SIMILARITY ASSESSMENT OF COUNTRIES TO FACILITATE LEARNING FROM INTERNATIONAL CONSTRUCTION PROJECTS

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ABSTRACT

SIMILARITY ASSESSMENT OF COUNTRIES TO FACILITATE LEARNING FROM INTERNATIONAL CONSTRUCTION PROJECTS

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Knowledge is a major source of competitive advantage in the global construction industry. Companies learn from previous experiences and if they can find an effective way to transfer their previous experiences to forthcoming projects, they can increase their competitiveness. The aim of this thesis is to demonstrate how similar countries can be grouped so that contractors can utilise lessons learned in similar markets to improve project performance in forthcoming projects. For this purpose, at the initial stage of this study, host country factors affecting the success of international construction projects are identified through literature review. An evaluation form is designed and validated by experts to collect country-specific data. After the collection of country data using available resources as well as expert opinion, cluster analysis is performed to group countries where Turkish contractors frequently execute their projects. In this thesis, 39 countries are clustered by using cluster analysis with SPSS 23.0. As a result, three clusters are obtained and further validated by statistical methods as well as by expert opinion. Finally, how identification of similarities and transferring lessons learned between countries may facilitate learning from international construction projects are discussed. It is clear that the clusters identified are not static

and may change in time. Also, the country clusters are not generic as they only reflect the Turkish contractors' perspective and experience in global construction industry. However, research findings provide some evidence that firms may learn from experiences in similar countries and cluster analysis can be utilised to identify similar country clusters.

Keywords:, Country factors, similarity, organizational learning, knowledge management, cluster analysis, international construction

ÖZ

ULUSLARARASI İNŞAAT PROJELERİNDEN ÖĞRENMEYİ KOLAYLAŞTIRMAK İÇİN ÜLKELERİN BENZERLİK DEĞERLENDİRMESİ

Özyurt, Beste

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Bilgi, küresel inşaat sektöründe önemli bir rekabet avantajı kaynağıdır. Şirketler önceki projelerindeki deneyimlerinden öğrenirler ve önceki deneyimlerini gelecek projelere aktarmanın etkili bir yolunu bulabilirlerse rekabetçiliklerini artırabilirler. Bu tezin amacı, benzer ülkelerin, müteahhitlerin benzer piyasalarda öğrendikleri dersleri gelecek projelerde proje performansını iyileştirmek için kullanabilmelerini sağlamak amacıyla nasıl gruplanabileceğini göstermektir. Bu amaçla, bu çalışmanın ilk aşamasında, uluslararası inşaat projelerinin başarısını etkileyen ev sahibi ülke faktörleri literatür taraması sonucunda tespit edilmiştir. Ülkelere özgü verileri toplamak için bir ülke değerlendirme formu tasarlanmış ve validasyonu uzmanlar tarafından yapılmıştır. Mevcut kaynakları ve uzman görüşlerini kullanarak ülke verilerinin toplanmasının ardından, Türk müteahhitlerinin projelerini sıklıkla gerçekleştirdikleri ülkeleri gruplamak için kümeleme analizi yapılmıştır. Bu tez kapsamında 39 ülke, SPSS 23.0 aracılığıyla kümeleme analizi kullanarak kümelenmiştir. Sonuç olarak, üç küme elde edilmiş daha sonra istatistiksel yöntemlerle ve uzman görüşü kullanılarak doğrulanmıştır. Son olarak, benzerliklerin belirlenmesinin ve ülkeler arasında öğrenilen derslerin aktarılmasının uluslararası inşaat projelerinden öğrenmeyi nasıl kolaylaştırabileceği tartışılmıştır. Elde edilen

kümelerin statik olmadığı ve zamanla değişebileceği açıktır. Ayrıca, ülke kümeleri sadece Türk müteahhitlerinin küresel inşaat endüstrisindeki bakış açısını ve tecrübelerini yansıttığı için genelleyici değildir. Bununla birlikte, araştırma bulguları firmaların benzer ülkelerdeki deneyimlerden öğrenebileceğine ve ülke kümelerini belirlemek için kümeleme analizinin kullanılabileceğine dair bazı kanıtlar sunmaktadır.

Anahtar Kelimeler: Ülke faktörleri, benzerlik, kurumsal öğrenme, bilgi yönetimi, kümeleme analizi, uluslararası inşaat

Dedicated to my family…

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LIST OF ABBREVIATIONS

AGNES	AGglomerative Nesting
ASCE	American Society of Civil Engineers
CICA	Confederation of International Contractors'
CICA	Confederation of International Contractors' Associations
COFACE	Compagnie Francaise D'assurance Pour Le Commerce Extérieur
COPPMAN	COnstruction Project Portfolio MANagement,
DIANA	DIvisive ANAlysis
EIU	Economist Intelligence Unit
ENR	Engineering News Record
FIDIC	Fédération Internationale Des Ingénieurs-Conseils
GATT	General Agreement Tariffs and Trade
IHS	Information Handling Services
IMF	International Monetary Fund'
OECD	Organisation for Economic Co-operation and Development
OMIS	Organizational Memory Information Systems
PMI	Project Management Institute
SPSS	Statistical Package for the Social Sciences
TCA	Turkish Contractors Associations
TUBITAK	Scientific and Technological Research Council of Turkey
UAE	United Arab Emirates
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
WTO	World Trade Organisation

