LOGISTICS PERFORMANCE INDEX ANALYSIS AND STRATEGIC SUGGESTIONS FOR IMPROVING TURKEY'S PERFORMANCE

MELTEM SEMİZ ÇAPAR

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THE GRADUATE SCHOOL OF SOCIAL SCIENCES

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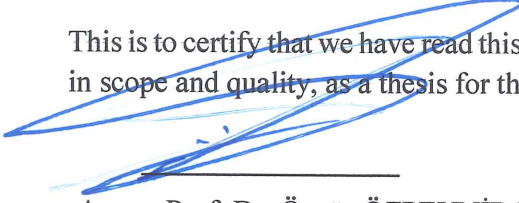
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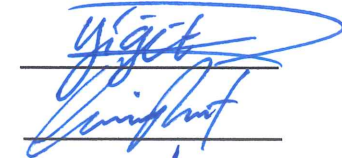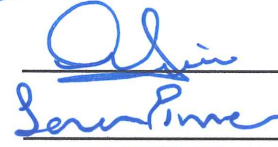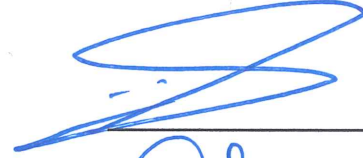Supervisor

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ABSTRACT

LOGISTICS PERFORMANCE INDEX ANALYSIS AND STRATEGIC
SUGGESTIONS FOR IMPROVING TURKEY'S PERFORMANCE

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Today, with globalization, trade is more important than ever. Countries are in constant competition even with the countries they trade. With increasing awareness, the competitive power of the whole world is on the rise. Logistics is one of the most important factors that provide competition in trade. While efficient logistics services provide benefits in reducing total cost, inefficient logistics causes reduction of the countries and companies competition power because of the increasing costs. In such a competitive trade environment, it will be a loss for countries not to understand the importance of logistics in competition. To compete with other countries, countries have seen they should develop themselves in the field of logistics, which is very important today. However, until the Logistics Performance Index (LPI) which prepared by the world bank, there was no clear determinative indicator as the which side of logistics they should do improvements.

LPI is a worldwide survey evaluating logistics relationship in six logistics area between countries and the countries they trade with. It started in 2007, the second assessment took place after 3 year, now it continues every two years. LPI measures the logistics performance of countries and helps countries to compare with other countries, and it also helps countries to see the improvements for logistics and the challenges they face.

The main objective of the research is give to recommendations on strategic development for Turkey's logistics improvement and guess the new score by taking LPI as a benchmark. To achieve this aim the decisions, investments and strategies of the countries that have risen in the ranking or are always in top were analysed. In order to find and analyse the effects of real actions which are taken by countries and actions effect, the data required for secondary data analysis were collected from reliable logistics magazines, articles, newspapers, investments reports of the world bank to relevant countries, Ministry of Transport publications and news. Although this study was performed to Turkey, also can be used for other countries with changing data. Needed development area(s) for increase LPI ranking of Turkey's will be possible to seen with using the results of analysis and those can be used as a competitive tool.

In this thesis multi method was used for solving the problem, because of to get rid of the uncertainty of strategic recommendations. Content analysis was performed first. The data generated in the content analysis were translated into the matrix, and the significance of these data was determined by regression analysis. As a result of the analyses, it was found that some actions had a significant effect on the Logistics Performance Index. In addition,

we found that the effect of the data on LPI scores in regression analysis. On the other hand, since a budget is required to implement the strategic recommendations, a questionnaire was prepared to estimate this budget. A questionnaire was prepared to solve the experts who could give the most reliable answer to get an idea of what the costs of these actions might be. After analysing the results of the survey a mathematical model was created to solve the problem with 100 different action costs and 20 different budget combination. Comprehensive computation experiments on randomly generated samples allow us to find out how action choices are affected in different budget combinations and a combination of strategies where we can achieve a maximum score with a minimum budget.

Keywords: Logistic Performance Index, Logistics, Logistics Strategy Development, Country Score

ÖZET

LOJİSTİK PERFORMANS GÖSTERGELERİ ANALİZİ İLE TÜRKİYE'NİN LOJİSTİK GELİŞTİRMESİ İÇİN STRATEJİ ÖNERİLERİ

Semiz Çapar, Meltem

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Aralık, 2018

Artan küreselleşmeyle birlikte günümüzde ticaret her zamankinden daha önemlidir. Ülkeler ticaret yaptıkları ülkelerle bile sürekli rekabet halindedir. Artan farkındalık ile tüm dünyanın rekabet gücü artıyor. Lojistik, ticarette rekabeti sağlayan en önemli faktörlerden biridir. Verimli lojistik hizmetleri toplam maliyeti azaltmada fayda sağlarken, verimsiz lojistik, artan maliyet nedeniyle ülkelerin ve şirketlerin rekabet gücünü azaltmaktadır. Böylesine rekabetçi bir ticaret ortamında, rekabetin lojistik sektöründeki önemini anlamayan ülkeler için bir kayıp olacaktır. Ülkeler diğer ülkelerle rekabet edebilmek için kendilerini bugün çok önemli olan lojistik alanında geliştirmeleri gerektiğini gördüler. Ancak, dünya bankası tarafından hazırlanan Lojistik Performans Endeksi'ne (LPI) kadar, lojistikte hangi tarafın iyileştirmeler yapması gerektiği konusunda net bir belirleyici gösterge yoktu.

LPI, ülkeler ve ticaret yaptıkları ülkeler arasındaki altı lojistik alanda lojistik ilişkiyi değerlendiren dünya çapında bir ankettir. 2007 yılında başladı, ikinci değerlendirme 3 yıl sonra gerçekleşti ve şimdi her iki yılda bir devam ediyor. LPI, ülkelerin lojistik performanslarını ölçer ve ülkelerin diğer ülkelere kıyasla hangi seviyede lojistik kullandıklarını anlamalarına yardımcı olur ve aynı zamanda ülkelerin lojistik iyileştirme ve karşılaştıkları zorluklara yönelik fırsatları görmelerine yardımcı olur.

Araştırmanın temel amacı, LPI'yı bir referans noktası olarak alarak, sıralamada yükselen ya da hep üst sıralarda olan ülkelerin kararlarını, yatırımlarını ve stratejilerini analiz ederek Türkiye'nin lojistik geliştirmesi için stratejik tavsiyelerde bulunmak ve tavsiye edilen eylem ya da eylemlerin yapılması durumunda Türkiye'nin LPI sıralamasındaki puanını tahmin etmektir. Ülkeler tarafından gerçekleştirilen gerçek eylemlerin etkilerini tespit edip analiz edebilmek için, ikincil veri analizi için gerekli veriler güvenilir lojistik dergilerinden, makalelerden, dünya bankasının yatırım raporlarından, ülkelerin ulaştıma bakanlıklarının yayınlarından ve haberlerden toplanmıştır. Bu çalışma Türkiye için yapılmasıyla birlikte, değişen verilerle başka ülkeler için de kullanılabilir. Türkiye'nin LPI sıralamasını yükseltmek için ihtiyaç duyulan geliştirme alan(lar)ı analiz sonuçları kullanılarak görülmesi mümkün olacak ve bunlar rekabetçi bir araç olarak kullanılabilecektir.

Bu tezde, stratejik önerilerin belirsizliğinden kurtulmak için sorunun çözümü için çoklu yöntem kullanılmıştır. Önce içerik analizi yapıldı. İçerik analizinde üretilen veriler matrise çevrildi ve bu verilerin önemi regresyon analizi ile belirlenmiştir. Yapılan analizler sonucunda bazı aksiyonların lojistik performans indeksi üzerinde anlamlı etkisinin bulunduğu saptanmıştır. Ayrıca,

regresyon analizinde verilerin LPI puanları üzerindeki etkisini de bulduk. Öte yandan, stratejik önerileri uygulamak için bir bütçe gerektiğinden, bu bütçeyi tahmin etmek için bir anket hazırlanmıştır. Bu işlemlerin maliyetinin ne olabileceği hakkında bir fikir edinmek için en güvenilir cevabı verebilecek uzmanları çözmek için bir anket hazırlanmıştır. Anket sonuçları analiz edildikten sonra, problemi çözmek için 100 farklı işlem maliyeti ve 20 farklı bütçe kombinasyonu ile matematiksel bir model oluşturulmuştur. Rastgele oluşturulmuş örnekler üzerinde yapılan kapsamlı hesaplama deneyleri, farklı bütçe kombinasyonlarında eylem seçimlerinin nasıl etkilendiğini ve minimum bütçeyle maksimum puana ulaşabileceğimiz bir strateji kombinasyonunu bulmamızı sağlar.

Anahtar Kelimeler: Lojistik Performans İndeks, Lojistik, Lojistik Stratejisi Geliştirme, Ülke Puanı

To My Family...

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LIST OF ABBREVIATIONS

LPI: Logistics Performance Index

GCI: Global Competitiveness Index

APEC: Asia-Pacific Economic Cooperation

GCI: Global Competitiveness Index

GCR: Global Competitiveness Report

EPI: Environmental Performance Index

ESI: Environmental Sustainability Index

CPI: Corruption Perception Index

LPS: Logistics Service Provider

1 INTRODUCTION

Today, with globalization, trade is more important than ever. Countries are in constant competition even with the countries they trade. With increasing awareness, the competitive power of the whole world is on the rise.

Logistics is one of the most important factors that provide competition in trade. While efficient logistics services provide benefits in reducing total cost, inefficient logistics causes reduction of the countries and companies competition power because of the increasing cost. Numerous researchers have shown that logistics performance is statistically significantly related to the volume of bilateral trade (Hausman et al., 2013). The OECD (2005) estimates that logistics costs range between 2 and 15 percent of total turnover. This share of total turnover and increasing competition turned logistics into one of the key elements of the trade (Martí et al., 2014). So, today countries and companies understand the importance of the logistics in trade. They need to develop strategies to go forward in logistics. For this a measurement system requirement emerged for logistics which has a great weight for trade. However, until the Logistics Performance Index (LPI) which prepared by the world bank, there was no clear determinative indicator as the which side of logistics they should do improvements.

1.1 Introduction to the Main Concept and the Aims of the Study

Logistics Performance Index (LPI) is a worldwide survey evaluating logistics relationship in six logistics area between countries and the countries they trade with. It started in 2007, the second assessment took place after 3

year, now it continues every two years. It measures the logistics performance of 160 countries and give a chance for compare countries logistics performance, helps countries to see opportunities for logistics improvement and the challenges they face. This performance indicator is a very useful tool both for comparisons between countries and for cross-sectional statistical investigations (Gogoneata, 2008). Various international transport associations and institutions support the World Bank in preparing and implementing this questionnaire (Çemberci et al., 2015). Political decisions and implemented policies have both direct and indirect effects on the attractiveness of a region or a country in terms of business location decisions and/or foreign direct investment (FDI) (Ojala and Celebi, 2015). The LPI is being increasingly respected and used by the political authorities. In Indonesia, for example, the index is formally used to measure the performance of the Ministry of Commerce. The organization of Asia-Pacific Economic Cooperation (APEC) uses the LPI to measure the impact of an initiative to improve connectivity in the supply chain. The European Commission has used the LPI in its Transport Evaluation Panel and its performance evaluation of the Customs Union (das Chagas et al., 2018).

Arvis et al. (2007) defines the six areas of logistics performance index as in below:

Customs: The efficiency of customs and border management clearance.

Infrastructure: The quality of trade and transport infrastructure.

Ease of arranging shipments: The ease of arranging competitively priced shipments.

Quality of logistics services: The competence and quality of logistics services-trucking, forwarding and customs brokerage.

Tracking and tracing: The ability to track and trace consignments.

Timeliness: The frequency with which shipments reach consignees within scheduled or expected delivery times.

In the survey there are 34 questions to answer. As a result of the survey, scores for each performance area are generated for each country are formed. The questions were classified according to LPI indicators. So, each question refers to one or more indicators, and the average of scores of each criteria gives the total LPI score. This insight could help countries in understanding where to focus projects and how to improve their performance in the most efficient way.

LPI is an index generated by the responses of a questionnaire that countries can observe their situation over time, see where they are compared to other countries, and which criteria they should improve according to the result. It is necessary to understand logistics performance at the country level in order to better evaluate and target trade and transport facilitation policy efforts over time and across countries. If a country can obtain a competitive advantage in terms of logistics performance, this will increase its international trade, help to open new markets and encourage business (Ekici et al., 2016). For this reason, logistics performance index is an important source for countries' industries and trade since the first LPI were announced. Also LPI can be an important source for countries strategic development decisions.

There are some studies about LPI (e.g. Ekici et al., 2016; Çemberci et al.,

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2015; Hausman et al., 2013; Ojala and Celebi, 2015; das Chagas et al., 2018; van Roekel, 2017; Gogoneata, 2008; Martí et al., 2014) and etc. but there is no study about analysing reforms that the country do for logistics improvements on the LPI ranking and any of them did not look at the effects of these reforms on the LPI rankings of other countries. The main objective of the research is give recommendations on strategic development for Turkey by analysing the decisions, investments and strategies of the countries that have jumped in the ranking, in order by taking LPI scores as a benchmark, and predict the place of Turkey in the LPI rankings in case of the taking recommended action or set of actions.

This study, as a case study, after analysing the results of the LPI ranking will give recommendations on strategic development for Turkey which is ranked 18th in the world economic size with $ 718 B dollars Gross Domestic Produce (GDP), and has $ 198.6 B dollars imports, $ 157.9 B million dollars exports, over 10 million Twenty-foot Equivalent Unit (TEU) logistics capacity and connect east and west.

1.2   Originality and Significance of the Study

As previously mentioned in the study, LPI is a worldwide survey evaluating logistics relationship in six logistics area between countries and the countries they trade with. Since the LPI report began to be published, results give a chance for compare countries logistics performance, helps countries to see opportunities for logistics improvement and the challenges they face. Survey results shaped by average of the six indicators score. However, study of van Roekel (2017), which is about weights of LPI indicators, shows, it can't be assumed that all the criteria have the same effect on the total score, there

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should be a differences between affects of LPI criteria on the overall LPI score.

In trade, the competitiveness of logistics activities is rising from day to day, that's why logistics is one of the key elements of trade. Researchers as (Hausman et al., 2013) and (Martí et al., 2014) showed in their studies that the logistics performance index influenced inter-country trade. When we examine these studies, the LPI improvement is seriously affecting the trade, so it is necessary to consider the LPI and carry out performance enhancement studies in order to bring the countries trade to higher levels. At the same time, there is a similar relationship between competition and LPI, as well as the relationship between trade and LPI. Remedial work done in the areas of Global Competition Index (GCI) may increase the LPI ranking or any increase in LPI criteria may increase competitive power. Pupavac and Golubović (2015); Çemberci et al. (2015); Ekici et al. (2016) have done some study to show the relationship between global competition index and logistics performance index on this area.

Most of researchers in the literature has focused on comparison LPI with GCI, relationship between LPI and trade or they have examined reforms made by countries. These studies have shown that increasing ranking in LPI results is important in terms of increasing trade and competitiveness. Nevertheless, no study has made strategic recommendations to a country by looking at the impact of previous reforms and the potential impact to the LPI ranking on the other country to which these practices will be applied.

This study aims to contribute to the literature by calculating the possible effect of actions found with data analysis on the LPI score by combining

the actions taken to increase the logistics performance of the countries, and by making strategic recommendations to improve the logistics performance with limited budget according to the results. The fact that there is no work similar to this study made by examining the logistic performance index from a different point of view shows its originality and giving strategic advice based on the practice shows thesis significance. This study will fill this gap in the literature by helping countries to find out which logistical improvements are needed to increase their LPI scores.

1.3   Research Approach and Design

This thesis, as a case study, presents recommendations for increase Turkey's LPI ranking which is prepared by World Bank. The reason for the selection of this study there is not any previous study worked about giving suggestions to countries for increase logistics performance with analysing reforms done from other countries taking LPI as a benchmark. Also, the study gives suggestions with looking which action how much contribute countries LPI scores.

In accordance with the purpose of the thesis, the study was conducted in 3 stages. As a first step, secondary data analysis was conducted to find the actions that could affect countries LPI scores. The general rankings of countries in all LPI reports prepared by the World Bank are formed by averages of the scores they receive. Rank increases or decreases in countries need to be meaningful. In order to be able to understand whether the improvement efforts made have a certain contribution, the lower limit of the following year in general order should be higher than the upper limit of the previous year. This ranking assessment should not be limited to the following years. Because the effects of a remediation work can occur in the long run. Firstly the

countries which have meaningful increasing or decreasing are investigated. And then workings was searched of the other countries and countries which are always at the top ten. The collected data are combined in a table. The actions performed on the table are defined as "sub code". Since each sub-code represents an action, upper codes are created by combining them to see which actions are performed on which area. Secondary data analysis was done by logistics news, countries' publications and news on the transport ministry sites, logistics sector magazines and articles in this area from 2007 to 2018 were examined.

In the second phase of the thesis the table which is done with secondary data analysis was analysed by regression. Regression analysis done for seeing if actions effect LPI positive or negative way and what are the weights of this effect. In this analysis backward elimination option was used for best solution.

In the last step of thesis a mathematical model was created for see which action or action group should choosing. As a result of the mathematical model, suggestions have been developed to raise the rankings of Turkey's on the LPI outputs.

1.4 Research Questions and Structure of the Thesis

The main purpose of this study is giving a strategic recommendations to Turkey for logistics improvements and find the new score of the Turkey in the LPI.

This objective will be achieved through the following Research Questions

(RQs):

RQ1: What strategies determine the countries' Logistic Performance Index scores?

RQ2: What actions/strategies change countries' Logistic Performance Index ranking?

RQ3: What actions should Turkey take to improve Logistic Performance Index ranking?

RQ4: How a best combination of strategies can be formed for Turkey to improve its Logistic Performance Index ranking under budget constraints?

The organization of the thesis is as follows: The next chapter examines literature for the important concepts of the study. In Chapter 3 the methodology of the thesis are shown. Chapter 4 contains the analysis, results, findings of the study and also discussion of the obtained results and its contribution to the existing literature are examined. Finally conclusion of the study is presented in Chapter 5.

2 LITERATURE REVIEW

LPI is a questionnaire that countries can observe their situation over time, see where they are compared to other countries, and which criteria they should improve according to the result. Logistics performance at national level needs to be understood to better evaluate and target trade and transport policy efforts over time and across countries. If a country has a competitive advantage in terms of logistics performance, it increases its international trade, helps open new markets and encourages business (Ekici et al., 2016). For this reason, logistics performance index is an important source for countries' industries and trade since the first LPI were announced. Also LPI can be an important source for countries strategic development decisions.

There are some studies about LPI (e.g. Ekici et al., 2016; Çemberci et al., 2015; Hausman et al., 2013; Ojala and Celebi, 2015; das Chagas et al., 2018; van Roekel, 2017; Gogoneata, 2008; Martí et al., 2014) and etc. but there is no study about analysing reforms that the country do for logistics improvements on the LPI ranking and any of them did not look at the effects of these reforms on the LPI rankings of other countries. Studies on the literature mostly have studied LPI and GCI comparisons. But the main objective of the research is give recommendations on strategic development for Turkey by analysing the decisions, investments and strategies of the countries that have jumped in the ranking, in order by taking LPI scores as a benchmark, and predict the place of Turkey in the LPI rankings in case of the taking recommended action or set of actions.

2.1 Strategy and Logistics

The logistics strategy is a set of guiding principles, driving forces and ingrained attitudes that help to coordinate goals, plans and policies, reinforced by conscious and subconscious behaviour within and between partners throughout the network (Hayes and Wheelwright, 1984).

Whittington (2000) proposes four approaches to setting strategy. He starts by suggesting different motivations for setting strategy: -How deliberate are the processes of strategy setting? These can range from clearly and carefully planned to a series of ad hoc decisions taken on a day to day basis. -What are the goals of strategy setting? These can range from a focus on maximising profit to allowing other business priorities such as sales growth to be included (Harrison and Van Hoek, 2008).

2.1.1 Differentiating the Strategy

A supply chain, may additionally pick to compete on different criteria. Such criteria need in turn to be acknowledged and structure section of the commercial enterprise strategies of all the contributors of a given network. The options so made have predominant implications for the operation of each member. Failure to understand competitive standards and their implications for a given product or service via any member potential that the supply chain will compete much less effectively. It is like taking part in football when the goalkeeper makes an error and lets in a purpose that should no longer have took place s/he lets the entire facet down. What makes a successful strategy? Porter (1985) mentioned five principles of strategic positioning, related to logistics strategy, are as follows

- A unique value proposition: figuring out what makes the product/service distinctive from its competitors.

