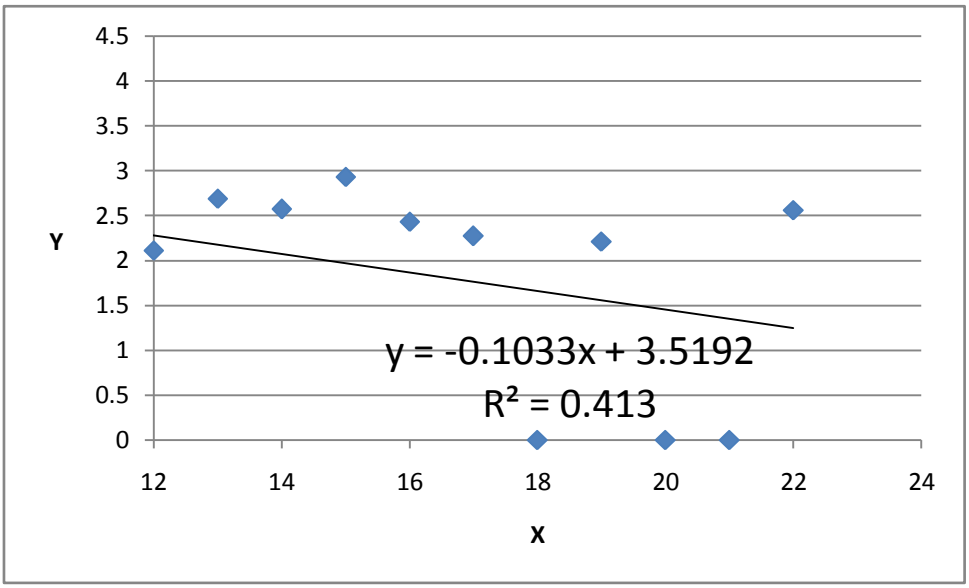

Figure (1-2)

Figure(1-2) shows the correlation slope of the Arabian countries logistics performance to their nominal GPD (appendix A includes the full detailed results) .

The Y Intercept represent the LPI Score of the Arabian Countries while the X intercept represent the nominal GDP of the Arabian countries.

Mauritania, Djibouti and Palestine don't have any LPI data in the latest published report, the values of the three countries were replaced by zero in the conducted correlation analysis.

The final results shows a correlation coefficient r =0.23 which indicates a weak correlation between two investigated variables.

In aim to produce more accurate results of the Arabian countries logistics performance ,A clustering algorithm (K-means clustering algorithm) used to divide the Arabian countries to three clusters according to their LPI scores.
Our experimental set up bears a close resemblance to (Vivek Roy, et al,2017) have developed a Multivariate Adaptive Regression Spline(MARS) model to examine the relationship between the LPI dimensions and Per Capita GDP using the LPI data 2014 , A K-means clustering algorithm has been employed to divide the countries LPI in to five clusters.

Country	GDP	LPI
Saudi Arabia	795580	3.01
United Arab Emirates	455590	3.96
Egypt	298150	2.82
Oman	86530	3.2
Kuwait	152370	2.86
Bahrain	41610	2.93
Qatar	204310	3.47

Table(1-3)

Table (1-3) shows the Arabian countries included in the first cluster according to the research calculations (Appendix C includes the detailed calculations and results), The final results shows a correlation coefficient r = 0.415which indicates a moderately strong correlation between two investigated variables in the first cluster .

LPI Component	**R-Square**	**Significance F**	***P-values***
Customs	**0.30**	**0.20**	**0.3**
Infrastructure	**0.34**	**0.16**	**0.37**
International Shipments	**0.54**	**0.05**	**0.05**
Quality	**0.42**	**0.11**	**0.24**
Tracking and tracing	**0.51**	**0.07**	**0.07**
Timeless	**0.25**	**0.24**	**0.24**

Table(1-4)

Table (1-4) shows the LPI components correlation with the GDP per capita of the Arabian countries included in the first cluster ,The final results shows a coefficient of determination r square = 0.51 between the tracking and tracing and the GDP per capita also a coefficient of determination r square between the international shipment and the GDP per capita of the countries placed the first cluster ,which indicates a moderately strong correlation between this two LPI components (tracing and tracking , international shipment) and the GDP per capita of these countries , accordingly the research recommend for the policy makers of the countries located in the first cluster to prioritize the development of the tracing and tracking and international shipment over other LPI components to enhance their ranking in LPI .