- A tailored supply chain: ruled via steady order triumphing and qualifying criteria.

- Identify the trade-off: through selecting no longer simply the priorities but additionally what not to do. A responsive grant chain is no longer well suited with an efficient furnish chain (Fisher, 1997).

- Align logistics processes: so that processes are mutually reinforcing.

- Continuity: logistics tactics are continuously and consistently multiplied over time. To reinforce the difficulty of differentiating strategies, let us appear at two typically used strategies that have very exclusive logistics implications. Consider products with one of a kind logistics priorities.

2.1.2 Logistics Strategies

Today innovation management in logistics has come to be an vital place with increasing competition. Although they as mentioned developments like globalization and outsourcing provide growing demands in logistics and two only low income margins exists, because new Logistics Service Providers (LSPs) are continuously coming into the market. While the opposition is developing rapidly, innovations offer a way to distinguish themselves positively from their rivals in order to enlarge their market share in logistics.

While achieving the provider level objectives, the science of evaluating the most economical methodology in the distribution of goods to the market is logistic. When a organization creates a logistics strategy it is defining the provider stages at which its logistics agency is at its most fee effective. Because provide chains are constantly altering and evolving, a company can

also increase a number of logistics strategies for unique product lines, unique countries, or specific customers.

In a number of sources, the logistics strategy of a focal business enterprise is referred to as a supply chain strategy. The method of the center of attention company, and then the supply chain strategy, relies upon on the commercial enterprise philosophy. In order to shape a logistics strategy, it is additionally necessary to understand the shoppers and the uncertainty in the furnish chain. Segmentation is carried out to better recognize the consumers. To advance a logistics strategy, it is important that segmentation is now not exclusively marketing, it also be relevant in the area of logistics. For example, buyers can be divided into corporations depending on the time of ready for an order or sensitivity to the value of offerings or from some other widespread for logistics signs. Uncertainty is also an vital component affecting the logistics strategy.Thus, with excessive uncertainty, it is imperative to grant for reserve capacities, reserves and locations of their deployment, a time reserve. In addition, with uncertainty, a great deal attention is paid to working out the problems of interplay and coordination of companions in the grant chain (Martí et al., 2014).

2.2 The Role of Logistics on Trade

There are so many dimensions for logistics. It is measuring and summarizing performance throughout countries is challenging. Examining the time and costs related with logistics procedures port processing, customs clearance, transport, and the like is a good start, and in many instances this statistics is readily available. However, even when complete, this information can not be without problems aggregated into a single, constant cross-country

dataset, due to the fact of structural differences in nations provide chains.

Even more important, many indispensable elements of precise logistics such as technique transparency and carrier quality, predictability, and reliability can not be assessed the use of solely time and value information. The modern generation of global change is one of increasingly complex interactions between people, firms, and organizations. Supply chains pass nations and regions. Trade has turn out to be a 24/7 commercial enterprise and desirable overall performance in trade requires connectivity along now not only roads, rail and sea, however in telecommunications, monetary markets and information-processing. Having inefficient or insufficient systems of transportation, logistics and trade-related infrastructure can severely obstruct a countries' potential to compete on a international scale.

This growing complexity has serious implications for the world's poor, who frequently are disproportionately disconnected from global, regional or even nearby markets. Poverty is frequently focused in geographic areas that are poorly related to active monetary center, inside and between countries. These pockets of poverty may be close to dynamic, urban markets, for example, however economically remoted from them. They frequently lack correct connections to financial, economic, information, and infrastructure networks, too. Firms and communities in these areas pass over opportunities to enhance skilled, competitive workforces; they are not built-in in international manufacturing chains and are much less capable to diversify their merchandise and skills.

2.2.1 Logistics Performance

Logistics and transport are turning into an increasing number of essential in global trade relations. Logistic Performance Index (LPI) analyses the differences between countries, offering a customary image of customs procedures, logistics charges and the pleasant of the infrastructure vital for overland and maritime transport.At the same time, and as a result of the non-stop expansion procedures it has undergone, the European Union (EU) is a very fascinating case to learn about how the reforms that decorate logistics overall performance have affected exports (Martí et al., 2014).

In trade, the competitiveness of logistics activities is rising from day to day, that's why logistics is one of the key elements of trade. Researchers as (Hausman et al., 2013) and (Martí et al., 2014) showed in their studies that the logistics performance index inuenced inter-country trade. When we examine these studies, the LPI improvement is seriously affecting the trade, so it is necessary to consider the LPI and carry out performance enhancement studies in order to bring the countries trade to higher levels.

2.2.2 Logistics Performance Effects on Trade

World trade is an necessary part of the financial improvement of the international economy. Countries depend on trade to expand sales of their home merchandise in international markets, and for rising economies, trade is an important skill for their financial development. Of course, the volume of trade between two countries depends on the exporting country's attractiveness and the importing country's needs. When an importing country has multiple potential sources of supply, the distance and additional costs of crossing borders, transporting the products and the customs and respon-

sibilities levied are important components of the volume of bilateral trade between trade partners.

From the perspective of the importing firms, when a company makes procurement decisions, it almost always calculates the overall cost of the different possible sources for assessment. The overall cost of the landing includes acquisition costs, shipping costs, customs and responsibilities, interest charges, all other logistics charges (like paperwork) and inventory holding. The stock keeping costs consist of cycle stock, which depends on the frequency of shipments; the pipeline inventory, which depends on the complete lead time from source to destination; and the protection stock, which relies upon on the transportation frequency, the average lead time, and the variability in lead time (or the reliability of shipments).

The logistical performance between two nations can be a true indicator of the total price of landing. It can therefore have a significant effect on the decision on procurement and therefore on the level of trade volume between trading countries. From a country's perspective, many research studies have demonstrated a strong link between increased logistics performance and improved trade. In almost all cases, however, the metrics used for logistics performance are either indicators derived from surveys or more comprehensive concepts such as " the customs environment."

Due to strong relationship between logistics and economic development , logistics activities in provinces play an increasingly crucial role in the development of national competitiveness in modern knowledge-based economies. These findings are especially relevant for developing countries such as Turkey

that needs to invest in logistics in order to emerge in a more competitive position in international trade (Özceylan et al., 2016).

As the backbone of international trade, logistics encompasses freight transportation, warehousing, border clearance, payment systems and many other functions which are mostly performed by private service providers for private traders and owners of goods; however, it is also important for public policies of national governments and regional and international organizations (Arvis et al., 2010). Ekici et al. (2016) mentioned that, due to the complexity of global supply chains, the efficiency of logistics depends on the efficiency of government services, investment and policies as well as other factors which influence the competitiveness of the nation as a whole.

Political decisions and implemented policies have both direct and indirect effects on the attractiveness of a region or a country in terms of business location decisions and/or foreign direct investment (FDI). Transport system efficiency and industry profitability are closely related. Inventory reduction through high turnover, ability to respond to volatile demand, short lead times and achieving lowest possible transportation costs are essential aspects of a company's competitiveness. For this reason, transportation systems are considered as a production factor and as one of the key determinants of facility location decisions (Ojala and Celebi, 2015).

World trade is an important part of the economic development of the global economy. Countries depend on trade to increase sales of their domestic products in global markets, and for emerging economies, trade is an important means for their economic development. Naturally, the volume of

trade between two countries depends on the attractiveness of the exporting country and the needs of the importing country. When an importing country has several potential supply sources, the distance and the associated costs of crossing the borders, transporting the goods, and the customs and duties levied are important determinants of the volume of bilateral trade between trading partners (Hausman et al., 2013).

The quality and performance of logistics performance differs markedly across countries. In Kazakhstan it takes 81 days to export a 20-foot full container load (FCL) container of cotton apparel, and in Mauritania 39 days, while in Sweden it takes only 8 days. In Kyrgyz Republic the costs of all trade-related transactions for importing a 20-foot FCL container, including inland transport from the ocean vessel to the factory gate, amount to more than \$3000, and in Ethiopia to slightly less than \$3000 (Ojala et al., 2010). In Germany these costs amount to only \$937, and in Sweden to a little more than \$700. These variations in time and cost across countries stem from differences in the quality and cost of infrastructure services as well as differences in policies, procedures, and institutions. They have a significant effect on trade competitiveness. Many empirical studies have examined the effect of logistics performance on trade flows.

Other research shows that logistics performance differences are only partially driven by bad quality physical infrastructure services such as road, rail, waterways, port services and interfaces (Subramanian and Arnold, 2001). Instead, the insufficiency frequently are caused by way of (non tariff) policy and institutional constraints such as procedural purple tape, insufficient enforcement of contracts, week definition and enforcement of policies of engagement,

delays in customs, delays at ports and border crossings, and highly restrictive protocols on motion of cargo. Take into account these differences and their consequences for easy trade: 100% of imports coming into Sri Lanka and nearly 100% coming into Nigeria are subject to the wide inspection, while 2% are inspected in Germany and only 1% in Canada. Driven by way of financial liberalization and technological developments, the managing from different places of production, marketing, and distribution things to do international provides growing countries extremely good opportunities to take part in world markets. Participation in international supply chains can enhance market access for countries and stimulate investment, improve business opportunities.

In Bangladesh, for example, The clothing industry provides employement more than 1.5 million poor, low - skilled employees. However, this decentralized working environment also provides developing countries with strong difficulties, requiring them to be highly efficient, productive and able to provide just- in- time services. Effective logistical performance plays a key role in the global movement of goods and services and in countries ' ability to attract and sustain investment. Logistics inefficiencies have been underlined by previous studies on investment climate and trade facilitation(behind border issues) as an crucial limitation on company productivity and competitiveness in developing nations (Hausman et al., 2013). Subramanian and Arnold (2001) find that long periods of customs clearance have a significant negative impact on the overall productivity factor of companies.

2.3   Logistics Performance Index (LPI)

The LPI is an interactive benchmarking tool deigned to help countries define the challenges and opportunities that they face in their performance on trade logistics and what they can do to improve their performance. The LPI 2018 permits for comparisons throughout 160 countries. The LPI is based on a global survey of operators on the ground (global freight forwarders and express carriers), providing feedback on the logistics friendliness of the international locations in which they function and these with which they trade.They mix in-depth understanding of the countries in which they operate with knowledgeable qualitative assessments of other nations where they trade and experience of international logistics environment. Feedback from operators is supplemented with quantitative data on the performance of key components of the logistics chain in the country of work.

The LPI therefore consists of qualitative and quantitative measures and helps to create profiles of friendly logistics for these countries. LPI measures the performance of a country's logistics supply chain and offers two different points of view: global and domestic (Ojala et al., 2014).

The Role of the LPI ;

-Most detailed country performance information

-Large indication of problems

-Strengthen public private dialogue on reform priorities.

-Promote fresh acceleration for reforms

-Track progress over time

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2.3.1 International LPI

Provides qualitative assessments of a country in six areas by logistics professionals from its trading partners working outside the country. The components analysed in the international LPI were selected based on the latest theoretical and empirical research and the practical experience of the logistics professionals involved in international freight transport.

The Methodology for selecting country groups for survey respondents is shown in Figure 1.

Figure 1: Methodology for Selecting Country Groups for Survey Respondents (Arvis et al., 2007)

2.3.2 Domestic LPI

Domestic LPI provides logistics professionals working in the country with qualitative and quantitative evaluations of a country. It includes detailed

logistics information, key logistics processes, institutions and time and cost data. The Domestic LPI examines the logistics environments in 100 countries in detail. Logistics professionals surveyed evaluate the logistics environment in their own countries for this measure. This domestic evaluation include more detailed information on the logistics environment of countries, key logistics processes and institutions, and time and distance info. This approach examines the logistical restrictions in countries, not only on terminals, such as ports or borders. To measure performance, it uses four key determinants of overall logistics performance.

• Infrastructure,

• Services,

• Custom procedures and time, and

• Reliability of supply chain.

2.3.3 Construction of LPI

In order to build the international LPI, the standardized scores for each of the original six indicators are multiplied by their component loads and summed up. The loads of the components are the weight given to each initial indicator in the international LPI. Because the loadings are similar to the six indicators, the international LPI is close to the simple average of the indicators.

2.4 LPI and Other Index's

The LPI score can be considered as a reflection of the studies of the countries for logistics development. LPI measures how advanced the countries are in terms of logistics, such as customs, on-time delivery and quality.

LPI guides countries in terms of the aspects they need to improve in terms of logistics. Researchers previously found that it was more beneficial than other studies to make the studies that affect LPI scores to increase trade.

The Global Competitiveness Index (GCI) therefore measures the set of rights, policies and factors that set the sustainable levels of economic prosperity in the current and medium term. The report analyses countries' ability to provide high welfare to their citizens. This depends on how efficient a country uses available resources. Çemberci et al. (2015) studied the moderator effect of the Global Competitiveness Index (GCI) on the LPI and it concluded that a higher GCI score can be achieved by improving the timeliness, tracking and tracing of LPI components and international shipments. Erkan (2014) also investigated the link between GCI's infrastructure-weighted indicators and LPI. The infrastructure components of GCI used; Road Quality, Railway Infrastructure Quality, Port Infrastructure Quality, Air Transport Infrastructure Quality, Value Chain Width and R&D.

LPI scores combined with the Environmental Performance Index (EPI) from Kim and Min (2011). EPI addresses the affect of environmental changes in a country on the population and ecosystem.

The Corruption Perception Index (CPI) lists countries / regions, public officials and politicians in terms of corruption. Benefit from various assessments and commercial opinion surveys conducted by independent and recognized institutions. Gains data on the political and administrative aspects of corruption.

2.4.1   Global Competitiveness Report and Index (GCI)

The Global Competitiveness Report (GCR) is a yearly report published by the World Economic Forum. Since 2004, the Global Competitiveness Report ranks countries based on the Global Competitiveness Index. Before that, the macroeconomic ranks were based on Growth Development Index and the microeconomic ranks were based on Business Competitiveness Index. In a single index, the Global Competitiveness Index integrates the macroeconomic and micro / business aspects of competition.

The report examines the capability of countries to provide their citizens with high levels of prosperity. This depends on how productive a country uses the resources at its disposal. The Global Competitiveness Index (GCI) therefore measures the set of rights, policies and factors that set the sustainable levels of economic prosperity in the current and medium term (Schwab, 2018).

The report notes that wages tend to increase as a nation develops and that labor productivity must improve in order to maintain this higher income for the nation to compete. What creates productivity in Sweden also necessarily differs from what drives productivity in Ghana. Therefore, the GCI divides countries into three stages: factor driven, efficiency driven, and innovation driven, each implies a growing level of complexity in the way the economy operates.

The annual reports of GCI are somewhat similar to the Ease of Doing Business Index and the Economic Freedom Index, which also look at economic growth factors.

2.4.2 Environmental Performance Index (EPI)

The Environmental Performance Index (EPI) is a method of numerically quantifying and metrics the environmental performance of a country's policies. This index was created by the Pilot Environmental Performance Index, which was first published in 2002, to complement the environmental objectives set out in the Millennium Development Goals of the United States.

In the period 1999 to 2005, the EPI was followed by the Environmental Sustainability Index (ESI). Both indexes have been created by Yale University (Yale Center for Environmental Law and Policy) and Columbia University (International Earth Science Information Network) in cooperation with the European Commission 's World Economic Forum and Joint Research Centre. The ESI has been designed to assess environmental sustainability in relation to other countries ' paths. Because of the shift in focus of the ESI teams, the EPI uses results - oriented indicators and then acts as a benchmark index that policy-makers, environmental scientists, advocates and the general public can use more easily.

2.4.3 Corruption Perception Index (CPI)

The Corruption Perceptions Index (CPI) ranks countries / territories to the extent that public officials and politicians perceive corruption. It draws on various evaluations and business opinion surveys conducted by independent and renowned institutions. It collects data about the political and administrative aspects of corruption. Broadly speaking, the surveys and evaluations used to compile the index include issues related to the bribery of public officials, public procurement kickbacks, the misappropriation of public funds and questions that demonstrate the strength and efficiency of public

sector anti - corruption activities.

The CPI was measured from year to year using various techniques, making annual comparisons difficult. The methodology was modified again in 2012, this time to allow time - consuming comparisons. According to Transparency International, the new methodology comprises four basic steps, including the selection of source data, the re-scaling of source data, the aggregation of re-scaled data and a statistical measure indicating the degree of security. There is also a quality control system in the process. This includes independent data collection and calculations from two internal researchers and two independent academic researchers.

As a basis for its country scores, Transparency International used 13 sources in 2017. Sources included the African Development Bank, the World Bank, a survey of executives at the World Economic Forum, country risk ratings from the Economist Intelligence Unit and country risk ratings from Global Insight, among others.

Sources must document their methods of data collection and measurement, and Transparency International evaluates the quality and appropriateness of these methodologies. For example, if data is collected through a business survey, Transparency International will assess whether the sample size of the surveys is large enough to be representative.

3 METHODOLOGY

Studies in the literature have mentioned about the importance of LPI ranking on trade and competitiveness. The aim of this study, to identify reforms that need to be implemented to ensure maximum profit for countries, especially Turkey. There are some studies done about LPI but, literature has a gap about giving strategic recommendations to a country by looking at the impact of previous reforms and the potential impact to the LPI ranking on the other country to which these practices will be applied. This study aims fill this gap in the literature with both quantitative and qualitative methods.

In accordance with the main purpose of the thesis, we have developed an approach to solve the thesis. Steps of the approach is in below;

- Find which country done something for improving about Logistics and classify the actions.
- Use regression to find meaningful actions.
- Exercise a survey to provide an approach to action costs.
- Improve a mathematical model to solve the problem.

First of all, this study try to understand action done by countries on logistics improvements. To collect and understand those actions qualitative content analysis method was selected. According to the Forman and Damschroder (2007) secondary data analysis is very good way to classify textual data. In order to find and analyse the effects of real actions which are taken by countries and actions effect, the data required for secondary data analysis were collected from reliable logistics magazines, articles, newspapers, investments reports of the world bank to relevant countries, Ministry

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of Transport publications and news. The data were collected under 16 different classes by looking at the content and effect area. Secondary data analysis allows the practitioner to interpret the data in more detail, but does not include numeric data.

As a second step of the thesis regression analysis was performed in order to calculate how much is the effect of action classes on each LPI criteria. For regression analysis a matrix was created that the actions taken by the countries in the same year were written in a row. Meaningful effects of actions means this actions effects can change LPI criteria positive or negative way. After finding the weights of actions which have meaningful effect on LPI, we should include regression analysis results in a mathematical model.

In the third step a survey was conducted to calculate the costs of action and the budget that may arise. We asked respondents to value the questions from 1 to 100 while doing the survey. However, the evaluation intervals of the investors were very wide. Therefore, we normalized the questionnaire responses. We have decided to use normalized values because the standard deviations of the normalized survey results are smaller than the non-normalized results.

As a last step of the thesis we develop a mathematical model. The mathematical model is designed to see how the action choices in different budget combinations.

Figure 2 is explain for flow of methodology for this study.