Country	GDP	LPI
Lebanon	59,730	2.72
Jordan	43,990	2.69
Tunisia	42,280	2.57
Comoros	750	2.56
Morocco	122,460	2.54
Algeria	200,170	2.45
Sudan	34,370	2.43

Table (1-5) shows the Arabian countries included in the second cluster according to the research calculations (Appendix C includes the detailed calculations and results),The final results shows a correlation coefficient r =0.49 which indicates a moderately strong correlation between two investigated variables in the second cluster

LPI Component	R-Square	Significance F	P-values
Customs	**0.0002**	**0.001**	**0.975**
Infrastructure	**0.51**	**0.069**	**0.069**
International Shipments	**0.36**	**0.15**	**0.15**
Quality	**0.15**	**0.38**	**0.38**
Tracking and tracing	**0.026**	**0.725**	**0.725**
Timeless	**0.37**	**0.14**	**0.14**

Table (1-6) shows the LPI components correlation with the GDP per capita of the Arabian countries included in the second cluster, The final results shows a coefficient of determination r square = 0.51 between the infrastructure and the GDP per capita of the countries placed in the second cluster ,which indicates a moderately strong correlation between the quality of infrastructure and the GDP per capita of these countries , accordingly the research recommend for the policy makers of the countries located in the second cluster to prioritize the development of the country's infrastructure over other LPI components to enhance their ranking in LPI .

Country	GDP	LPI
Syrian Arab Republic	77460	2.3
Yemen, Rep.	34320	2.27
Somalia	7820	2.21
Iraq	250070	2.18
Libya	51330	2.11

Table (1-7) shows the Arabian countries included in the third cluster according to the research calculations (Appendix C includes the detailed calculations and results),The final results shows a correlation coefficient r = 0.033which indicates a weak correlation between two investigated variables in the third cluster.

LPI Component	R-Square	Significance F	P-values
Customs	**0.0002**	**0.97**	**0.97**
Infrastructure	**0.51**	**0.06**	**0.06**
International Shipments	**0.23**	**0.15**	**0.15**
Quality	**0.15**	**0.38**	**0.38**
Tracking and tracing	**0.02**	**0.72**	**0.72**
Timeless	**0.37**	**0.14**	**0.14**

Table (1-8) shows the LPI components correlation with the GDP per capita of the Arabian countries included in the third cluster, The final results shows a coefficient of determination r square = 0.51 between the infrastructure and the GDP per capita of the countries placed in the third cluster ,which indicates a moderately strong correlation between the quality of infrastructure and the GDP per capita of these countries , accordingly the research recommend for the policy makers of the countries located in the third cluster to prioritize the development of the country's infrastructure over other LPI components to enhance their ranking in LPI .

IV. FINDING AND DISCUSSIONS

The sample used in the study conducted composed of 22 countries 19 of them were listed in the Logistics performance Index (LPI) ,The 22 Arabian countries economic and logistics performances were scattered among the high ,medium and low income countries which provide the research results more significance for example ;Qatar's nominal GDP per capita is around 125 times as high as that of Yemen

This result has further strengthened our confidence that in the Arabian region the nominal GDP doesn't provide sufficient explanation for the country logistics performance.
The Average LPI performance of the Arabian region is quite moderate ,the high LPI score of one or two countries doesn't reflect the performance in the whole region .
Interestingly the high values of nominal GDP don't usually mean a high LPI score, Iraq for instance have the fourth highest nominal GDP among the Arabian countries placed while the second lowest LPI score in comparison with other Arabian countries , This finding confirms(Lauri OJALA, Dilay Çelebi,2015) conclusions that political instability and wars in neighboring countries strongly affect their logistics performance especially the timing of delivery consignments .

Our research results correlate favorably with(Turkay Yildiz,2014) concluding that a moderately strong correlations was found between the logistics performance variables and the country's GDP

Our study provides additional support for (Vivek Roy, et al,2017,) conclusions that the significance of the LPI dimensions to the country nominal GDP vary according to the country income group ,for example developing countries indicates a top priority to focus in the development of their current telecommunication and transport infrastructure to enhance their LPIs ranking.