Figure 2: Methodology Flowchart
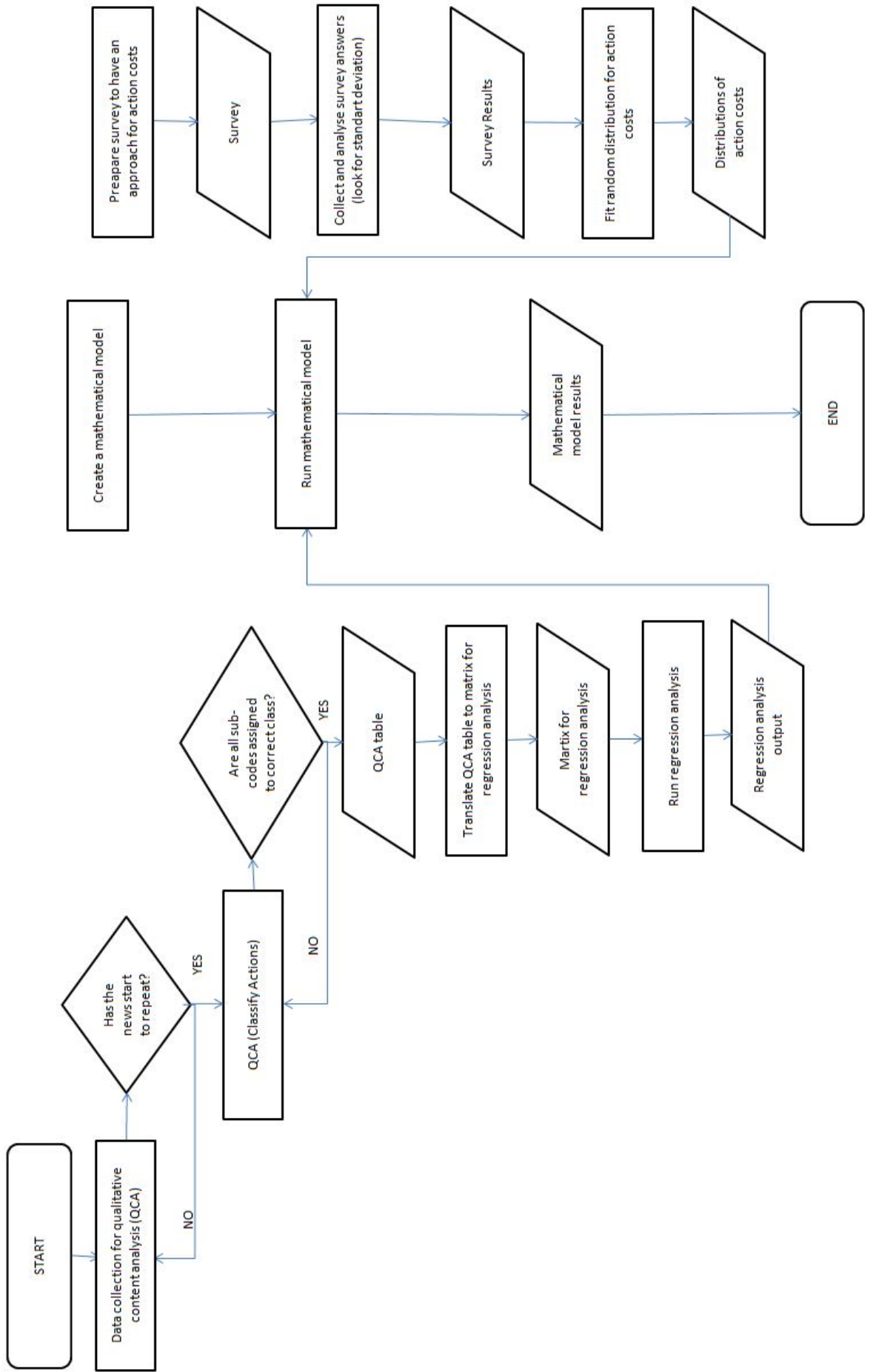
3.1 Qualitative Content Analysis

There are various types of content analysis that systematically categorize content data, including quantitative and qualitative methods (Forman and Damschroder, 2007). The most significant differences between those two analysing method is, quantitative analysing is deductive, qualitative analysing is inductive. Qualitative content analysis is one of the method which used for analysing textual data. Qualitative content analysis was used in this thesis for analysing actions taken by countries, which was used with following the guideline in the literature.In qualitative content analysis, data are categorized with make inferences with deeply reading from the themes of the data (inductively) (Morgan and Zhao, 1993). In the literature there is a path to follow for qaulitative data analysis and Forman and Damschroder (2007); White and Marsh (2006); Mayring (2000) are explain that path. The schema of steps are as shown in Figure 2 for qualitative data analysis.

Figure 3: Steps of Qualitative Content Analysis (Mayring, 2000)
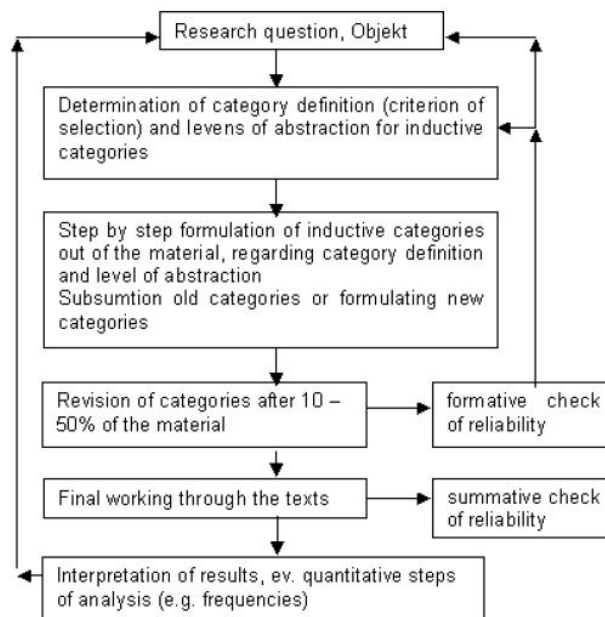
Establish hypothesis or hypotheses: The main starting point of this research is the question of whether we can use LPI as a benchmark to evaluate countries logistics performance. When we examine the LPI rankings of the countries, the ranking increases in some periods and can decrease in another periods. This means that some actions taken by countries in some periods affect the rankings positively, while some actions affect the ranking in a negative way. As a result of these investigations, it was observed that the actions taken by the countries could guide other countries to develop logistics.

Identify appropriate data (text or other communicative material): The appropriate data for the research are the actions of the countries for the logistics development.

Determine sampling method and sampling unit: Since LPI's first report was published in 2007 and the last LPI report was published in 2018, data collection for this thesis was made between these years, in addition, the publications and news of the logistics and trade ministries of these countries and investments reports of the world bank to relevant countries were reviewed. The reliability of the logistics magazines has been intuitively determined by examining their contents and confirmed with the order of the ranking sites which name is www.alexa.com. When the news and findings about the activities of the countries started to repeat, that is, when the rate of new news was very low, we stopped searching for content.

The general rankings of countries in all LPI reports prepared by the

World Bank are formed by averages of the scores they receive. Rank increases or decreases in countries need to be meaningful. In order to be able to understand whether the improvement efforts made have a certain contribution, the lower limit of the following year in general order should be higher than the upper limit of the previous year. This ranking assessment should not be limited to the following years. Because the effects of a remediation work can occur in the long run. Figure 3 shows upper bound, overall scores and lower bounds between 2007 & 2018 of Kenya's.

The ranks of all countries in all LPI reports prepared by the World Bank has been examined. The most striking example of the work, Kenya, looks like the Table 1. We see a significant increase between 2014 and 2016 with a 0.07 difference, but the significant increase between 2012 and 2016 is much more significant with a difference of 0.5. In addition, we can see a difference of 0.42 between 2010 and 2016 and we cannot see any significant differences between 2018 and other years. Meaningful gap table for all countries available in appendix.

Table 1: Significant Differences for Kenya Between Years

2 Years				4 Years			6 Years		8 Years
2010-2012	2012-2014	2014-2016	2016-2018	2010-2014	2012-2016	2014-2018	2010-2016	2012-2018	2010-2018
		0.07			0.05		0.42		

This study also examined the countries which are continually in the top rankings as well as the countries which are in the subordinate rankings and which have progressed. Generally, countries with steadily higher levels are among the high income countries according to the OECD

Figure 4: Graphic of Kenya's Upper Bounds, Overall Scores and Lower Bounds Between 2007 & 2018
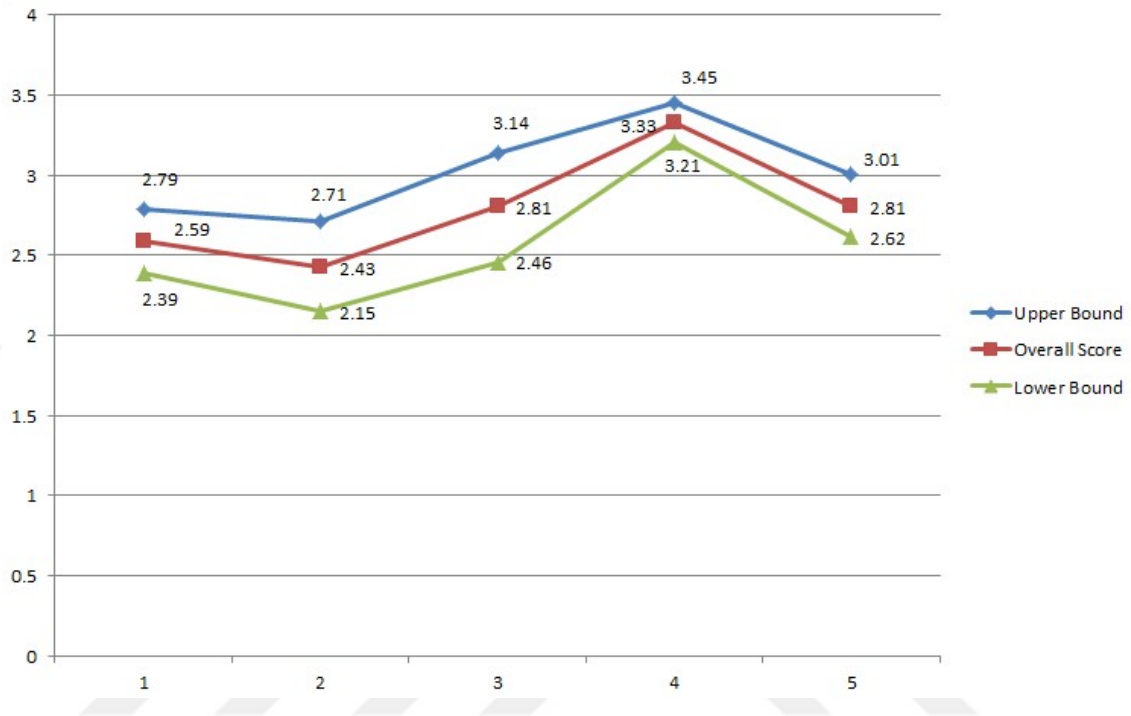
report. The fact that the same countries are in the top rankings continuously is a sign of good practices in the logistics of these countries. Their applications of these countries may provide important indications given recommendations for Turkey. Table 2 shows these countries. Also Table 3 shows the Rankings of the top 10 countries in terms of the average score according to years for the other countries.

Data management: In order to find the actions taken by the countries, all the data collected were collected by forming a table as in the example below. This step is to emphasize or underline the passages related to reading through text, writing potentials and important for research questions, and writing emphasis to the margins.

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Table 2: Overall Scores of Top Ten Countries Over Years

Country	2007	2010	2012	2014	2016	2018
Germany	4.10	4.11	4.03	4.12	4.23	4.201
Luxembourg	3.54	3.98	3.82	3.95	4.22	3.63
Sweden	4.08	4.08	3.85	3.96	4.20	4.05
Netherlands	4.18	4.07	4.02	4.05	4.19	4.02
Singapore	4.19	4.09	4.13	4.00	4.14	4.00
Belgium	3.89	3.94	3.98	4.04	4.11	4.04
United Kingdom	3.99	3.95	3.90	4.01	4.07	3.99
Hong Kong SAR, China	4.00	3.88	4.12	3.83	4.07	3.92
United States	3.84	3.86	3.93	3.92	3.99	3.88
Austria	4.06	3.76	3.89	3.65	4.10	4.03

Code data: In order to divide the data into analytically meaningful categories, the data table was renovated by adding two more columns which names code and sub code. In the first step of preparing the table, the sub-codes were like comments indicating what the selected text was about. Later, the sub codes are rearranged as actions that can be taken. In order to see which action is done for which area the actions are combined in a parent cluster which is called as code. Coding was terminated when we thought that all actions were gathered under correct codes.

Check for reliability of coding and adjust coding process if necessary: The reliability of the coding was examined by some academicians.

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Table 3: The Ranking of the Top 10 Countries in Terms of the Average Score According to Years for the Other Countries

Country	2007	2010	2012	2014	2016	2018
Germany	98	100	98	100	100	100
Luxembourg	84	97	92	96	100	86
Sweden	97	99	93	96	99	96
Netherlands	100	99	97	98	99	96
Singapore	100	100	100	97	98	95
Belgium	93	96	96	98	97	96
United Kingdom	95	96	94	97	96	95
Hong Kong SAR, China	95	94	100	93	96	93
United States	92	94	95	95	94	92
Austria	97	91	94	89	97	96

Analyse coded data, applying appropriate statistical test(s): For this thesis coded data will be test with regression.

Write up results: The results obtained from regression and mathematical model will be written in the findings section of the thesis.

3.2   Regression Analysis

As a second step of data analysis in this thesis regression analysis was used to find if actions effect countries positively or negatively. And also for this thesis regression analysis shows us the weights of meaningful actions. According to the Mendenhall et al. (1996) regression analysis of data is a very powerful statistical tool. It provides a technique for building a statis-

tical predictor of a response. Regression analysis is a branch of statistical methodology concerned with relating a response to a set of independent, or predictor, variables. The goal is to build a good model a prediction equation relating y to the independent variables that will enable us to predict y for given values of x, and to do so with a small error of prediction.

When the LPI scores were analysed between years, it was observed that there was variability in scores every year. A content analysis was made about the actions that were thought to be something that caused this change. In order to find out what the generated encoding means and how these affect the country's LPI scores, the coding table is adapted to regression analysis. The table for regression analysis was prepared according to which action how many times taken by counties in which year (see Table 4). For this problem LPI scores are assigned as y variables , and the taken actions as x variables. The table which is used for regression analysis will be explained in the next section.

Since the backward procedure tests the contribution of each dummy variable after the others have been entered into the model, the backward elimination method can be an advantage when at least one of the candidate independent variables is a qualitative variable at three or more levels (requiring at least two dummy variables) (Mendenhall et al., 1996). Backward elimination regression analysis method was used in this thesis because of its suitability. Minitab 18 program was used for regression analysis. The outputs of all regression analysis results are included in the appendix. It was checked that assumptions were made for multiple regression.

Table 4: Example of Regression Analysis Table

Country	Date	Change in management system	Cooperation	Create alternative energy source	Efficiency works	Environmentalist mindset	Fee/Tax regulation	Infrastructure development	Labor reform	Marketing	Monitoring, analyzing and reporting of the system	Provide safety in logistics	Technological improvement	Training and education	Use of different modes of port	Use of different modes of transport	Work on competition	2007	2010	2012	2014	2016	2018
Australia	2010	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.58	3.68	3.60	3.85	3.54	3.87
Belgium	2013	0	10	0	0	0	0	0	0	1	0	0	1	1	0	4	0	3.61	3.83	3.85	3.80	3.83	3.66
Belgium	2011	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.61	3.83	3.85	3.80	3.83	3.66
Belgium	2010	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.61	3.83	3.85	3.80	3.83	3.66
Belgium	2007	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.61	3.83	3.85	3.80	3.83	3.66
Brazil	2013	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.39	2.37	2.51	2.48	2.76	2.41
Burundi	2013	4	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2.20	2.20	1.67	2.60	2.02	1.69
Cambodia	2010	0	1	0	0	0	0	0	0	0	0	0	2	0	0	1	0	2.19	2.28	2.30	2.67	2.62	2.37
Cameroon	2007	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2.57	2.11	2.37	1.86	2.09	2.46
Canada	2008	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	3.82	3.71	3.58	3.61	3.95	3.60
Chile	2007	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	3.32	2.93	3.11	3.17	3.19	3.27
Colombia	2007	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2.10	2.50	2.65	2.59	2.21	2.61
Congo, Dem. F.	2013	4	1	0	0	0	0	0	0	0	1	0	2	0	1	0	0	2.60	2.60	2.10	1.78	2.22	2.37
Cyprus	2016	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2.77	2.92	3.02	2.88	3.11	3.05
France	2008	2	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	3.51	3.63	3.64	3.65	3.71	3.59
Germany	2010	2	4	0	0	5	0	10	5	3	0	4	4	2	0	4	2	3.88	4.00	3.87	4.10	4.12	4.09
Germany	2009	2	0	0	0	0	0	0	0	0	0	0	4	0	1	0	2	3.88	4.00	3.87	4.10	4.12	4.09
Ghana	2007	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2.00	2.35	2.33	2.22	2.46	2.45
Greece	2012	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.06	2.48	2.38	3.36	2.85	2.84
Hong Kong	2011	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3.84	3.83	3.97	3.72	3.94	3.81
Indonesia	2010	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2.73	2.43	2.53	2.87	2.69	2.67
Indonesia	2008	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	2.73	2.43	2.53	2.87	2.69	2.67
Italy	2016	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.19	3.38	3.34	3.36	3.45	3.47
Japan	2011	2	0	0	0	0	1	1	0	0	0	0	0	0	2	1	0	3.79	3.79	3.72	3.78	3.85	3.99
Kenya	2017	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	2.33	2.23	2.08	1.96	3.17	2.65
Kenya	2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.33	2.23	2.08	1.96	3.17	3.17
Total		62	24	4	8	7	5	21	8	7	14	4	29	7	4	17	10						

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3.3 Mathematical Model

In the final stage of the thesis, it is aimed to solve the problem with a mathematical model by using content analysis, regression analysis results and survey results as input. If we define the problem mathematically; The problem is a maximization problem. In other words, the main objective of the thesis is to calculate the new LPI score which will carry the LPI rankings up.

As a result of regression analysis, actions to be used in mathematical model were determined. In this study 2018 regression results was used in the mathematical model since it is desired to determine the actions after this year. However, the costs for these actions have not been determined yet. In order to get an idea of what the costs of these actions could be, a questionnaire was prepared to solved the experts who could give the most reliable answer. The survey prepared on Google Drive to make more interactive and that was restricted for each participant could answer the questionnaire only one time. We reached 27 different logistics expert by phone to explain the aim of the survey and what we exactly want to reach from the answer of the survey. 27 different logistics expert answered survey considering which action more or less costly. In the survey 1-100 scaling method was chosen to calculate costs of the action. Also in the questionnaire, cost research was only carried out for those who had a positive effect according to the regression analysis result. Distribution of survey respondents according to the their expertise as in Table 5. The average experience of the experts in the sector is 12 years. The survey is given in the appendix.

Also the mathematical model needs budget as a constraints. If this limit

Table 5: Distribution of Survey Respondents

Field	Respondents Qty
Logistics Specialist	13
Academician	4
Marketing Specialist	4
Custom Consultancy	6
Total	**27**

is not taken into account, the cost-value balance cannot be established. In other words, a high value-added action can be selected, albeit with a high cost. However, with this restriction, cost-value balance has been tried to be taken into consideration considering the action costs. Also the model should have a budget, because there is no limitless budget for the actions that can be taken in the real world. We want to make solutions for multiple values, not a single solution, such as using the average of costs when calculating budget and evaluating the costs of actions. We thought that the results of the survey were random distribution and we tried to estimate this. For estimate random distributions we used Arena Input Analyser. In order to run the model for different scenarios, we added a loop to create 100 different scenarios into the mathematical model and run it for 20 different budgets. This loop creates different action costs in each scenario using the distributions that we have obtained using the survey results. And in this problem budget is total of the actions costs.

The mathematical model which is created to solve the problem is as follows.

Sets:

I set of actions i $\in$ I=1...11

J set of criteria of LPI j $\in$ J=1...6

Parameters:

a_{ij} = impact of action i on criterion j

w_j=weight of criteria j; w_j=1/6

LP_j=current LPI score of TR for criteria j

c_i=cost of action i

b= budget of Turkey for Logistics;

$B=\sum_{i=1}^{11} c_i$

Decision Variables:

x_i: 1 if action i is taken and 0 other wise

LP_j^*: Modified LPI score of criterion j

LP^*: Final LPI score

$$Maximize \quad LP^* = \sum_{j=1}^{j} w_j * LP_j^* \tag{1}$$

s.t.

$$LP_j^* \leq LP_j + \sum_{i=1}^{11} a_{ij} * x_i, \qquad \forall j \tag{2}$$

$$LP_j^* \leq 5 \qquad \forall j \tag{3}$$

$$\sum_{i=1}^{11} c_i * x_i \leq b \tag{4}$$

$$LP_j^* \geq 0 \qquad \forall j \tag{5}$$

$$x_i \in 0,1 \qquad \forall i \tag{6}$$

The objective function (1) aims to maximize the final LPI score, which is defined as the weighted sum of the modified LPI scores of each criterion. Constraint sets (2) and (3) define upper bounds on the modified criterion scores. Constraint set (2) imposes that for each criterion, the modified criterion score can not exceed the sum of current LPI score and the total impact of taken actions. Constraint set (3) defines the upper bound for each criterion. Constraint (4) ensures that the total cost of taken actions do not exceed the budget. Constraint sets (5) and (6) define the decision variables.

Based on the survey results, we randomly generate 100 instances with different c_i values, on the other hand, same a_{ij} values are used in all instances. For a given instance the budget required to take all actions is defined as $B = \sum_{i=1}^{11} c_i$. In order to analyse the trade-offs between the available budget and the final LPI score, we solve an instance for 20 different budget values, such that b=5%,10%,...,100% of B value. For each budget value b, we analyse the final LPI score and the selected actions for the given budget.

The mathematical model was solved in the GAMS (see appendix for the model).

Solutions of the mathematical model and other analysis and findings will be discussing in next section.

4 ANALYSIS AND FINDINGS

4.1 Content Analysis (Secondary Data Analysis & Regression Analysis)

At the beginning of the study, we first had to investigate how other countries have increased their LPI rankings. In order to access this information, data analysis steps were followed which is described in section 3.1 of the thesis. Since we cannot understand which of these studies are positive and which one is negative, we have started to compile all the studies of the countries in the field of logistics between 2007 and 2018. Because of the main objective of this thesis is to offer suggestions to improve Turkey's LPI ranking, we have primarily investigated the studies of countries that have made a significant difference in the LPI rankings at any year intervals and the top 10 countries studies as mentioned in previous chapters. Real actions which are taken by countries were collected reliable logistics magazines, articles, newspapers, investments reports of the world bank to relevant countries, Ministry of Transport publications and news. When the news and findings about the activities of the countries started to repeat, that is, when the rate of new news was very low, we stopped searching for content. After the data collection was completed, firstly all the data content and effect area were analysed and then sub-codes were created. All sub-codes are short significative explanations of what kind of action is taken. As a result of content analysing, 234 sub-codes and 16 different classes were determined. The determined 16 different classes were formed by the classification of 158 different sub-codes. The sub-code of 158 names is not completely unique and can be similar. But we only use The classification study has been taken into consideration by different academicians and it is assured of the appropriateness of action

and classification. Table 6 shows the distribution of sub-codes to aggregated codes.

Table 6: Number of Sub Code in Groups

Code	Number of Sub Code
Change in management system	29
Cooperation	18
Create alternative energy source	4
Efficiency works	8
Environmentalist mindset	7
Fee regulation	3
Improve working conditions	5
Infrastructure development	23
Labor reform	2
Marketing	6
Monitoring, analysing and reporting of the system	6
Provide safety in logistics	4
Tax regulation	2
Technological improvement	13
Training and education	6
Use of different modes of transport center	4
Use of different modes of transport	8
Work on competition	10
Total	**158**

The reason why the country's LPI scores differ in each report is that the actions taken are considered to have an impact on LPI scores. However, it was not known how much the actions effected and at the same time that

this effect was positive or negative. In order to find out the possible effects of the actions on LPI scores, the data analysis table was translated into the matrix and solved in regression analysis. The matrix for regression analysis was prepared according to which action how many times taken by counties in which year. Since the LPI score was calculated according to the average of 6 criteria, we had to first find the effect on the criteria to find the effect of the newly discovered criteria on LPI. Therefore, the regression analysis was run for each criteria in order to see which action in the data analysis had a significant effect on LPI. Because an action can affect more than one criterion and these effects may be different for each criterion. Regression analysis was solved with using backward elimination method because of the suitability. And also the reason of the choosing regression analysis is we can calculate either positive or negative weights of actions, which have meaningful effect on the LPI criteria. The actions found to have a significant effect on LPI scores, which means their p values are less than 0.005 as a result of regression analysis, are listed according to positive or negative effect on LPI score as follows.

These 5 codes, which were found to have negative effects, were used by the developed countries as an action for logistics development. For example, Germany worked for improve working and living conditions in the freight transport and logistics sector in 2010 (labor reform), Belgium develop cargo community system in 2013 (technological improvement), USA establishment of an advisory group for continuous reporting and monitoring of port performance in 2015 (monitoring analysing and reporting of the system) and United Kingdom took a decision to expand of container capacity of ports (infrastructure development). But the reason of negativity of those codes unsuccessful attempts on emerging or less developed country. That's why it

can be named those code totally negative for countries logistics development. If these actions are implement after being well adapted to the existing system, it may affect the LPI score positively.

Actions that have a positive effect on LPI;

- Cooperation
- Environmental Mindset
- Marketing
- Use of Different Modes of Transport Center
- Use of Different Modes of Transportation
- Efficiency Works

Actions that have a negative effect on LPI;

- Infrastructure Development
- Labor Reform
- Technological Improvement
- Monitoring, Analysing and Reporting of The System
- Provide Safety in Logistics

For the purposes of the problem in order to increase Turkey's LPI score, as a result of the regression analysis, actions that have a positive effect on LPI score are discussed in detail.

4.1.1   Cooperation

Co-operation between two or more countries (i.e. between ports) or port policy and private sector on customs operations, economic or logistics activities has been evaluated under this action. Since the first LPI, between public agencies and private stakeholders rather than separately addressing issues such as custom procedures, port performance, international transit, or investment in services, more countries are implementing well-rounded programs to address the weakest links in their stimulate cooperation and macro supply chain (Ojala et al., 2010).

Like Kenya, Uganda, Brundi and etc. well done a regional integration (establishment a trade corridor) is most important thing in this action. When we look at the those countries LPI scores we can easily see the differences between before and after the action (Arvis et al., 2016). One of the most important aspects of building a corridor is that paper works are done only once in the corridor. Thus, shortening of delivery times occurs, and can be preferred much more. However, in some periods declines were observed due to not being managed well by stakeholders. In addition, cooperation always increases confidence between the parties. Because in cooperation experiences and know-how sharing. And it is obvious that trust increase trade. Also integration of ports were evaluated under this action. It means paper works can decrease like in corridor situation.

Figure 5: Cooperation in Content Analysing

First-Order Codes

* Societal integration of ports, the anchoring of ports in logistic chains and reinforcement of the competitive position of Flemish seaports.
* Joint trade missions and exhibitions between ports.
* Coordination of Flemish port interests at EU level.
*Co-operation Antwerp-Ghent inland waterways.

* Economic and commercial cooperation, logistics cooperation, cooperation on policy themes, common development of operational tools, a common approach towards students and employees and the joint creation of societal integration of ports.

* Realignment of comminication between companies and trade associations
* Optimize communication between policymakers and transport stakeholders, thereby improving practical cooperation.
* Cooperation between the Federal Government, the federal states and regional marketing initiatives.
* Cooperation between carriers

* Exchange of experience and collobrative schemes are to be facilitated.
* The intensified exchange of ideas and experiance
* Exchange of port and logistics know-how

* Establishment of a transportation corridor in a regional base
* New pipeline corridors

Sub-Code

Integration of ports

Common strategy

Cooperation between all stakeholders of the logistics network (between companies- trade associations- policymakers-transport stakeholders- Federal Government, states-regional markets-between carriers)

Facilitating exchange of experience and cooperation programs

Make regional integration

Aggregated Code

COOPERATION

4.1.2 Environmentalist Mindset

If the country is involved in environmental work activities, it is evaluated under this action. For example, waste management, emission reduction, environmental protection, etc.

As mentioned by other researches Rao and Holt (2005) and van Roekel (2017) and the world bank in its report Arvis et al. (2010), sustainable environmental thinking is emerging as a market driver. As in this study, lowering and control the CO_2 emission rate in the world comes first in terms of environmental activities. Encouraging the use of environmentally friendly vehicles and equipment by the government, and the development and strict supervision of waste disposal facilities are studies that can be done with environmental thinking. Decisions can be taken like as Singapore done before Xiao and Lam (2017) provide 50% of the investment cost of the implementation of Green Technology for green logistics or 15% discount applicable in port dues will be granted to ocean-going vessels that use type approved abatement/scrubber technology or clean fuels during a port stay of 5 days or less. Or CO_2 emission reduction studies can be carried out, as Germany is working on the environment (Federal Ministry of Transport and Development, 2010).

Figure 6: Environmental Mindset in Content Analysing

First-Order Codes

* Provides a grant of up to 50% of the investment cost of the implementaiton of Green Technology for green logistics.
* 15% concession in port dues will be granted to ocean-going vessels that use typeapproved abatement/scrubber technology or clean fuels during a port stay of 5 days or less (MPA, 2013)
* proactively promotes environmentally-friendly port equipment and practices.

* Improve supply and disposal facilities (including shoreside power supply)

* The environmental compatibility of logistics activities is to be improved. To this end, uniform standards are to be developed that will make it possible to calculate CO2 emissions from logistics services. This will make a contribution to "green logistics".
* The Federal Ministry of Transport, Building and Urban Development will review existing systems and seek to standardize them.
* The standards are also to give small and medium- sized enterprises the possibility of calculating their own emissions.
* The measure will be focused on the objective of avoiding distortions of competition by means of standardized calculation of CO2 emissions.
* Action to protect the environment and tackle climate change is to be promoted. Environmental standards are to be implemented in a manner that is uniform worldwide.
* Use environmentally friendly heavy goods vehicles.
* Improve inland waterway vessels

Sub-Code

Encouragment of using environmentally-friendly port equipment and practices.

Improve supply and disposal facilities

Emission Control

Aggregated Code

ENVIRONMENTALIST MINDSET

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4.1.3 Marketing

Studies such as customer-oriented work, advertising, and promotion of private sector participation were evaluated under this action.

Marketing is also one of the important things in trade. If the country wants to increase the using of ports they should attracting the interest of foreign shippers with international trade fairs. Improving the use of the port by thinking customer-oriented will increase the competitiveness (De Langen and van der Lugt, 2006).

Figure 7: Marketing in Content Analysing
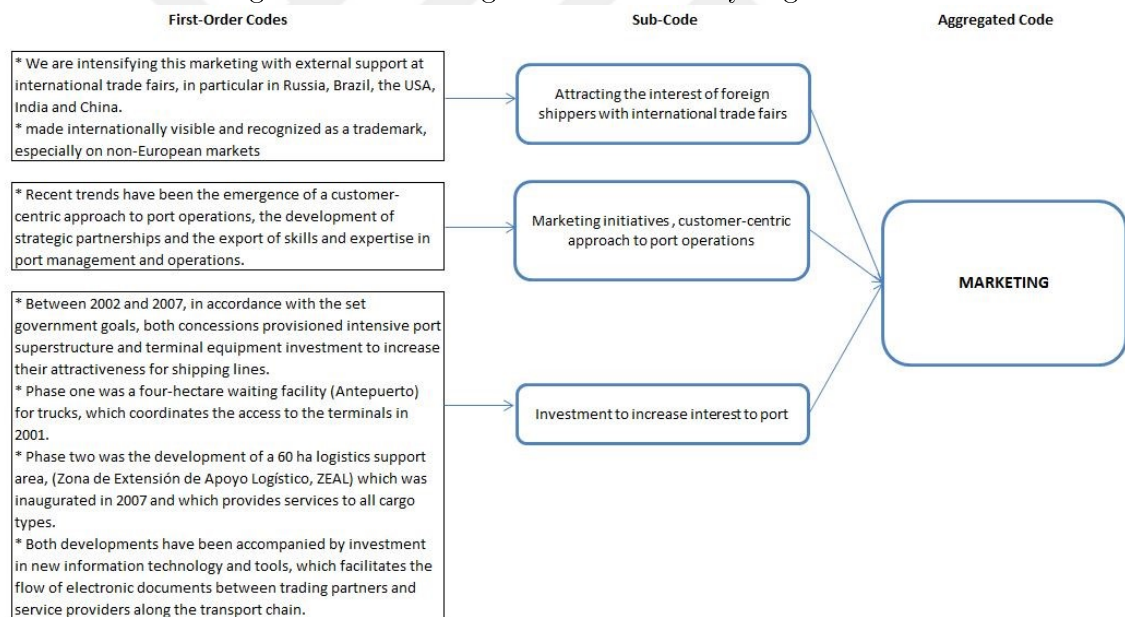
4.1.4 Use of Different Modes of Transport Center

Investments in the creation of transport center models such as the transfer center (a combination and distribution point in a transport network) or the use of the host model (Landlord: Port land owned by the state but all operations carried out by private companies) were evaluated under this action.

This action can be chosen as it will facilitate operation management. This initiative eliminates unnecessary intensity and complexity in transport center.

Figure 8: Use of Different Modes of Transport Center in Content Analysing
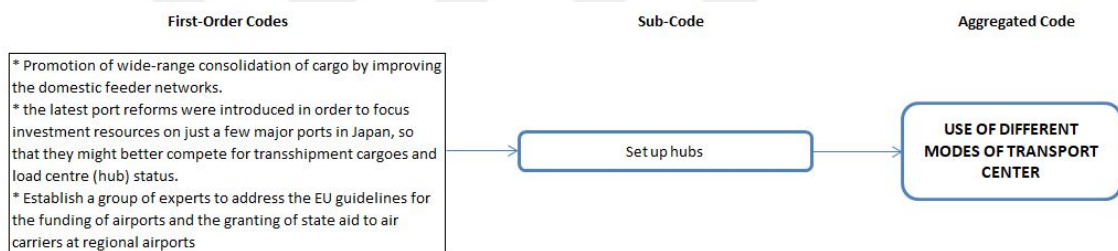
4.1.5   Use of Different Modes of Transportation

The actions of combining different types of transport (multi-modal transportation) and establishing a corridor model were evaluated under this action.

Countries that take this action usually transport by connecting transport networks. One of the objectives of this application is to reduce the traffic in the preferred transportation method, and another to shorten the delivery time. Also establishment a regional corridor support this action, because of the landlocked countries.

Figure 9: Use of Different Modes of Transportation in Content Analysing

First-Order Codes   **Sub-Code**   **Aggregated Code**

* The Northern Corridor; The Northern Economic Corridor (NEC) is a multi-modal corridor, consisting of road, rail, pipeline, and inland waterways transport, and is recognized as a significant corridor for logistics in East Africa. The main road network runs from Mombasa Sea Port through Kenya and Uganda to Rwanda and Burundi and to Democratic Republic of Congo (DRC). The road network also links Kenya and Uganda to Juba in South Sudan.

→ Establisment a multi-modal corridor, consisting of road, rail, pipeline, and inland waterways transport

* Improvements in port development, coordination and communication have been achieved but modal cooperation remains elusive. Solid lessons are possible for many countries seeking improvement; hinterland modal cooperation is flagged as a factor to be addressed.
*Study on hinterland connections, Optimisation of combined rail traffic

→ Hinterland model cooperation

* Multi-modal platforms inland waterways,
* Access rail way operators to port terminals,
* Optimisation of combined rail traffic,
* Untapped potential for multimodal transport is to be identified in order to optimize freight transport chains.
* Options for shifting freight traffic to the railways and waterways are to be identified.
* A comprehensive study is to be conducted to examine the potential for multimodal transport and modal shift options.
* To supplement this, a quantitative analysis is to show what proportion of all transport services is basically suitable for multimodal transport.
* Deepening of waters at the strategic container warves to accommodate the vessels of increasing sizes.
* The development and deployment of innovative technologies are designed to result in better use being made of the entire infrastructure and to make a contribution to a modal shift towards the railways and waterways.
*The funding for combined transport is to be increased in order to shift more traffic to the railways and waterways in the interests of environmental protection and to relieve congestion on our roads.
* Strengthening combined transport is designed to enhance the overall system, relieve conges- tion on the roads and ensure more environmentally friendly transport operations.

→ Multimodal transportation

USE OF DIFFERENT MODES OF TRANSPORTATION

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4.1.6 Efficiency Works

If the countries have done efficiency studies, they are evaluated under this action. For example; to remove unnecessary administrative barriers, to invest in bottlenecks, to maximize container efficiency and so on.

The most remarkable action in productivity studies is making investments to remove bottlenecks. Since the studies to eliminate bottlenecks will vary according to the downturn, first the bottlenecks should be identified and then systematically eliminated. Like Canada do that can be using performance indicator to measure efficiency in ports and supply chain (Arvis et al., 2010). Because measurement can provide to see opportunities to remove inefficient works. Or simply adding a loading and unloading ramps can save much time. Larger transport units can decrease transport quantity (Federal Ministry of Transport and Development, 2010). Efficiency studies are the easiest way to reduce operating costs. And low cost is often preferred by the customer.

Figure 10: Efficiency Works in Content Analysing
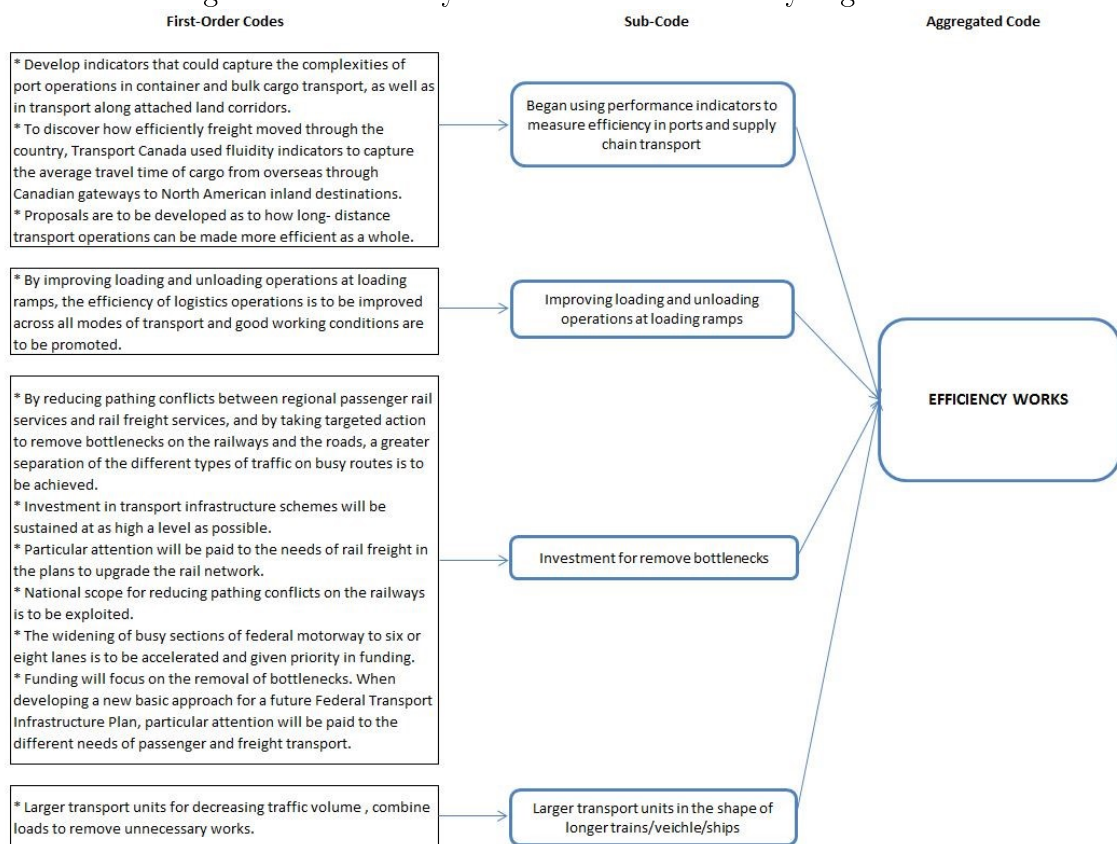
4.2   Survey and Mathematical Model

In the this part of the thesis, we have first input required for mathematical model. Because we need the costs and budget of the actions to solve the problem, we applied a questionnaire to the experts in the field of logistics to find these answers. In the questionnaire, we asked respondents to evaluate the possible costs of these actions from 1 to 100 for the actions we found to have a positive effect on LPI score as a result of regression. When we examined the results of the survey, the standard deviation of the responses was higher due to the differences in the response intervals. For this reason, the results of the survey were normalized and it was seen that the normalized survey results have lower standard deviations. The results showed that the use of normalized survey results would provide more accurate results in solving the main problem (see Table 7 and Table 8 for Real/Normalized Survey Answers).

In this study, which is not only that we must take actions to improve the LPI score of Turkey at the same time, we aim to find out how the action affected the choices in different budget constraints. Considering the random distribution of the questionnaire responses, we analysed the results of Arena Input Analyser and found their distributions. At the end of the analysis, we found that the triangular distribution is suitable for the actions which are of different type of transport center and use of different type of transportation, the normal distribution is suitable for cooperation, marketing, environmentalist mindset and efficiency works (See Table 9). The p values of the solutions are statistically significant.