This study has not confirmed previous research (SametGuner* and ErmanCoskun 2012) findings that a weak relationship existed between the country nominal GDP and their logistics performance.

V. LIMITATIONS

We aware that our research may have two limitations firstly the LPI components were not tested in correlation with other factors that might affect the countries logistics performance secondly the research didn't study the effect of the Arabian countries logistics performance in their bilateral trade .

There are several sources for the moderate logistic performance in the Arab region that also affect their bilateral trade (Ebaidalla M. Ebaidalla, et al,2018) the influence of country specific socio-political-institutional factors concerning Arab countries is responsible for a large portion of the mean of total variation in the trade level, (Luisa Martí ,et al ,2017)The Somalian and Yemeni resultsare a consequence of a combination of sources such as weak governmental institutions,a natural bottleneck in the area, and a significant flow of merchant ships throughthe Gulf as more than a 10% of the cargo use the Suez Canal and is potentiallyaffected by this threat, This supports previous findings in the literature (Lauri OJALA, Dilay Çelebi,2015) that the political instability and wars in neighboring countries has been seen as one of the major reasons for delays in delivery times.

Given that the focus of the study was on the effect of the the country nominal GDP on its logistics performance there is a possibility that we were unable to investigate the relationships between the LPI score and other factors as country Competitiveness (Turkay YILDIZ , 2016,Vittorio d'Aleo,2015),human development (SametGuner*,et al ,2012)corruption (WaiPengWong,et al ,2018)that might significantly affect the countries logistics performance

VI. SUMMARY

The Arab region is rich in resources, with enormous oil and natural gas reserves however the region's instability has affected the country's economic performance , Arab countries are made up of twenty two Arab-speaking states which of the Arab League These countries have noticeable similarities in terms of language, cultural, historical, social and religious values. These factors along with geographic closeness facilitate the economic interaction and trade cooperation between member countries

In 2007 the World Bank published the Logistics Performance Index (LPI) to help countries to identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The report measures 160 countries

According to the world bank most recent LPI data published in 2018 ,UAE ranked first in the Arab world and 11th globally, followed by Oman, Saudi Arabia, Bahrain and Kuwait in the 2018 LPI report . while Egypt ranked seventh in the Arab standings, followed by Lebanon, Jordan and Djibouti, with 67, 79, 84 and 90 respectively. Tunisia, the Comoros, Morocco, Algeria, Sudan and Mauritania followed in the rank, while Syria, Yemen, Somalia, Iraq and Libya were placed in last regionally.

The researchresults has further strengthened our confidence that in the Arabian region the nominal GDP doesn't provide sufficient explanation for the country logistics performance. TheAverage LPI performance of the Arabian region is quite moderate ,the high LPI score of one or two countries doesn't reflect the performance in the whole region .

In aim to produce more accurate results of the Arabian countries logistics performance ,A clustering algorithm (K-means clustering algorithm) used to divide the Arabian countries to three clusters according to their LPI scores.

The Arabian countries included in the first cluster and second cluster according to the research calculations shows a correlation coefficient r equals 0.415 and 0.49 accordingly which indicates a moderately strong correlation between the

two investigated variables in the first and second cluster however the correlation coefficient r equals 0.033 for the countries in the third cluster which represent a weak relationship between the two variables

APPENDIX-A-

Country	GDP	LPI
Saudi Arabia	**795,580**	**3.01**
United Arab Emirates	**455,590**	**3.96**
Egypt	**298,150**	**2.82**
Iraq	**250,070**	**2.18**
Qatar	**204,310**	**3.47**
Algeria	**200,170**	**2.45**
Kuwait	**152,370**	**2.86**
Morocco	**122,460**	**2.54**
Oman	**86,530**	**3.2**
Syria	**77,460**	**2.3**
Lebanon	**58,281**	**2.72**
Libya	**51,330**	**2.11**
Jordan	**43,990**	**2.69**
Tunisia	**42,280**	**2.57**
Bahrain	**41,610**	**2.93**
Sudan	**34,370**	**2.43**
Yemen	**34,320**	**2.27**
Palestine	**12,766**	**0**
Somalia	**7,820**	**2.21**
Mauritania	**5,240**	**0**
Djibouti	**2,390**	**0**
Comoros	**750**	**2.56**