In order to run the model for different scenarios, with put this distribu-

Table 7: Real Survey Answers

Cooperation	Environmental Mindset	Marketing	Use of Different modes of Transport Center	Use of Different modes of Transportation	Efficiency Works
15	40	60	70	50	30
25	75	70	70	70	25
20	60	40	40	30	40
10	20	10	25	25	10
50	40	60	100	100	100
50	40	95	95	75	60
40	60	10	90	70	30
60	80	90	80	90	50
50	70	80	60	50	60
50	65	75	45	90	40
15	20	15	20	20	10
60	80	40	60	70	80
80	70	90	90	80	95
50	40	50	70	50	40
80	90	80	80	90	60
90	100	80	80	90	100
90	100	80	80	90	100
100	100	100	100	100	100
80	80	60	80	70	80
75	100	25	100	100	10
70	50	40	60	80	80
100	80	100	70	80	100
100	90	90	80	80	80
20	30	10	10	20	10
90	80	60	50	90	60
80	50	10	90	90	10
75	60	30	30	35	50
Weighted Average 69.19	65.56	57.41	67.59	69.81	55.93
Standard Deviation 28.77	24.59	30.58	25.51	25.55	32.40

tions into the model, we added a loop to create 100 different scenarios into the mathematical model and run it for 20 different budgets with 5% increasing ratio and record optimal x and new LPI score for each scenario. This loop creates different action costs in each scenario using the distributions that we have obtained using the survey results. Gams runs the normal distribution, but to achieve the triangular distribution, we achieved a uniform distribution by transforming it into triangles and ran the model. With this

Table 8: Normalized Survey Answers

	Cooperation	Environmental Mindset	Marketing	Use of Different modes of Transport Center	Use of Different modes of Transportation	Efficiency Works
	5,66	15,09	22,64	26,42	18,87	11,32
	7,46	22,39	20,90	20,90	20,90	7,46
	8,70	26,09	17,39	17,39	13,04	17,39
	10,00	20,00	10,00	25,00	25,00	10,00
	11,11	8,89	13,33	22,22	22,22	22,22
	12,05	9,64	22,89	22,89	18,07	14,46
	13,33	20,00	3,33	30,00	23,33	10,00
	13,33	17,78	20,00	17,78	20,00	11,11
	13,51	18,92	21,62	16,22	13,51	16,22
	13,70	17,81	20,55	12,33	24,66	10,96
	15,00	20,00	15,00	20,00	20,00	10,00
	15,38	20,51	10,26	15,38	17,95	20,51
	15,84	13,86	17,82	17,82	15,84	18,81
	16,67	13,33	16,67	23,33	16,67	13,33
	16,67	18,75	16,67	16,67	18,75	12,50
	16,67	18,52	14,81	14,81	16,67	18,52
	16,67	18,52	14,81	14,81	16,67	18,52
	16,67	16,67	16,67	16,67	16,67	16,67
	17,78	17,78	13,33	17,78	15,56	17,78
	18,29	24,39	6,10	24,39	24,39	2,44
	18,42	13,16	10,53	15,79	21,05	21,05
	18,87	15,09	18,87	13,21	15,09	18,87
	19,23	17,31	17,31	15,38	15,38	15,38
	20,00	30,00	10,00	10,00	20,00	10,00
	20,93	18,60	13,95	11,63	20,93	13,95
	24,24	15,15	3,03	27,27	27,27	3,03
	26,79	21,43	10,71	10,71	12,50	17,86
Weighted Average	15.67	18.14	14.78	18.40	18.93	14.09
Standard Deviation	4.77	4.57	5.45	5.29	3.88	5.15

Table 9: Distribution of Survey Answers

	Cooperation	Environmental Mindset	Marketing	Use of Different modes of Transport Center	Use of Different modes of Transportation	Efficiency Works
Mean	14.78	15.67	18.14	18.40	18.93	14.09
St. Dev.	5.45	4.77	4.57	5.29	3.88	5.15
Distribution	NORM(14.8, 5.35)	NORM(15.7, 4.68)	NORM(18.1, 4.49)	TRIA(10, 15.2, 30)	TRIA(12, 16.8, 28)	NORM(14.1, 5.06)

loop, the mathematical model is solved for a total of 2000 scenario.

The findings obtained from the analysis for the study are explained in detail in the next section.

4.3   Findings and Discussion

The action choices in different budgets after running the mathematical model are shown in Table 10. The table also shows which action to be chosen firstly under the budget limitation. We can easily say that environmentalist mindset have the highest selection rate, taking into account the effect of the action on the LPI score and cost distribution. The table shows that the mathematical model prefers to take the action of environmental mindset even if the budget is 15% of the total action costs. After the budget has exceeded 25% of the total action cost, the environmentalist mindset is the most significant return on the action and has been selected in each scenario. Moreover, efficiency works and cooperation actions are always selected actions even at lower budgets. Use of different modes of transport center action is also contribute the LPI score, but always this should be the last choices for spend budget.

The mathematical model calculates what can be the best LPI value for each unit budget with 100 different cost scenarios. And Figure 11 shows what will be the best possible new LPI score with the money spent. Those are the minimum, maximum and the average best possible new LPI scores. As the budget increases, mathematical model naturally tends to take all actions.

When the changes in the logistic performance scores of the countries were taken into consideration, it was researched which strategies determine the countries' Logistic Performance Index scores with secondary data analysis

Table 10: Percentage of Selected Action for Selected Budget

Budget	Cooperation	Environmetal Mindset	Marketing	Use of Different modes of Port	Use of Different modes of Transportation	Efficiency Works
5	2	1	0	0	0	3
10	10	9	3	0	0	22
15	16	43	4	1	0	35
20	8	90	2	0	0	14
25	10	100	2	1	0	24
30	23	100	2	3	0	58
35	19	100	4	0	0	86
40	34	100	4	6	0	94
45	69	100	19	14	0	86
50	91	100	9	9	0	95
55	97	100	13	11	1	100
60	91	100	43	36	5	94
65	97	100	77	26	0	97
70	100	100	94	7	0	100
75	99	100	96	13	5	100
80	96	100	81	84	23	100
85	100	100	99	100	1	100
90	100	100	100	100	0	100
95	100	100	100	100	0	100
100	100	100	100	100	100	100
Total number of selections in all scenarios	1262	1743	852	611	135	1508
Percentage of selection in all scenarios	63,10%	87,15%	42,60%	30,55%	6,75%	75,40%

and regression analysis in RQ1. Consequently, 11 new criteria were found that can affect the countries logistics performance scores. In addition, with regression analysis which actions should Turkey take to improve logistic performance index ranking. Also, with mathematical model the priorities of the actions to be taken under budget constraints are determined in RQ4.

As a result of the analysis conducted in this study, 6 more criteria found that affect the LPI score in a positive way. When we examine the found crite-

Figure 11: MAX - MEAN - MIN of LP_j^*
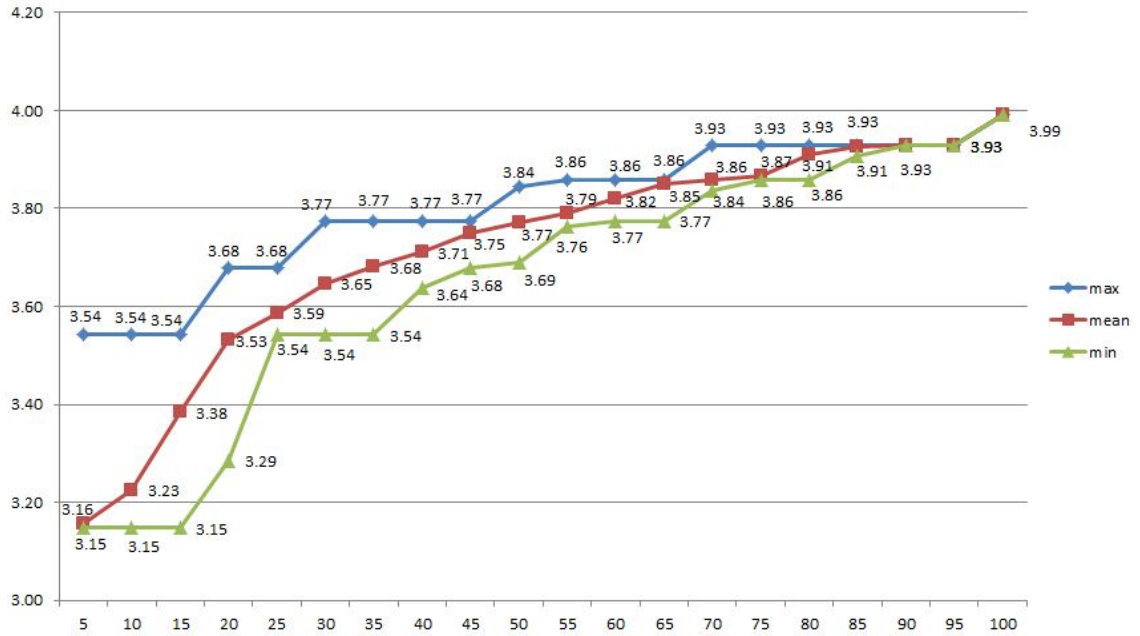
ria together with the effect on the LPI and the estimated costs, the selection of criteria in the restricted budget varies. However, the priority given to the criteria to be applied in the limited budget should be as follows, because of the their percentage of selection in all scenarios.

1) Environmentalist Mindset
2) Efficiency Works
3) Cooperation
4) Marketing
5) Use of Different Modes of Transport Center
6) Use of Different Modes of Transportation

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5   CONCLUSION

Today, with globalization, trade is more important than ever. Countries are in constant competition even with the countries they trade. With increasing awareness, the competitive power of the whole world is on the rise. Logistics is one of the most important factors that provide competition in trade. While efficient logistics services provide benefits in reducing total cost, inefficient logistics causes reduction of the countries and companies competition power because of the increasing costs. In such a competitive trade environment, it will be a loss for countries not to understand the importance of logistics in competition. To compete with other countries, countries have seen they should develop themselves in the field of logistics, which is very important today. Because countries that increase their logistics performance are preferred by the countries they trade. However, until the LPI, there was no clear determinative indicator as the which side of logistics they should do improvements.

Therefore, the logistics performance index prepared by the world bank is important for the countries. There was no study to measure the logistics performance of the countries up to LPI and to show which rankings were compared to other countries.The LPI guides countries in identifying the challenges and opportunities they face in developing their logistics and, therefore, trade, and in determining which areas should be implemented strategically. Since they understand the importance of LPI on the trade, many country use LPI report to improve themselves. Because, as mentioned in the studies of Ekici et al. (2016) and Çemberci et al. (2015), the LPI score has an effect on trade. It can be said that countries should increase their LPI scores in order to increase their trade in the globalized world. In this case, this question

arises, how? LPI is evaluated by 6 main criteria, like custom, infrastructure, timeliness, tracking and tracing, logistics quality and international shipment. But is it enough to evaluate these improvements under 6 criteria? Countries LPI scores changing year by year. There should be a reason for this changing. This study was started considering that the criteria affecting the LPI score could not be limited to the criteria determined by the world bank and that there were other criteria affecting the LPI score. Some strategies applied by countries in previous years may affect that countries' LPI score. Those experiments can show a way to other countries for increase LPI score.

In this study found 11 criteria that effect LPI, using multi method with the analysing taking by countries. 5 of the founded action affect countries LPI score in a negative way because of the unsuccessful attempts. For example, when the data analysis were examine technical improvement are expected to have a positive impact. However, it could not be successful due to insufficient implementation. In addition, the 6 criterion found to have a positive effect on LPI score were found with weights by regression analysis. And at the end of the study with mathematical model was established to answer the RQ4.

As a result of series of qualitative and quantitative studies, the combination of strategies was found for Turkey to improve its Logistic Performance Index ranking under budget constraints. This study shows that if Turkey wants to improve its LPI score, it should use those strategies which found by this study. In addition, order of selection from the strategies proposed in the limited budget are as follows; environmentalist mindset, efficiency works, cooperation, marketing, use different modes of port and use different modes of transportation. This ranking was obtained with the aim of reaching the

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best LPI score with low budget.

5.1 Theoretical Implications

LPI scores in the logistics sector have a lot of importance besides increasing the trade between countries. Firstly, this is the first study to examine the real studies of countries to improve their logistics performance in order to increase the LPI score. In this context, the study makes a significant contribution to the literature by showing that the criteria other than the 6 main criteria determined by the world bank have changed the logistic LPI scores.

This study, by identifying areas that need work to upgrade Turkey's logistics performance in detail, be regarded as a guidance for the development of Turkey's logistics performance.

Furthermore, this study may lead the way for other countries not only for Turkey. Considering there is more criteria than the measured by the world bank, this study will shed light on the logistics development of the countries and the development of the literature on this. With this study, countries will able to see they can increase their LPI scores with focus different criteria.

5.2 Managerial Implications

This study is the first study has made strategic recommendations to a country by looking at the impact of previous reforms and the potential impact to the LPI ranking on the other country to which these practices will be applied. Although other studies show the effect of LPI scores on trade, still there isn't any study to recommend strategies to country with examine

real action which taken by countries previously. This is important because, in this thesis previous studies have been found to have an impact on logistics performance score. With this study, Turkey will be able to see what level they can carry LPI score with how much money should spend in real, when the exact costs of actions are known. In addition, when the study is done with data from other countries, it will be able to give strategic suggestions to other countries.

LPI is a good tool for measuring the performance of countries logistics. However, this study found that there are additional criteria for better measurement of LPI. As a result of the analysis of these criteria envrionmentalist mindset step forward. After that efficiency works and cooperation are follow. This means that the most important issue in the whole world is the environmental sensitivity. Countries make the environmentalist thought structure as primary and other jobs in accordance with this structure. In parallel with this study findings according to EPI 2018 key findings most countries improved GHG emissions intensity over the past ten years. Three-fifths of countries in the EPI have declining CO_2 intensities, while 85–90% of countries have declining intensities for methane, nitrous oxide, and black carbon. These trends are promising yet must be accelerated to meet the ambitious targets of the 2015 Paris Climate Agreement. The most effective way to reduce environmental pollution is to reduce the source. Specially if companies apply this target they can both increase their profit and protect environment at the same time by reducing the sources. For example, in terms of CO_2 emissions, the penalty for non-compliance is also high. Together with the environmental sensitivity, they do not have to pay these high penalties. In addition, all these studies need to be sustainable in order to provide a truly

effective protection for the environment. The 2018 EPI confirms that success with regard to sustainable development requires both economic progress that generates the resources to invest in environmental infrastructure and careful management of industrialization and urbanization that can lead to pollution that threatens both public health and ecosystems.

On the other hand with the globalization cooperation shows the importance as a strategies. For increase the LPI score, not just private intersectoral cooperation should do, cooperation should occur between government and private sector, between ports, between countries and etc. Because cooperation can occur with trust and trust bring sustainable trade. Also cooperation should sustainable like evironmentalist mindset. Because unsustainable studies do not give trust to the collaborator.

Also remove the bottlenecks can help provide satisfying customers much more. Efficiency studies can usable both private companies and government and this is the easiest way to reduce operating costs. And low cost is often preferred by the customer. It means trade can be more easier with efficient implementation.

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APPENDIX

A Meaningful Gap Table

Country	2 Years				4 Years			6 Years		8 Years
	2010-2012	2012-2014	2014-2016	2016-2018	2010-2014	2012-2016	2014-2018	2010-2016	2012-2018	2010-2018
Afghanistan									0.,02	
Albania		-2.48	2.22		-2.22					
Algeria								0.02		
Angola							0.04			
Argentina										0.03
Armenia				0.04						
Austria			0.09							
Azerbaijan			-2.15			-2.02		-2.44		
Bahamas, The							0.02			
Bahrain										0.09
Bangladesh	-2.60	2.37				2.50				
Belarus	2.38				2.42			2.21		
Belgium								0.01		
Bhutan								2.04	0.00	
Bosnia and Herzegovina						-0.07				
Botswana								0.15		
Brazil					-0.06					
Brunei Darussalam			2.57							
Burundi	1.29	0.21		0,00	2.15	0.34		2.28		
Cameroon				0.03	0.00					
Central African Republic	2.25		-1.89		1.89					
China			0.02			0.03		0.08		0.02
Congo, Dem, Rep,			0.11		-0.04		0.13			
Côte d'Ivoire										0.07
Czech Republic						0.14			0.15	
Djibouti	-0.15					0.04			0.35	
Egypt, Arab Rep,								0.06		

	2 Years				4 Years			6 Years		8 Years
Country	2010-2012	2012-2014	2014-2016	2016-2018	2010-2014	2012-2016	2014-2018	2010-2016	2012-2018	2010-2018
El Salvador		0.05					0.11			
Equatorial Guinea		1.98			1.98	1.53		1.53		
Gambia, The			-2.03			-2.23		-2.24		
Germany			0.01			0.09		0.02	0.06	
Guatemala							0.05		0.03	
Guyana								0.01		
Haiti	-0.20		-0.20	0.07				-0.50		0.11
Honduras	0.00							-0.02		
Hong Kong SAR, China	0.08	-0.17	0.11					0.02	0.04	
Hungary					0.01					
India			0.20	0.10		0.21		0.14		
Iran, Islamic Rep,		-2.25	2.26		-2.41					
Ireland	-0.06	0.05								0.00
Israel	-3.19	3.11	0.06			3.47				
Kenya			0.07	0.20		0.50		0.42		
Kuwait	-0.03									
Lao PDR				0.14						
Latvia		0.14		0.12		0.06	0.20			0.02
Lebanon	-0.13									0.02
Lesotho	1.87				2.04			1.65		
Lithuania				0.17		0,23		0.06		
Luxembourg				0.16						
Madagascar						-0.09		-0.04		
Malawi	2.56		-2.59		2.59	-2.56				
Malaysia			0.00				0.08			
Mali	-1.92	2.22				2.28				
Mauritania	2.12				1.86			1.52		

	2 Years				4 Years			6 Years		8 Years
Country	2010-2012	2012-2014	2014-2016	2016-2018	2010-2014	2012-2016	2014-2018	2010-2016	2012-2018	2010-2018
Mauritius			-2.22			-2.57		-2.34		
Morocco	2.86	-2.86	2.25					2.25	0.13	
Mozambique	-1.99	1.85				2.48				
Namibia	0.04							0.11		
Nepal		0.05								
Netherlands				0.02		0.00				
Nicaragua	-2.33	2.42				2.31				
Pakistan				0.23			0.01	0.09		
Panama									0.02	
Qatar					0.08			0.11		
Rwanda					0.14	0.32		0.46	0.18	0.32
Sco Tomi and Principe	2.21				2.46			2.11		
Senegal										0.00
Sierra Leone		-1.80	1.70		-1.75					
Singapore		0.00	0.00							
Slovenia	0.01				0.16					0.04
Somalia	-1.05	1.32				1.37				0.34
South Africa			0.07	0.20				0,07	0.01	
Spain										0.01
Sri Lanka			-2.48			-2.47		-2.02		
Sweden						0.07				
Switzerland			0.01							
Syrian Arab Republic		-0.02		0.18	-0.19	-0.49		-0.66		0.05
Tajikistan			-0,07							
Tanzania			0.33			0.10		0.10		
Thailand		0.05	0.00						0.01	
Trinidad and Tobago			2,26			2,26		2,26		

| Country | 2 Years | | | | 4 Years | | | 6 Years | | 8 Years |
	2010-2012	2012-2014	2014-2016	2016-2018	2010-2014	2012-2016	2014-2018	2010-2016	2012-2018	2010-2018
Tunisia		-0.06				-0.12			0.13	
Turkey	0.01			0.04	0.06		0.18		0.13	
Turkmenistan	-2.26	2.04				1.84				
Uganda	-2.64		2.93	0.12	-2.64	2.93				
United Arab Emirates		-0.11	0.29			0.03	0.26	0.17	0.01	0.14
United Kingdom		0.01				0.07		0.01		
United States				0.00				0.05		
Venezuela, RB			-0.10				0.24	-0.02		0.16
Yemen, Rep.			-1.67			-2.64		-2.01		
Zambia	-1.76	2.10	2.26			2.26				
Zimbabwe	2.34				1.98			1.77		

B Regression Analysis Solutions

Regression Analysis: 2007 versus Cooperation; Create ... n competition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	10,3628	3,4543	12,52	0,000
Environmentalist mindset	1	0,8875	0,8875	3,22	0,079
Marketing	1	1,0793	1,0793	3,91	0,053
Technological improvement	1	8,3747	8,3747	30,35	0,000
Error	54	14,8996	0,2759		
Lack-of-Fit	25	7,9562	0,3182	1,33	0,229
Pure Error	29	6,9433	0,2394		
Total	57	25,2624			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,525279	41,02%	37,74%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,1432	0,0814	38,61	0,000	
Environmentalist mindset	0,312	0,174	1,79	0,079	2,88
Marketing	0,495	0,250	1,98	0,053	2,75
Technological improvement	-0,5324	0,0966	-5,51	0,000	1,37

Regression Equation

2007 = 3,1432 + 0,312 Environmentalist mindset + 0,495 Marketing
            - 0,5324 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2007	Fit	Resid	Std Resid	
2	3,613	3,105	0,507	1,09	X
11	3,321	3,105	0,215	0,46	X
16	3,883	4,060	-0,177	-1,42	X
20	3,843	3,638	0,205	0,45	X
43	3,240	3,638	-0,398	-0,87	X