APPENDIX-B-

Country	Customs	Infrastructure	International Shipments	Quality	Tracking and tracing	Timeless
United Arab Emirates	3.63	4.02	3.85	3.92	3.96	4.38
Qatar	3.00	3.38	3.75	3.42	3.56	3.70
Oman	2.87	3.16	3.30	3.05	2.97	3.80
Saudi Arabia	2.66	3.11	2.99	2.86	3.17	3.30
Bahrain	2.67	2.72	3.02	2.86	3.01	3.29
Kuwait	2.73	3.02	2.63	2.80	2.66	3.37
Egypt, Arab Rep.	2.60	2.82	2.79	2.82	2.72	3.19
Lebanon	2.38	2.64	2.80	2.47	2.80	3.18
Jordan	2.49	2.72	2.44	2.55	2.77	3.18
Tunisia	2.38	2.10	2.50	2.30	2.86	3.24

Comoros	2.63	2.25	2.49	2.21	2.93	2.80
Morocco	2.33	2.43	2.58	2.49	2.51	2.88
Algeria	2.13	2.42	2.39	2.39	2.60	2.76
Sudan	2.14	2.18	2.58	2.51	2.51	2.62
Syrian Arab Republic	1.82	2.51	2.37	2.29	2.37	2.44
Yemen, Rep.	2.40	2.12	2.21	2.26	2.16	2.43
Somalia	2.00	1.81	2.61	2.30	2.23	2.20
Iraq	1.84	2.03	2.32	1.91	2.19	2.72
Libya	1.95	2.25	1.99	2.05	1.64	2.77
Total Score	46.64	49.69	51.61	49.44	51.64	58.26
Average Score	2.45	2.62	2.72	2.6	2.72	3.07

APPENDIX-C-

k-means clustering is a method of vector quantization, originally from signal processing, that is popular for cluster analysis in data mining. k-means clustering aims to partition n observations into k clusters in which each observation belongs to the cluster with the nearest mean, serving as a prototype of the cluster. This results in a partitioning of the data space into Voronoi cells. k-Means minimizes within-cluster variances (squared Euclidean distances), but not regular Euclidean distances, which would be the more difficult Weber problem: the mean optimizes squared errors, whereas only the geometric median minimizes Euclidean distances. Better Euclidean solutions can for example be found using k-medians and k-medoids.

The algorithm has a loose relationship to the k-nearest neighbor classifier, a popular machine learning technique for classification that is often confused with k-means due to the name. Applying the 1-nearest neighbor classifier to the cluster centers obtained by k-means classifies new data into the existing clusters. This is known as nearest centroid classifier or Rocchio algorithm.

The research relied on the k-means algorithm to conduct clustering on the data set included in appendix B for the 19 Arabian countries .

We compared each individual's distance to its own cluster mean and to that of the opposite cluster.

	1	2	3
1	2.94649	7.476761	10.588439
2	0.00000	4.530271	7.641949
3	1.85867	2.871162	5.982840
4	2.72522	1.805053	4.916731
5	3.23484	1.295435	4.407113
6	3.61203	1.561795	4.029915
7	3.86330	0.849402	3.778648
8	4.53027	0.000000	3.111678
9	4.65567	0.658236	3.325356
10	5.44119	1.145377	2.445287
11	5.49368	1.692334	2.566042
12	5.59151	1.098911	2.125751
13	6.11311	1.582834	1.979634
14	6.28407	1.823071	1.419973
15	7.01099	2.480719	1.516317
16	7.23733	2.739419	1.448819

17	7.64195	3.111678	0.000000
18	7.79186	3.261591	1.622689
19	8.16681	3.636540	2.528346

Based on the above results the research divided the 19 countries to three different clusters .

First Cluster Regression

Regression Statistics	
Multiple R	0.644928029
R Square	0.415932162
Adjusted R Square	0.269915203
Standard Error	129562.2816
Observations	6

Second Cluster Regression

Regression Statistics	
Multiple R	0.702087
R Square	0.492926
Adjusted R Square	0.323901
Standard Error	65296.8
Observations	5

Third Cluster Regression

Regression Statistics	
Multiple R	0.183307
R Square	0.033601
Adjusted R Square	-0.28853
Standard Error	109115.7
Observations	5

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