X Unusual X

Regression Analysis: 2010 versus Cooperation; Create ... n competition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	5	13,1357	2,6271	8,39	0,000
Cooperation	1	2,6074	2,6074	8,33	0,006
Environmentalist mindset	1	4,4151	4,4151	14,11	0,000
Infrastructure development	1	1,1666	1,1666	3,73	0,059
Technological improvement	1	8,1852	8,1852	26,15	0,000
Use of different modes of port	1	0,9086	0,9086	2,90	0,094
Error	52	16,2736	0,3130		
Lack-of-Fit	23	7,0250	0,3054	0,96	0,537
Pure Error	29	9,2486	0,3189		
Total	57	29,4093			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,559423	44,67%	39,34%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,1400	0,0897	34,99	0,000	
Cooperation	0,1697	0,0588	2,89	0,006	1,30
Environmentalist mindset	0,988	0,263	3,76	0,000	5,78
Infrastructure development	-0,256	0,133	-1,93	0,059	5,92

Cooperation	1	1,3661	1,3661	4,84	0,032
Environmentalist mindset	1	3,7684	3,7684	13,35	0,001
Infrastructure development	1	2,0935	2,0935	7,42	0,009
Marketing	1	0,8506	0,8506	3,01	0,089
Technological improvement	1	9,5209	9,5209	33,73	0,000
Use of different modes of port	1	0,8928	0,8928	3,16	0,081
Error	51	14,3938	0,2822		
Lack-of-Fit	22	6,8302	0,3105	1,19	0,326
Pure Error	29	7,5636	0,2608		
Total	57	29,8473			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,531254	51,78%	46,10%	1,72%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,1598	0,0854	37,01	0,000	
Cooperation	0,1334	0,0606	2,20	0,032	1,54
Environmentalist mindset	0,940	0,257	3,65	0,001	6,13
Infrastructure development	-0,367	0,135	-2,72	0,009	6,80
Marketing	0,522	0,301	1,74	0,089	3,89
Technological improvement	-0,603	0,104	-5,81	0,000	1,55
Use of different modes of port	0,405	0,228	1,78	0,081	1,05

Regression Equation

2012 = 3,1598 + 0,1334 Cooperation + 0,940 Environmentalist mindset
- 0,367 Infrastructure development + 0,522 Marketing - 0,603 Technological improvement
+ 0,405 Use of different modes of port

Fits and Diagnostics for Unusual Observations

Obs	2012	Fit	Resid	Std Resid	
2	3,847	4,045	-0,198	-1,57	X
16	3,872	3,872	0,000	0,00	X
24	3,720	3,603	0,117	0,39	X
30	2,077	3,160	-1,083	-2,07	R

R Large residual
X Unusual X

Regression Analysis: 2014 versus Cooperation; Create ... n competition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	4	11,978	2,9945	7,66	0,000

Cooperation	1	2,188	2,1876	5,60	0,022
Environmentalist mindset	1	4,433	4,4329	11,34	0,001
Infrastructure development	1	1,100	1,1000	2,81	0,099
Technological improvement	1	8,496	8,4957	21,73	0,000
Error	53	20,720	0,3909		
Lack-of-Fit	24	10,864	0,4527	1,33	0,229
Pure Error	29	9,856	0,3399		
Total	57	32,698			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,625258	36,63%	31,85%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,2075	0,0976	32,86	0,000	
Cooperation	0,1553	0,0657	2,37	0,022	1,30
Environmentalist mindset	0,982	0,292	3,37	0,001	5,69
Infrastructure development	-0,246	0,146	-1,68	0,099	5,77
Technological improvement	-0,565	0,121	-4,66	0,000	1,52

Regression Equation

2014 = 3,2075 + 0,1553 Cooperation + 0,982 Environmentalist mindset
- 0,246 Infrastructure development - 0,565 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2014	Fit	Resid	Std Resid	
2	3,801	3,950	-0,148	-0,99	X
9	1,857	3,207	-1,350	-2,19	R
16	4,098	4,025	0,073	0,61	X
30	1,958	3,207	-1,250	-2,02	R
46	4,007	4,190	-0,183	-0,34	X
48	4,007	4,190	-0,183	-0,34	X

R Large residual
X Unusual X

Regression Analysis: 2016 versus Cooperation; Create ... n competition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	8,819	2,9396	10,97	0,000
Cooperation	1	1,208	1,2079	4,51	0,038
Environmentalist mindset	1	4,776	4,7763	17,83	0,000
Technological improvement	1	7,214	7,2139	26,93	0,000

Error	54	14,465	0,2679		
Lack-of-Fit	25	5,921	0,2369	0,80	0,708
Pure Error	29	8,544	0,2946		
Total	57	23,284			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,517563	37,87%	34,42%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,3785	0,0799	42,30	0,000	
Cooperation	0,1130	0,0532	2,12	0,038	1,25
Environmentalist mindset	0,499	0,118	4,22	0,000	1,36
Technological improvement	-0,520	0,100	-5,19	0,000	1,52

Regression Equation

2016 = 3,3785 + 0,1130 Cooperation + 0,499 Environmentalist mindset
      - 0,520 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2016	Fit	Resid	Std Resid	
2	3,830	3,988	-0,158	-1,27	X
9	2,091	3,378	-1,288	-2,52	R
16	4,123	4,244	-0,121	-0,90	X
38	2,222	3,378	-1,156	-2,26	R
54	1,964	3,378	-1,415	-2,77	R

R Large residual
X Unusual X

Regression Analysis: 2018 versus Cooperation; Create ... n competition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	4	9,9712	2,4928	10,70	0,000
Cooperation	1	1,1527	1,1527	4,95	0,030
Environmentalist mindset	1	4,9557	4,9557	21,27	0,000
Technological improvement	1	6,7657	6,7657	29,04	0,000
Use of different modes of port	1	0,8289	0,8289	3,56	0,065
Error	53	12,3469	0,2330		
Lack-of-Fit	24	5,0585	0,2108	0,84	0,667
Pure Error	29	7,2884	0,2513		
Total	57	22,3181			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,482660	44,68%	40,50%	8,62%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,2069	0,0770	41,67	0,000	
Cooperation	0,1104	0,0496	2,22	0,030	1,25
Environmentalist mindset	0,509	0,110	4,61	0,000	1,36
Technological improvement	-0,5075	0,0942	-5,39	0,000	1,54
Use of different modes of port	0,384	0,204	1,89	0,065	1,02

Regression Equation

2018 = 3,2069 + 0,1104 Cooperation + 0,509 Environmentalist mindset
        - 0,5075 Technological improvement + 0,384 Use of different modes of port

Fits and Diagnostics for Unusual Observations

Obs	2018	Fit	Resid	Std Resid	
2	3,663	3,803	-0,140	-1,21	X
16	4,092	4,161	-0,069	-0,55	X
24	3,994	3,975	0,019	0,07	X

X Unusual X

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Regression Analysis: 2007 versus Change in ... s; Work on competition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	17,441	5,8136	13,66	0,000
Cooperation	1	2,454	2,4541	5,77	0,020
Environmentalist mindset	1	8,617	8,6173	20,25	0,000
Technological improvement	1	14,973	14,9726	35,19	0,000
Error	54	22,978	0,4255		
Lack-of-Fit	30	14,809	0,4936	1,45	0,177
Pure Error	24	8,169	0,3404		
Total	57	40,419			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,652315	43,15%	39,99%	10,61%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,310	0,101	32,89	0,000	
Cooperation	0,1610	0,0671	2,40	0,020	1,25
Environmentalist mindset	0,670	0,149	4,50	0,000	1,36
Technological improvement	-0,750	0,126	-5,93	0,000	1,52

Regression Equation

2007 = 3,310 + 0,1610 Cooperation + 0,670 Environmentalist mindset
       - 0,750 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2007	Fit	Resid	Std Resid	
2	4,000	4,171	-0,171	-1,09	X
9	2,000	3,310	-1,310	-2,03	R
16	4,191	4,307	-0,116	-0,69	X

R Large residual
X Unusual X

Regression Analysis: 2010 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

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Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	6	22,018	3,6697	9,89	0,000
Cooperation	1	3,266	3,2657	8,80	0,005
Efficiency works	1	1,089	1,0888	2,93	0,093
Environmentalist mindset	1	1,794	1,7945	4,83	0,032
Infrastructure development	1	2,184	2,1839	5,88	0,019
Technological improvement	1	15,128	15,1278	40,75	0,000
Use of different modes of port	1	1,379	1,3792	3,72	0,059
Error	51	18,933	0,3712		
Lack-of-Fit	27	11,285	0,4179	1,31	0,253
Pure Error	24	7,648	0,3187		
Total	57	40,951			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,609283	53,77%	48,33%	31,04%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,3547	0,0986	34,04	0,000	
Cooperation	0,1900	0,0640	2,97	0,005	1,30
Efficiency works	0,550	0,321	1,71	0,093	10,25
Environmentalist mindset	0,788	0,358	2,20	0,032	9,05
Infrastructure development	-0,394	0,162	-2,43	0,019	7,47
Technological improvement	-0,763	0,120	-6,38	0,000	1,56
Use of different modes of port	0,503	0,261	1,93	0,059	1,05

Regression Equation

2010 = 3,3547 + 0,1900 Cooperation + 0,550 Efficiency works + 0,788 Environmentalist mindset
- 0,394 Infrastructure development - 0,763 Technological improvement
+ 0,503 Use of different modes of port

Fits and Diagnostics for Unusual Observations

Obs	2010	Fit	Resid	Std Resid	
2	4,010	4,097	-0,088	-0,66	X
9	2,102	3,355	-1,253	-2,08	R
16	4,336	4,366	-0,030	-0,36	X
24	4,188	3,967	0,222	0,64	X
30	2,139	3,355	-1,216	-2,02	R
46	4,218	4,143	0,075	0,16	X
48	4,218	4,143	0,075	0,16	X

R Large residual
X Unusual X

Regression Analysis: 2012 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	6	23,570	3,9283	11,79	0,000
Cooperation	1	3,603	3,6028	10,81	0,002
Efficiency works	1	1,173	1,1732	3,52	0,066
Environmentalist mindset	1	1,621	1,6215	4,87	0,032
Infrastructure development	1	2,108	2,1078	6,33	0,015
Technological improvement	1	17,492	17,4921	52,50	0,000
Use of different modes of port	1	1,107	1,1065	3,32	0,074
Error	51	16,992	0,3332		
Lack-of-Fit	27	10,881	0,4030	1,58	0,130
Pure Error	24	6,111	0,2546		
Total	57	40,562			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,577216	58,11%	53,18%	40,11%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,4267	0,0934	36,70	0,000	
Cooperation	0,1995	0,0607	3,29	0,002	1,30
Efficiency works	0,571	0,304	1,88	0,066	10,25
Environmentalist mindset	0,749	0,340	2,21	0,032	9,05
Infrastructure development	-0,387	0,154	-2,52	0,015	7,47
Technological improvement	-0,821	0,113	-7,25	0,000	1,56
Use of different modes of port	0,450	0,247	1,82	0,074	1,05

Regression Equation

2012 = 3,4267 + 0,1995 Cooperation + 0,571 Efficiency works + 0,749 Environmentalist mindset
        - 0,387 Infrastructure development - 0,821 Technological improvement
        + 0,450 Use of different modes of port

Fits and Diagnostics for Unusual Observations

Obs	2012	Fit	Resid	Std Resid	
2	4,117	4,214	-0,098	-0,78	X
9	2,244	3,427	-1,182	-2,08	R
16	4,258	4,246	0,011	0,14	X
24	4,106	3,941	0,166	0,51	X
30	2,156	3,427	-1,271	-2,23	R
46	4,148	4,176	-0,028	-0,06	X
48	4,148	4,176	-0,028	-0,06	X

R Large residual
X Unusual X

Regression Analysis: 2014 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	5	18,626	3,7253	10,79	0,000
Efficiency works	1	4,738	4,7383	13,72	0,001
Infrastructure development	1	1,897	1,8970	5,49	0,023
Monitoring, analyzing and repor	1	1,898	1,8982	5,50	0,023
Technological improvement	1	9,746	9,7458	28,23	0,000
Use of different modes of trans	1	3,145	3,1453	9,11	0,004
Error	52	17,955	0,3453		
Lack-of-Fit	28	11,027	0,3938	1,36	0,222
Pure Error	24	6,928	0,2887		
Total	57	36,581			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,587613	50,92%	46,20%	34,65%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,580	0,101	35,29	0,000	
Efficiency works	0,961	0,259	3,70	0,001	7,19
Infrastructure development	-0,397	0,169	-2,34	0,023	8,75
Monitoring, analyzing and repor	-0,525	0,224	-2,34	0,023	1,54
Technological improvement	-0,712	0,134	-5,31	0,000	2,11
Use of different modes of trans	0,457	0,152	3,02	0,004	2,40

Regression Equation

2014 = 3,580 + 0,961 Efficiency works - 0,397 Infrastructure development
       - 0,525 Monitoring, analyzing and repor - 0,712 Technological improvement
       + 0,457 Use of different modes of trans

Fits and Diagnostics for Unusual Observations

Obs	2014	Fit	Resid	Std Resid	
2	4,099	4,301	-0,202	-0,78	X
9	1,854	3,055	-1,201	-2,18	R
16	4,323	4,358	-0,035	-0,36	X
30	2,403	3,580	-1,177	-2,03	R
39	4,230	3,055	1,175	2,13	R

R Large residual
X Unusual X

Regression Analysis: 2016 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	14,390	4,7965	16,47	0,000
Cooperation	1	1,894	1,8944	6,51	0,014
Environmentalist mindset	1	7,246	7,2456	24,88	0,000
Technological improvement	1	12,331	12,3305	42,35	0,000
Error	54	15,723	0,2912		
Lack-of-Fit	30	8,077	0,2692	0,85	0,672
Pure Error	24	7,645	0,3186		
Total	57	30,113			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,539597	47,79%	44,89%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,5413	0,0833	42,53	0,000	
Cooperation	0,1415	0,0555	2,55	0,014	1,25
Environmentalist mindset	0,615	0,123	4,99	0,000	1,36
Technological improvement	-0,680	0,105	-6,51	0,000	1,52

Regression Equation

2016 = 3,5413 + 0,1415 Cooperation + 0,615 Environmentalist mindset
          - 0,680 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2016	Fit	Resid	Std Resid	
2	4,054	4,276	-0,222	-1,72	X
9	2,206	3,541	-1,336	-2,51	R
16	4,439	4,459	-0,019	-0,14	X
38	2,461	3,541	-1,080	-2,03	R
54	2,444	3,541	-1,097	-2,06	R

R Large residual
X Unusual X

Regression Analysis: 2018 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	5	14,518	2,9035	8,93	0,000
Efficiency works	1	3,473	3,4731	10,68	0,002
Infrastructure development	1	1,229	1,2287	3,78	0,057
Monitoring, analyzing and repor	1	1,201	1,2009	3,69	0,060
Technological improvement	1	7,839	7,8385	24,10	0,000
Use of different modes of trans	1	2,649	2,6492	8,14	0,006
Error	52	16,916	0,3253		
Lack-of-Fit	28	9,654	0,3448	1,14	0,375
Pure Error	24	7,262	0,3026		
Total	57	31,434			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,570364	46,18%	41,01%	33,07%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,5042	0,0985	35,58	0,000	
Efficiency works	0,823	0,252	3,27	0,002	7,19
Infrastructure development	-0,319	0,164	-1,94	0,057	8,75
Monitoring, analyzing and repor	-0,418	0,217	-1,92	0,060	1,54
Technological improvement	-0,639	0,130	-4,91	0,000	2,11
Use of different modes of trans	0,420	0,147	2,85	0,006	2,40

Regression Equation

2018 = 3,5042 + 0,823 Efficiency works - 0,319 Infrastructure development
- 0,418 Monitoring, analyzing and repor - 0,639 Technological improvement
+ 0,420 Use of different modes of trans

Fits and Diagnostics for Unusual Observations

Obs	2018	Fit	Resid	Std Resid	
2	3,984	4,225	-0,241	-0,96	X
16	4,374	4,371	0,004	0,04	X
39	4,208	3,087	1,121	2,10	R

R Large residual
X Unusual X

Regression Analysis: 2007 versus Change in … rt; Work on competition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	8,847	4,4237	21,15	0,000
Environmentalist mindset	1	5,476	5,4762	26,18	0,000
Technological improvement	1	7,667	7,6672	36,66	0,000
Error	55	11,503	0,2091		
Lack-of-Fit	31	6,276	0,2024	0,93	0,581
Pure Error	24	5,227	0,2178		
Total	57	20,350			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,457317	43,48%	41,42%	34,96%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,3404	0,0705	47,38	0,000	
Environmentalist mindset	0,531	0,104	5,12	0,000	1,35
Technological improvement	-0,5048	0,0834	-6,05	0,000	1,35

Regression Equation

2007　=　3,3404 + 0,531 Environmentalist mindset - 0,5048 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2007	Fit	Resid	Std Resid	
9	2,333	3,340	-1,007	-2,23	R
16	3,910	3,976	-0,066	-0,56	X

R Large residual
X Unusual X

Regression Analysis: 2010 versus Change in management … mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	4	4,7297	1,1824	10,28	0,000
Cooperation	1	0,5336	0,5336	4,64	0,036

Environmentalist mindset	1	1,5820	1,5820	13,76	0,000
Labor reform	1	0,3491	0,3491	3,04	0,087
Technological improvement	1	3,4465	3,4465	29,98	0,000
Error	53	6,0934	0,1150		
Lack-of-Fit	29	2,9988	0,1034	0,80	0,717
Pure Error	24	3,0946	0,1289		
Total	57	10,8231			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,339073	43,70%	39,45%	22,72%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,2201	0,0524	61,41	0,000	
Cooperation	0,0837	0,0389	2,15	0,036	1,55
Environmentalist mindset	0,620	0,167	3,71	0,000	6,35
Labor reform	-0,309	0,177	-1,74	0,087	7,36
Technological improvement	-0,3611	0,0659	-5,48	0,000	1,53

Regression Equation

2010 = 3,2201 + 0,0837 Cooperation + 0,620 Environmentalist mindset - 0,309 Labor reform
- 0,3611 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2010	Fit	Resid	Std Resid	
2	3,311	3,387	-0,076	-0,93	X
8	2,187	2,859	-0,672	-2,02	R
11	2,741	2,550	0,191	0,67	X
16	3,656	3,665	-0,009	-0,13	X
27	2,839	2,911	-0,072	-0,26	X
46	3,861	3,840	0,021	0,07	X
48	3,861	3,840	0,021	0,07	X

R Large residual
X Unusual X

Regression Analysis: 2012 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	5	9,3928	1,8786	11,86	0,000
Cooperation	1	0,5131	0,5131	3,24	0,078
Environmentalist mindset	1	1,5585	1,5585	9,84	0,003
Infrastructure development	1	0,7017	0,7017	4,43	0,040

	DF	Adj SS	Adj MS	F-Value	P-Value
Marketing	1	0,5282	0,5282	3,33	0,074
Technological improvement	1	7,5319	7,5319	47,54	0,000
Error	52	8,2384	0,1584		
Lack-of-Fit	28	4,3166	0,1542	0,94	0,562
Pure Error	24	3,9218	0,1634		
Total	57	17,6312			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,398033	53,27%	48,78%	27,24%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,3443	0,0622	53,77	0,000	
Cooperation	0,0817	0,0454	1,80	0,078	1,54
Environmentalist mindset	0,602	0,192	3,14	0,003	6,08
Infrastructure development	-0,2094	0,0995	-2,10	0,040	6,58
Marketing	0,410	0,224	1,83	0,074	3,86
Technological improvement	-0,5323	0,0772	-6,89	0,000	1,52

Regression Equation

2012 = 3,3443 + 0,0817 Cooperation + 0,602 Environmentalist mindset
- 0,2094 Infrastructure development + 0,410 Marketing
- 0,5323 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2012	Fit	Resid	Std Resid	
2	3,732	3,830	-0,098	-1,03	X
7	1,571	2,361	-0,790	-2,10	R
9	2,369	3,344	-0,975	-2,48	R
16	3,671	3,687	-0,016	-0,21	X
20	4,175	3,754	0,421	1,30	X
43	3,429	3,754	-0,325	-1,00	X

R Large residual
X Unusual X

Regression Analysis: 2014 versus Change in management … mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	4	6,1614	1,54034	14,23	0,000
Cooperation	1	0,7630	0,76299	7,05	0,010
Environmentalist mindset	1	1,6435	1,64352	15,19	0,000
Monitoring, analyzing and repor	1	0,3387	0,33870	3,13	0,083

	DF	Adj SS	Adj MS	F-Value	P-Value
Technological improvement	1	3,3108	3,31081	30,59	0,000
Error	53	5,7356	0,10822		
Lack-of-Fit	29	2,3472	0,08094	0,57	0,923
Pure Error	24	3,3884	0,14118		
Total	57	11,8970			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,328966	51,79%	48,15%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,4006	0,0531	64,07	0,000	
Cooperation	0,0898	0,0338	2,66	0,010	1,25
Environmentalist mindset	0,3102	0,0796	3,90	0,000	1,53
Monitoring, analyzing and repor	-0,201	0,114	-1,77	0,083	1,27
Technological improvement	-0,3925	0,0710	-5,53	0,000	1,88

Regression Equation

2014 = 3,4006 + 0,0898 Cooperation + 0,3102 Environmentalist mindset
- 0,201 Monitoring, analyzing and repor - 0,3925 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2014	Fit	Resid	Std Resid	
2	3,798	3,907	-0,109	-1,55	X
9	2,196	3,199	-1,003	-3,24	R
13	1,705	2,504	-0,799	-2,58	R
16	3,744	3,741	0,003	0,04	X
29	3,153	2,504	0,649	2,10	R

R Large residual
X Unusual X

Regression Analysis: 2016 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	5,844	1,9480	10,27	0,000
Cooperation	1	1,245	1,2454	6,57	0,013
Environmentalist mindset	1	2,405	2,4051	12,69	0,001
Technological improvement	1	5,089	5,0889	26,84	0,000
Error	54	10,238	0,1896		
Lack-of-Fit	30	4,375	0,1458	0,60	0,910
Pure Error	24	5,863	0,2443		
Total	57	16,082			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,435429	36,34%	32,80%	7,52%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,4409	0,0672	51,21	0,000	
Cooperation	0,1147	0,0448	2,56	0,013	1,25
Environmentalist mindset	0,3541	0,0994	3,56	0,001	1,36
Technological improvement	-0,4371	0,0844	-5,18	0,000	1,52

Regression Equation

2016 = 3,4409 + 0,1147 Cooperation + 0,3541 Environmentalist mindset
- 0,4371 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2016	Fit	Resid	Std Resid	
2	4,051	4,151	-0,100	-0,96	X
9	1,983	3,441	-1,457	-3,39	R
16	3,857	3,922	-0,065	-0,58	X
54	2,333	3,441	-1,108	-2,57	R

R Large residual
X Unusual X

Regression Analysis: 2018 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	5	5,6042	1,1208	6,93	0,000
Cooperation	1	0,5372	0,5372	3,32	0,074
Environmentalist mindset	1	0,6504	0,6504	4,02	0,050
Infrastructure development	1	0,5341	0,5341	3,30	0,075
Marketing	1	0,7989	0,7989	4,94	0,031
Technological improvement	1	3,5831	3,5831	22,14	0,000
Error	52	8,4150	0,1618		
Lack-of-Fit	28	4,0738	0,1455	0,80	0,712
Pure Error	24	4,3412	0,1809		
Total	57	14,0192			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,402277	39,97%	34,20%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,3146	0,0629	52,73	0,000	
Cooperation	0,0836	0,0459	1,82	0,074	1,54
Environmentalist mindset	0,389	0,194	2,00	0,050	6,08
Infrastructure development	-0,183	0,101	-1,82	0,075	6,58
Marketing	0,504	0,227	2,22	0,031	3,86
Technological improvement	-0,3672	0,0780	-4,71	0,000	1,52

Regression Equation

$$2018 = 3{,}3146 + 0{,}0836 \text{ Cooperation} + 0{,}389 \text{ Environmentalist mindset} - 0{,}183 \text{ Infrastructure development} + 0{,}504 \text{ Marketing} - 0{,}3672 \text{ Technological improvement}$$

Fits and Diagnostics for Unusual Observations

Obs	2018	Fit	Resid	Std Resid	
2	3,995	4,105	-0,110	-1,15	X
16	3,859	3,810	0,049	0,66	X
20	3,770	3,819	-0,049	-0,15	X
43	3,826	3,819	0,008	0,02	X
54	2,498	3,315	-0,817	-2,06	R

R Large residual
X Unusual X

Regression Analysis: 2007 versus Change in ... s; Work on competition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	12,570	4,1901	10,63	0,000
Cooperation	1	1,859	1,8595	4,72	0,034
Environmentalist mindset	1	6,600	6,5998	16,74	0,000
Technological improvement	1	10,367	10,3669	26,29	0,000
Error	54	21,290	0,3943		
Lack-of-Fit	30	12,777	0,4259	1,20	0,326
Pure Error	24	8,514	0,3547		
Total	57	33,861			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,627908	37,12%	33,63%	1,48%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,3290	0,0969	34,36	0,000	
Cooperation	0,1402	0,0646	2,17	0,034	1,25
Environmentalist mindset	0,587	0,143	4,09	0,000	1,36
Technological improvement	-0,624	0,122	-5,13	0,000	1,52

Regression Equation

2007 = 3,3290 + 0,1402 Cooperation + 0,587 Environmentalist mindset
             - 0,624 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2007	Fit	Resid	Std Resid	
2	3,949	4,107	-0,158	-1,05	X
16	4,207	4,327	-0,120	-0,74	X

X Unusual X

Regression Analysis: 2010 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value

	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	4	14,245	3,5613	10,20	0,000
Cooperation	1	3,044	3,0443	8,72	0,005
Environmentalist mindset	1	4,356	4,3560	12,48	0,001
Infrastructure development	1	1,017	1,0168	2,91	0,094
Technological improvement	1	11,030	11,0303	31,59	0,000
Error	53	18,506	0,3492		
Lack-of-Fit	29	10,895	0,3757	1,18	0,339
Pure Error	24	7,612	0,3171		
Total	57	32,751			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,590909	43,49%	39,23%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,3792	0,0923	36,63	0,000	
Cooperation	0,1832	0,0620	2,95	0,005	1,30
Environmentalist mindset	0,974	0,276	3,53	0,001	5,69
Infrastructure development	-0,236	0,138	-1,71	0,094	5,77
Technological improvement	-0,644	0,115	-5,62	0,000	1,52

Regression Equation

2010 = 3,3792 + 0,1832 Cooperation + 0,974 Environmentalist mindset
       - 0,236 Infrastructure development - 0,644 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2010	Fit	Resid	Std Resid	
2	4,132	4,331	-0,199	-1,41	X
16	4,138	4,045	0,093	0,82	X
38	2,125	3,379	-1,254	-2,15	R
46	4,120	4,353	-0,233	-0,46	X
48	4,120	4,353	-0,233	-0,46	X

R Large residual
X Unusual X

Regression Analysis: 2012 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	13,728	4,5761	16,97	0,000
Cooperation	1	1,764	1,7637	6,54	0,013
Environmentalist mindset	1	6,379	6,3795	23,65	0,000
Technological improvement	1	12,214	12,2136	45,28	0,000

	DF	Adj SS	Adj MS	F-Value	P-Value
Error	54	14,565	0,2697		
Lack-of-Fit	30	9,173	0,3058	1,36	0,221
Pure Error	24	5,392	0,2247		
Total	57	28,294			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,519352	48,52%	45,66%	31,08%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,4074	0,0801	42,52	0,000	
Cooperation	0,1365	0,0534	2,56	0,013	1,25
Environmentalist mindset	0,577	0,119	4,86	0,000	1,36
Technological improvement	-0,677	0,101	-6,73	0,000	1,52

Regression Equation

2012 = 3,4074 + 0,1365 Cooperation + 0,577 Environmentalist mindset
            - 0,677 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2012	Fit	Resid	Std Resid	
2	3,984	4,096	-0,112	-0,90	X
16	4,094	4,128	-0,034	-0,26	X

X Unusual X

Regression Analysis: 2014 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	11,873	3,9576	16,74	0,000
Cooperation	1	1,872	1,8719	7,92	0,007
Environmentalist mindset	1	5,282	5,2819	22,34	0,000
Technological improvement	1	10,523	10,5228	44,50	0,000
Error	54	12,770	0,2365		
Lack-of-Fit	30	7,289	0,2430	1,06	0,443
Pure Error	24	5,481	0,2284		
Total	57	24,643			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,486293	48,18%	45,30%	28,97%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,4482	0,0750	45,95	0,000	
Cooperation	0,1407	0,0500	2,81	0,007	1,25
Environmentalist mindset	0,525	0,111	4,73	0,000	1,36
Technological improvement	-0,6285	0,0942	-6,67	0,000	1,52

Regression Equation

2014 = 3,4482 + 0,1407 Cooperation + 0,525 Environmentalist mindset
      - 0,6285 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2014	Fit	Resid	Std Resid	
2	4,111	4,226	-0,115	-0,99	X
16	4,123	4,120	0,002	0,02	X
54	2,422	3,448	-1,026	-2,14	R

R Large residual
X Unusual X

Regression Analysis: 2016 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	9,188	3,0627	13,46	0,000
Cooperation	1	1,497	1,4969	6,58	0,013
Environmentalist mindset	1	4,530	4,5301	19,91	0,000
Technological improvement	1	7,737	7,7366	34,01	0,000
Error	54	12,285	0,2275		
Lack-of-Fit	30	5,885	0,1962	0,74	0,789
Pure Error	24	6,400	0,2666		
Total	57	21,473			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,476965	42,79%	39,61%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,5321	0,0736	47,99	0,000	
Cooperation	0,1258	0,0490	2,57	0,013	1,25
Environmentalist mindset	0,486	0,109	4,46	0,000	1,36
Technological improvement	-0,5389	0,0924	-5,83	0,000	1,52

Regression Equation

2016 = 3,5321 + 0,1258 Cooperation + 0,486 Environmentalist mindset
- 0,5389 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2016	Fit	Resid	Std Resid	
2	4,071	4,251	-0,180	-1,58	X
9	2,317	3,532	-1,215	-2,58	R
16	4,279	4,309	-0,030	-0,25	X
38	2,586	3,532	-0,946	-2,01	R
54	2,589	3,532	-0,943	-2,00	R

R Large residual
X Unusual X

Regression Analysis: 2018 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	9,894	3,2981	13,52	0,000
Cooperation	1	1,772	1,7716	7,26	0,009
Environmentalist mindset	1	5,056	5,0560	20,72	0,000
Technological improvement	1	8,012	8,0122	32,84	0,000
Error	54	13,176	0,2440		
Lack-of-Fit	30	7,789	0,2596	1,16	0,361
Pure Error	24	5,387	0,2245		
Total	57	23,070			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,493955	42,89%	39,72%	12,65%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,4463	0,0762	45,21	0,000	
Cooperation	0,1368	0,0508	2,69	0,009	1,25
Environmentalist mindset	0,513	0,113	4,55	0,000	1,36
Technological improvement	-0,5484	0,0957	-5,73	0,000	1,52

Regression Equation

2018 = 3,4463 + 0,1368 Cooperation + 0,513 Environmentalist mindset
- 0,5484 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2018	Fit	Resid	Std Resid	
2	4,131	4,266	-0,135	-1,14	X
16	4,311	4,367	-0,056	-0,44	X
54	2,298	3,446	-1,149	-2,35	R

R Large residual
X Unusual X

Regression Analysis: 2007 versus Change in ... s; Work on competition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	13,847	4,6156	14,72	0,000
Cooperation	1	1,532	1,5324	4,89	0,031
Environmentalist mindset	1	6,699	6,6993	21,37	0,000
Technological improvement	1	12,258	12,2581	39,10	0,000
Error	54	16,930	0,3135		
Lack-of-Fit	30	9,286	0,3095	0,97	0,535
Pure Error	24	7,644	0,3185		
Total	57	30,777			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,559935	44,99%	41,93%	29,26%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,4508	0,0864	39,94	0,000	
Cooperation	0,1273	0,0576	2,21	0,031	1,25
Environmentalist mindset	0,591	0,128	4,62	0,000	1,36
Technological improvement	-0,678	0,108	-6,25	0,000	1,52

Regression Equation

2007 = 3,4508 + 0,1273 Cooperation + 0,591 Environmentalist mindset
       - 0,678 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2007	Fit	Resid	Std Resid	
2	3,959	4,045	-0,086	-0,64	X
16	4,119	4,201	-0,082	-0,57	X
38	2,000	3,451	-1,451	-2,62	R

R Large residual
X Unusual X

Regression Analysis: 2010 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	14,642	4,8805	19,19	0,000
Cooperation	1	1,968	1,9677	7,74	0,007
Environmentalist mindset	1	6,246	6,2461	24,56	0,000
Technological improvement	1	13,368	13,3681	52,57	0,000
Error	54	13,733	0,2543		
Lack-of-Fit	30	7,226	0,2409	0,89	0,625
Pure Error	24	6,506	0,2711		
Total	57	28,374			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,504289	51,60%	48,91%	38,68%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,5841	0,0778	46,06	0,000	
Cooperation	0,1442	0,0518	2,78	0,007	1,25
Environmentalist mindset	0,571	0,115	4,96	0,000	1,36
Technological improvement	-0,7084	0,0977	-7,25	0,000	1,52

Regression Equation

2010 = 3,5841 + 0,1442 Cooperation + 0,571 Environmentalist mindset - 0,7084 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2010	Fit	Resid	Std Resid	
2	4,221	4,318	-0,097	-0,80	X
16	4,184	4,180	0,003	0,03	X
38	2,000	3,584	-1,584	-3,18	R
54	2,562	3,584	-1,022	-2,05	R

R Large residual
X Unusual X

Regression Analysis: 2012 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	6	16,8131	2,8022	10,52	0,000
Cooperation	1	1,0908	1,0908	4,10	0,048
Environmentalist mindset	1	3,0107	3,0107	11,30	0,001
Infrastructure development	1	1,5183	1,5183	5,70	0,021

100

Marketing	1	0,9409	0,9409	3,53	0,066
Technological improvement	1	11,8582	11,8582	44,53	0,000
Use of different modes of port	1	0,7806	0,7806	2,93	0,093
Error	51	13,5826	0,2663		
Lack-of-Fit	27	8,0196	0,2970	1,28	0,271
Pure Error	24	5,5629	0,2318		
Total	57	30,3957			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,516067	55,31%	50,06%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,4565	0,0829	41,67	0,000	
Cooperation	0,1192	0,0589	2,02	0,048	1,54
Environmentalist mindset	0,840	0,250	3,36	0,001	6,13
Infrastructure development	-0,313	0,131	-2,39	0,021	6,80
Marketing	0,549	0,292	1,88	0,066	3,89
Technological improvement	-0,673	0,101	-6,67	0,000	1,55
Use of different modes of port	0,379	0,221	1,71	0,093	1,05

Regression Equation

2012 = 3,4565 + 0,1192 Cooperation + 0,840 Environmentalist mindset
- 0,313 Infrastructure development + 0,549 Marketing - 0,673 Technological improvement
+ 0,379 Use of different modes of port

Fits and Diagnostics for Unusual Observations

Obs	2012	Fit	Resid	Std Resid	
2	4,049	4,211	-0,162	-1,32	X
16	4,050	3,959	0,091	0,95	X
24	4,034	3,901	0,132	0,45	X
30	2,338	3,456	-1,119	-2,20	R

R Large residual
X Unusual X

Regression Analysis: 2014 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	5	11,0052	2,2010	12,16	0,000
Efficiency works	1	1,2531	1,2531	6,92	0,011
Monitoring, analyzing and repor	1	1,1519	1,1519	6,36	0,015
Provide safety in logistics	1	0,5474	0,5474	3,02	0,088

	DF	Adj SS	Adj MS	F-Value	P-Value
Technological improvement	1	4,2843	4,2843	23,66	0,000
Use of different modes of trans	1	1,3352	1,3352	7,37	0,009
Error	52	9,4154	0,1811		
Lack-of-Fit	28	4,5640	0,1630	0,81	0,710
Pure Error	24	4,8514	0,2021		
Total	57	20,4206			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,425517	53,89%	49,46%	*

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,5640	0,0694	51,37	0,000	
Efficiency works	0,906	0,344	2,63	0,011	24,17
Monitoring, analyzing and repor	-0,417	0,165	-2,52	0,015	1,60
Provide safety in logistics	-0,992	0,571	-1,74	0,088	28,27
Technological improvement	-0,502	0,103	-4,86	0,000	2,38
Use of different modes of trans	0,286	0,105	2,72	0,009	2,20

Regression Equation

2014　=　3,5640 + 0,906 Efficiency works - 0,417 Monitoring, analyzing and repor
　　　　　　- 0,992 Provide safety in logistics - 0,502 Technological improvement
　　　　　　+ 0,286 Use of different modes of trans

Fits and Diagnostics for Unusual Observations

Obs	2014	Fit	Resid	Std Resid	
2	4,112	4,205	-0,093	-0,56	X
10	3,968	4,053	-0,085	-0,28	X
16	4,168	4,168	0,000	*	X
39	4,073	3,147	0,926	2,37	R
57	4,138	4,053	0,085	0,28	X

R Large residual
X Unusual X

Regression Analysis: 2016 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	8,323	2,7743	10,15	0,000
Efficiency works	1	2,205	2,2047	8,07	0,006
Technological improvement	1	7,243	7,2427	26,50	0,000
Use of different modes of trans	1	1,420	1,4199	5,19	0,027
Error	54	14,759	0,2733		

Lack-of-Fit	30	6,637	0,2212	0,65	0,866
Pure Error	24	8,122	0,3384		
Total	57	23,082			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,522796	36,06%	32,51%	22,38%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,6339	0,0808	44,99	0,000	
Efficiency works	0,310	0,109	2,84	0,006	1,61
Technological improvement	-0,580	0,113	-5,15	0,000	1,88
Use of different modes of trans	0,290	0,127	2,28	0,027	2,13

Regression Equation

2016   =   3,6339 + 0,310 Efficiency works - 0,580 Technological improvement
+ 0,290 Use of different modes of trans

Fits and Diagnostics for Unusual Observations

Obs	2016	Fit	Resid	Std Resid	
2	4,224	4,213	0,012	0,05	X
9	2,037	3,634	-1,597	-3,09	R
14	2,539	3,634	-1,095	-2,12	R
16	4,265	4,334	-0,069	-0,61	X
38	2,336	3,634	-1,297	-2,51	R

R Large residual
X Unusual X

Regression Analysis: 2018 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	9,418	3,1393	14,86	0,000
Cooperation	1	1,273	1,2733	6,03	0,017
Environmentalist mindset	1	4,699	4,6993	22,25	0,000
Technological improvement	1	8,083	8,0828	38,27	0,000
Error	54	11,406	0,2112		
Lack-of-Fit	30	5,774	0,1925	0,82	0,700
Pure Error	24	5,632	0,2347		
Total	57	20,824			

Model Summary

	S	R-sq	R-sq(adj)	R-sq(pred)
	0,459597	45,23%	42,18%	30,50%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,5273	0,0709	49,73	0,000	
Cooperation	0,1160	0,0472	2,46	0,017	1,25
Environmentalist mindset	0,495	0,105	4,72	0,000	1,36
Technological improvement	-0,5508	0,0890	-6,19	0,000	1,52

Regression Equation

2018 = 3,5273 + 0,1160 Cooperation + 0,495 Environmentalist mindset
- 0,5508 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2018	Fit	Resid	Std Resid	
2	4,051	4,136	-0,085	-0,77	X
9	2,471	3,527	-1,056	-2,33	R
16	4,239	4,263	-0,023	-0,20	X
38	2,513	3,527	-1,015	-2,23	R

R Large residual
X Unusual X

Regression Analysis: 2007 versus Change in ... s; Work on competition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	12,168	4,0559	15,54	0,000
Cooperation	1	1,555	1,5551	5,96	0,018
Environmentalist mindset	1	5,577	5,5766	21,36	0,000
Technological improvement	1	10,886	10,8864	41,71	0,000
Error	54	14,096	0,2610		
Lack-of-Fit	30	8,535	0,2845	1,23	0,305
Pure Error	24	5,560	0,2317		
Total	57	26,263			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,510909	46,33%	43,35%	7,86%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,7657	0,0788	47,76	0,000	
Cooperation	0,1282	0,0525	2,44	0,018	1,25
Environmentalist mindset	0,539	0,117	4,62	0,000	1,36
Technological improvement	-0,6393	0,0990	-6,46	0,000	1,52

Regression Equation

2007 = 3,7657 + 0,1282 Cooperation + 0,539 Environmentalist mindset
       - 0,6393 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2007	Fit	Resid	Std Resid	
2	4,253	4,408	-0,155	-1,27	X
16	4,327	4,417	-0,090	-0,68	X

X Unusual X

Regression Analysis: 2010 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value

	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	8,668	2,8892	12,97	0,000
Cooperation	1	1,028	1,0277	4,61	0,036
Efficiency works	1	4,121	4,1208	18,50	0,000
Technological improvement	1	7,660	7,6601	34,40	0,000
Error	54	12,026	0,2227		
Lack-of-Fit	30	6,857	0,2286	1,06	0,445
Pure Error	24	5,168	0,2153		
Total	57	20,693			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,471907	41,89%	38,66%	27,12%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,8506	0,0730	52,77	0,000	
Cooperation	0,1045	0,0486	2,15	0,036	1,25
Efficiency works	0,3941	0,0916	4,30	0,000	1,39
Technological improvement	-0,5377	0,0917	-5,86	0,000	1,53

Regression Equation

2010 = 3,8506 + 0,1045 Cooperation + 0,3941 Efficiency works
- 0,5377 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2010	Fit	Resid	Std Resid	
2	4,288	4,358	-0,070	-0,67	X
16	4,483	4,483	0,000	0,00	X
38	2,857	3,851	-0,994	-2,13	R

R Large residual
X Unusual X

Regression Analysis: 2012 versus Change in management … mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	12,173	4,0577	19,17	0,000
Cooperation	1	1,313	1,3132	6,20	0,016
Environmentalist mindset	1	5,438	5,4378	25,69	0,000
Technological improvement	1	11,104	11,1041	52,46	0,000
Error	54	11,430	0,2117		
Lack-of-Fit	30	7,765	0,2588	1,69	0,094
Pure Error	24	3,666	0,1527		
Total	57	23,603			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,460080	51,57%	48,88%	25,73%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,7941	0,0710	53,44	0,000	
Cooperation	0,1178	0,0473	2,49	0,016	1,25
Environmentalist mindset	0,532	0,105	5,07	0,000	1,36
Technological improvement	-0,6456	0,0891	-7,24	0,000	1,52

Regression Equation

2012 = 3,7941 + 0,1178 Cooperation + 0,532 Environmentalist mindset
       - 0,6456 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2012	Fit	Resid	Std Resid	
2	4,198	4,327	-0,129	-1,17	X
7	1,665	2,621	-0,956	-2,19	R
16	4,318	4,345	-0,027	-0,23	X
25	2,883	3,794	-0,911	-2,01	R
27	2,883	3,794	-0,911	-2,01	R
28	2,883	3,794	-0,911	-2,01	R
30	2,883	3,794	-0,911	-2,01	R
31	2,883	3,794	-0,911	-2,01	R

R Large residual
X Unusual X

Regression Analysis: 2014 versus Change in management … mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	9,674	3,2247	18,62	0,000
Cooperation	1	1,553	1,5525	8,97	0,004
Environmentalist mindset	1	3,951	3,9508	22,82	0,000
Technological improvement	1	8,810	8,8099	50,88	0,000
Error	54	9,350	0,1731		
Lack-of-Fit	30	4,480	0,1493	0,74	0,789
Pure Error	24	4,871	0,2029		
Total	57	19,024			

Model Summary

	S	R-sq	R-sq(adj)	R-sq(pred)
	0,416113	50,85%	48,12%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,8558	0,0642	60,05	0,000	
Cooperation	0,1281	0,0428	2,99	0,004	1,25
Environmentalist mindset	0,4538	0,0950	4,78	0,000	1,36
Technological improvement	-0,5751	0,0806	-7,13	0,000	1,52

Regression Equation

2014 = 3,8558 + 0,1281 Cooperation + 0,4538 Environmentalist mindset
- 0,5751 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2014	Fit	Resid	Std Resid	
2	4,390	4,562	-0,172	-1,72	X
9	2,796	3,856	-1,060	-2,58	R
13	2,038	2,834	-0,796	-2,02	R
16	4,361	4,337	0,024	0,22	X

R Large residual
X Unusual X

Regression Analysis: 2016 versus Change in management ... mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	4,679	1,5598	8,32	0,000
Cooperation	1	1,093	1,0933	5,83	0,019
Environmentalist mindset	1	2,188	2,1884	11,68	0,001
Technological improvement	1	3,734	3,7344	19,93	0,000
Error	54	10,119	0,1874		
Lack-of-Fit	30	4,427	0,1476	0,62	0,891
Pure Error	24	5,692	0,2371		
Total	57	14,798			

Model Summary

	S	R-sq	R-sq(adj)	R-sq(pred)
	0,432879	31,62%	27,82%	0,00%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,8967	0,0668	58,33	0,000	

	Coef	SE Coef	T-Value	P-Value	VIF
Cooperation	0,1075	0,0445	2,42	0,019	1,25
Environmentalist mindset	0,3377	0,0988	3,42	0,001	1,36
Technological improvement	-0,3744	0,0839	-4,46	0,000	1,52

Regression Equation

2016 = 3,8967 + 0,1075 Cooperation + 0,3377 Environmentalist mindset - 0,3744 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2016	Fit	Resid	Std Resid	
2	4,426	4,597	-0,171	-1,65	X
9	2,287	3,897	-1,610	-3,76	R
16	4,453	4,518	-0,064	-0,58	X
45	2,606	3,522	-0,916	-2,15	R
54	3,000	3,897	-0,897	-2,10	R

R Large residual
X Unusual X

Regression Analysis: 2018 versus Change in management … mpetition

Backward Elimination of Terms

α to remove = 0,1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	8,629	2,8764	13,83	0,000
Cooperation	1	1,434	1,4343	6,90	0,011
Environmentalist mindset	1	3,951	3,9512	19,00	0,000
Technological improvement	1	7,507	7,5065	36,09	0,000
Error	54	11,231	0,2080		
Lack-of-Fit	30	5,916	0,1972	0,89	0,622
Pure Error	24	5,315	0,2215		
Total	57	19,860			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0,456056	43,45%	40,31%	29,35%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	3,7860	0,0704	53,80	0,000	
Cooperation	0,1231	0,0469	2,63	0,011	1,25
Environmentalist mindset	0,454	0,104	4,36	0,000	1,36
Technological improvement	-0,5308	0,0884	-6,01	0,000	1,52

Regression Equation

2018 = 3,7860 + 0,1231 Cooperation + 0,454 Environmentalist mindset
       - 0,5308 Technological improvement

Fits and Diagnostics for Unusual Observations

Obs	2018	Fit	Resid	Std Resid	
2	4,410	4,486	-0,076	-0,69	X
9	2,566	3,786	-1,220	-2,71	R
16	4,392	4,424	-0,032	-0,27	X
38	2,878	3,786	-0,908	-2,01	R

R Large residual
X Unusual X

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C   Impact of Action i on Criterion j

Action.Criteria	a_{ij}
envi.custom	0.509
coop.custom	0.1104
tech.custom	0.5075
port.custom	0.384
effi.infra	0.823
tech.infra	-0.639
develop.infra	-0.319
monit.infra	-0.418
trans.infra	0.42
envi.inter	0.389
tech.inter	0.3672
coop.inter	0.0836
develop.inter	-0.183
markt.inter	0.504
coop.quality	0.1368
envi.quality	0.513
tech.quality	0.5484
coop.time	0.1231
envi.time	0.454
tech.time	0.5308
coop.track	0.116
envi.track	0.495
tech.track	0.5508

D Survey

AKSİYONLARIN BÜTÇE DEĞERLENDİRMESİ İÇİN ANKET

Bu anket yüksek lisans tez çalışmasına objektif veriler toplayabilmek için hazırlanmıştır. Tezin amacı daha önce diğer ülkelerin yaptığı çalışmaları inceleyerek dünya bankası tarafından hazırlanan lojistik performans endeksinde Türkiye'nin sıralamasını arttırabilmek için öneriler sunmaktır. Lojistik performans endeksi ülkelerin lojistik alanındaki performanslarını ölçmek için hazırlanan dünya çapında bir kıyaslama aracıdır.

Stratejik olarak aksiyon almaya karar verirken, bütçe konusu ülkeler için önemlidir. Bu yüzden bu problemi çözebilmek için eylemler arasında bütçe değerlendirmesine ihtiyacımız vardır. Değerlendirmeyi objektif bir şekilde yapabilmek için desteğinizi rica ediyoruz.

Anket aşağıdaki aksiyonlarla ilgili çalışmalar yapılması halinde gerekli olacak bütçeyi 1 ve 100 arasında değerlendirilecek şekilde hazırlanmıştır. Anketteki aksiyonları gözden geçirerek aksiyonların gerektireceği bütçe miktarını 1 en düşük, 100 en yüksek bütçeli aksiyona verilecek şekilde değerlendirmenizi rica ederiz.

Ad Soyad *

Short answer text

Çalıştığınız Şirket - Ünvan *

Short answer text

Kaç yıldır sektördesiniz? *

Short answer text

Çevresel Çalışmalar: Eğer ülke çevresel çalışma faaliyetlerinde bulunduysa bu aksiyon altında değerlendirilmiştir. Örneğin atık yönetimi, emisyon düşürme çalışmaları, çevreyi koruma faaliyetleri vs. *

Short answer text

Pazarlama: Müşteri odaklı çalışma, reklam, özel sektör katılımını teşvik gibi çalışmalar bu aksiyon altında değerlendirilmiştir. *

Short answer text

İşbirliği: Gümrük işlemleri, ekonomik veya lojistik faaliyetleri hakkında iki veya daha fazla ülke (örneğin; limanlar arası) arasındaki işbirliği bu aksiyon altında değerlendirilmiştir. *

Short answer text

Farklı Liman Modellerinin Kullanılması: Aktarma merkezi (Bir taşımacılık ağındaki birleşim ve dağıtım noktasıdır.) oluşturmak veya ev sahibi modeli (Landlord: Liman arazisi devlete aittir ancak tüm operasyonlar özel şirketler tarafından yapılır.) kullanmak gibi liman modelleri oluşturulması için yapılan yatırımlar bu aksiyon altında değerlendirilmiştir. *

Short answer text

Farklı Ulaşım Türlerinin Kullanılması: Farklı ulaşım türlerini birleştirmek, çok türlü ulaşım (Taşıma ürünlerin en az iki farklı taşıma yöntemi ile taşınmasıdır.) bir koridor modeli işbirliğini kurmak eylemleri bu aksiyon altında değerlendirilmiştir. *

Short answer text

Verimlilik Çalışmaları: Ülkeler verimlilik çalışmaları yaptıysa bu aksiyon altında değerlendirilmiştir. Örneğin; gereksiz idari engelleri kaldırmak, darboğazları gidermek için yatırım yapmak, konteyner verimliliğini maksimize etmek vb. *

Short answer text

Değerlendirme Notları

Görüşleriniz bizim için değerlidir. Anket hakkındaki düşüncelerinizi aşağıdaki alanda bizimle paylaşabilir misiniz.

E GAMS Code for Mathematical Model

```
sets
i 'set of action' /coop, envi, tech, markt, develop, port, trans, monit, safety,
effi, labor/

j 'set of criteria of LPI' /custom, infra,inter,quality,time,track/
butce butce adimlari /1*20/
senaryo senaryo secimi /1*100/;
;

parameter a(i,j) 'impact of aciton i on j'
/
envi.custom    0.509
coop.custom    0.1104
tech.custom   -0.5075
port.custom    0.384
effi.infra     0.823
tech.infra    -0.639
develop.infra -0.319
monit.infra   -0.418
trans.infra    0.42
envi.inter     0.389
tech.inter    -0.3672
coop.inter     0.0836
develop.inter -0.183
markt.inter    0.504
coop.quality   0.1368
envi.quality   0.513
tech.quality  -0.5484
coop.time      0.1231
envi.time      0.454
tech.time     -0.5308
coop.track     0.116
envi.track     0.495
tech.track    -0.5508          /;
```

```
parameter w(j) 'weight of criteria j'; w(j)=1/6;

parameter LP(j) 'current LPI score of TR for criteria j'
/
custom          2.71
infra           3.21
inter           3.06
quality         3.05
time            3.23
track           3.63
/
parameter xUB(i) 'upper bound for number of times action i taken';
xUB(i)=1;
parameter c(i) 'cost of aciton i'
;
parameter b 'budget of TR';
b=0;

variable
LP_TR objective value

positive variable

LPs(j) * new LPI score of criteria j
integer variable
x(i) number of times action i is taken

equations
obj Objective function
c1   compute individual lps(j) values
c2   LPs values can not exceed 5
c3   budget limitation
c4   UBs on actions
;
```

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```
obj .. LP_TR=E=sum(j, w(j)* LPs(j));
c1(j) .. LPs(j)=L=LP(j)+sum(i, a(i,j)* x(i));
c2(j) .. LPs(j)=L=5;
c3    ..   sum(i, c(i)*x(i))=L=b;
c4(i) .. x(i)=L=xUB(i);
model meltem /all/ ;

meltem.optcr=0;
meltem.optca=0;

parameter sonuc_LP(senaryo, butce);
parameter sonuc_x(senaryo, butce,i);
scalar tmp;
scalar tmp2;
scalar tmp3;
scalar aa,bb,cc;
parameter c_all(senaryo, i);

loop(senaryo,

c("coop")  = max(0.1, NORMAL(14.8, 5.35));
c("markt") = max(0.1, NORMAL(18.1, 4.49));
c("envi")  = max(0.1, NORMAL(15.7, 4.68));
c("effi")  = max(0.1, NORMAL(14.1, 5.06));

**----------- port~ TRIA(10, 15.2, 30)

aa=10; cc=15.2; bb=30;

tmp=uniform(0,1);
tmp2=(cc-aa)/(bb-aa);
tmp3=bb-sqrt((1-tmp)*(bb-aa)*(bb-cc));
if (tmp<tmp2, tmp3=aa+ sqrt ( tmp*(bb-aa)*(cc-aa)));
```

```
c("port")=tmp3;
**-----------trans ~ TRIA(12, 16.8, 28)

aa=12; cc=16.8; bb=28;

tmp=uniform(0,1);
tmp2=(cc-aa)/(bb-aa);
tmp3=bb-sqrt((1-tmp)*(bb-aa)*(bb-cc));
if (tmp<tmp2, tmp3=aa+ sqrt ( tmp*(bb-aa)*(cc-aa)));
c("trans")=tmp3;
**----------

c_all(senaryo,i)=c(i);



loop (butce,
        b=sum(i,c(i))*ord(butce)/card(butce);
        solve meltem using MIP maximizing LP_TR ;
        sonuc_LP(senaryo, butce)=LP_TR.L;
        loop(i, sonuc_x(senaryo, butce,i)=x.L(i));
); //end of butce loop

); //end of senaryo   loop

*display x.L, LPs.L , LP_TR.L ;
display sonuc_LP;
display sonuc_x;
display c_all;
```

F c_i Values for Actions

	Coop.	Envi.	Markt.	Port.	Trans.	Effi.
1	13.12	17.87	19.57	15.53	16.15	4.84
2	12.69	12.15	22.30	29.25	19.31	14.10
3	9.94	12.60	19.64	20.10	17.94	11.64
4	7.85	17.20	11.92	14.90	20.26	20.11
5	20.24	11.02	14.85	14.08	23.22	14.13
6	9.48	18.80	14.03	19.51	18.20	22.05
7	13.63	15.20	13.78	16.01	15.74	12.77
8	25.40	20.40	21.81	19.98	21.39	10.29
9	19.31	25.53	11.68	11.81	21.90	17.51
10	15.70	21.63	25.51	16.56	17.28	23.24
11	10.45	13.16	14.50	15.61	15.10	20.59
12	15.18	7.46	17.55	13.97	15.66	14.09
13	8.74	15.44	12.60	28.62	17.37	14.84
14	11.56	14.79	23.91	13.53	21.12	18.03
15	11.42	4.09	18.59	19.52	16.16	16.63
16	11.02	14.65	11.26	16.52	17.41	8.75
17	9.91	12.35	15.43	13.25	17.49	13.26
18	11.69	11.40	13.53	17.98	13.86	15.26
19	22.77	7.60	25.55	20.27	18.60	20.09
20	9.59	16.02	20.11	28.02	16.19	8.72
21	18.53	12.77	23.03	15.06	20.04	9.37
22	15.96	10.33	16.39	14.41	20.58	13.01

	Coop.	Envi.	Markt.	Port.	Trans.	Effi.
23	17.24	11.58	15.41	23.24	19.67	21.98
24	15.42	17.24	13.32	17.69	21.95	11.35
25	10.77	14.47	32.39	17.25	25.90	14.22
26	12.73	21.04	16.25	11.68	15.88	15.85
27	16.84	18.47	17.48	19.69	15.45	6.45
28	10.23	22.15	7.87	16.57	19.10	15.04
29	17.78	19.44	17.23	27.81	21.53	4.74
30	16.34	21.58	12.74	24.91	23.77	7.20
31	23.98	19.27	22.47	15.60	18.50	14.17
32	15.98	22.27	25.53	13.46	25.73	18.35
33	20.23	20.68	19.66	22.13	19.64	19.47
34	11.18	14.46	18.00	14.50	16.17	14.70
35	19.96	17.75	21.87	23.57	16.04	16.29
36	14.53	6.91	15.64	15.76	15.22	10.87
37	21.66	10.36	16.56	15.43	23.68	13.54
38	11.18	5.94	17.50	19.72	20.01	11.99
39	13.25	16.50	14.89	25.10	18.09	13.50
40	10.80	8.45	17.07	13.41	21.32	5.27
41	13.97	16.29	10.04	24.56	23.74	15.69
42	19.92	15.78	16.85	19.15	14.51	20.59
43	22.96	17.94	26.30	15.94	16.93	9.60
44	16.56	11.39	8.01	17.90	19.29	16.67
45	20.93	17.96	22.40	19.27	20.21	10.10
46	8.61	19.25	15.78	16.83	15.48	21.26
47	15.98	14.49	12.19	17.02	17.21	11.32
48	9.66	9.50	19.07	24.97	16.05	3.30

	Coop.	Envi.	Markt.	Port.	Trans.	Effi.
49	6.72	20.88	19.14	13.93	24.44	6.73
50	14.51	18.72	17.51	16.79	16.82	11.37
51	12.42	16.90	25.92	14.10	16.93	8.97
52	17.51	15.48	10.80	20.19	17.06	14.20
53	17.70	21.33	15.08	22.93	18.68	19.87
54	5.51	15.01	20.09	22.42	17.07	10.40
55	10.44	19.83	18.74	17.51	20.89	14.77
56	14.98	17.51	22.64	15.25	20.46	11.50
57	14.51	6.46	20.39	19.07	23.34	11.62
58	9.01	22.60	20.07	11.70	22.18	16.01
59	5.80	7.52	15.82	18.78	18.96	18.89
60	15.12	12.16	19.72	26.67	24.98	19.74
61	8.59	13.37	14.37	21.08	16.56	11.22
62	22.13	11.58	20.89	10.90	23.11	19.23
63	13.31	11.26	17.92	16.85	19.02	21.06
64	9.38	19.20	23.96	14.71	18.64	13.83
65	13.84	12.12	20.72	16.59	15.97	14.14
66	19.16	12.06	29.12	18.43	19.00	7.79
67	11.76	17.05	17.39	14.03	18.28	13.73
68	12.37	15.71	12.28	18.10	22.58	13.43
69	10.42	11.15	13.64	18.50	14.40	4.01
70	17.77	23.26	20.38	16.82	23.09	8.55
71	16.89	6.79	18.37	16.36	17.80	11.77
72	15.17	21.42	25.91	25.27	17.58	12.47
73	12.02	24.22	26.29	14.25	19.58	17.83
74	18.01	13.74	25.23	24.33	18.01	11.12

	Coop.	Envi.	Markt.	Port.	Trans.	Effi.
75	2.31	13.13	27.10	19.75	22.00	11.40
76	15.20	14.94	19.91	22.85	22.33	2.31
77	23.17	15.07	23.29	12.19	15.51	12.87
78	13.84	16.72	12.47	11.93	17.25	19.65
79	3.50	14.27	17.31	23.32	19.91	16.61
80	15.05	21.28	25.19	18.79	19.09	15.63
81	15.15	16.12	19.46	16.82	22.11	17.74
82	14.56	12.15	16.91	18.53	19.73	15.01
83	15.68	14.48	17.51	24.20	20.39	7.98
84	9.88	16.74	15.71	17.15	20.18	12.06
85	13.89	20.69	9.12	17.35	15.09	13.46
86	12.86	14.02	17.01	23.22	22.37	18.35
87	14.58	13.91	21.99	16.03	16.05	18.77
88	18.15	14.19	17.18	15.57	14.98	5.48
89	13.77	14.43	21.65	13.90	17.51	11.91
90	21.07	15.37	16.50	15.03	17.31	16.15
91	18.39	11.64	12.16	17.58	15.34	13.07
92	14.94	12.49	22.68	21.64	26.06	14.16
93	16.88	11.87	21.05	23.20	18.24	19.34
94	22.91	12.18	12.74	15.16	18.08	7.49
95	17.11	16.61	17.38	15.94	16.01	15.88
96	10.46	9.22	20.28	18.85	25.39	18.42
97	16.97	16.00	29.66	26.97	19.47	11.83
98	11.08	10.93	18.41	24.08	20.87	13.00
99	11.83	20.04	18.77	26.51	20.60	10.96
100	23.01	16.04	24.18	23.05	23.60	8.30