CHAPTER 1

INTRODUCTION

In today's business environment, as many sectors have been, the construction industry has become global. Because of the phenomenal global changes in different areas such as technology and communication, the world has been changing for decades (Abbasi and Baldry, 2004). As a result of the process of change, a term known as ‘‘globalisation’’ where political borders become more insignificant has arisen (Ngowi et al., 2006). With the protocols of the World Trade Organisation (WTO) and General Agreement Tariffs and Trade (GATT), in addition to the advances in transport, technology and communication, the concept of globalisation has spread rapidly throughout the world (Darwish et al., 2012). As a result, in the construction industry, the previously insulated markets can be more accessible for the contractors, so, international contractors have appeared and globalization of the construction industry is increasing rapidly all around the world (Ngowi et al., 2005). According to Confederation of International Contractors' Associations (CICA), as of 2017, hundreds of contractors are doing business in over a hundred countries of the world. This current situation of the construction industry is associated with not only the contractors from advanced industrialized countries but also contractors from developing and underdeveloped countries. In the past, contractors from advanced industrialized countries were generally employed in undeveloped countries. However, along with the recent expansion of globalization, all nations are encouraged to be involved in it (Ahmad, 2001). Therefore, the international construction market is open for the contractors from both developing and developed countries (Abbasi and Baldry, 2004). In today’s construction industry, contractors from many different countries, including

developing countries can perform a project in many countries around the world including advanced industrialized countries. As a result, in the globalizing construction sector, there have been various projects in many different markets. If the developments in the construction industry and the trend of the industry are to be taken into consideration, it can be said that globalization of the construction industry and its expansion will increasingly continue.

Turkish contractors have been active players in the global construction industry. According to Turkish Contractors Associations (TCA, 2017), Turkish contractors have been undertaking projects in abroad for over 45 years. In the period between 1972-2017 October, Turkish contractors have undertaken 9138 projects in 118 countries, with a total value of 349,3 billion USD (TCA, 2017).

In the global construction industry, for the construction companies working abroad, host country conditions have an important role in the performance and management of projects. The construction industry is a project-based industry, has a multi-partied, complex, fragmented nature (Bilgin et al., 2015). In addition, because of the nature of the construction industry, construction projects are extremely influenced by the conditions of the business environment where they are conducted. As all international businesses conducted in foreign markets, the international construction industry is affected from host country conditions as well.

When construction projects are executed abroad, contractors experience the worst and the best cases related to the country (i.e. lessons learned) throughout the life cycle of the project, as in every construction project. In addition, the performance of international construction projects depends on the conditions of the country, as it has been mentioned before. For construction companies, learning and investigating the gained experience (i.e. lessons learned) in each stage of construction projects such as bidding, contracting, construction etc. are significant in order to prevent making the same mistakes, make better decisions, obtain successful project outcomes (Ferrada, et al., 2014; Cheah et al., 2011). In other words, managing the valuable information by

captured lessons learned related with countries becomes a source of competitive advantage for construction companies (Ozorhon, 2004).

In the construction industry, competitiveness of companies significantly depends on knowledge sources and experience. According to Lehner and Maier (2000), information is the most significant prerequisite for decision-making. For today's industries, it can be said that knowledge assets overweigh tangible assets (Caldas et al., 2009; Tserng and Chang, 2008). In the international construction market, learning from gained experiences from previous projects in various markets and managing knowledge effectively are particularly significant for global contractors so that the right strategies can be developed, effective project governance systems can be established. If past project performances are analysed, the problems or conveniences related with country are determined and related lessons are learned, the same mistakes might not be repeated and projects can be executed more efficiently (Akatsuka, 1994; Caldas et al., 2009; Kartam, 1996). In other words, similar problems may not reoccur in similar cases through the selection of the right management strategy of projects. So, learning in an organization and knowledge management that is storing and reusing knowledge of past projects for the both ongoing and forthcoming similar projects and also which is a systematic process of searching, capturing, codifying, storing, retrieving, reusing, distributing and sharing risk event histories have an extremely important role for construction industry (Lin et al., 2006; Ozorhon, 2004). It can be said that managing knowledge and sustainable learning are critical success factors for construction companies.

As a result, lessons learned gained in various countries should be retrieved and reused in order to support the decision making process and to make a right decision, such as project selection, determination of strategies etc. (Yıldız, 2012; Graham and Thomas, 2007). With knowledge management techniques, experiences gained in these markets can be transferred and adapted to forthcoming projects. By this way, companies can make better decisions and perform the project successfully with achievement of desirable outcomes within the expected results.

For reusing gained lessons learned, investigation of post project appraisals can be an effective and proposed way (Akatsuka, 1994; Kartam, 1996). However, in addition to the fact that the construction industry as a being a project-based industry has industry specific barriers to learning; generally accessing the necessary information about countries including the gained lessons learned and reusing this information and experiences for decision making process are difficult for contractors. Furthermore, contractors have difficulty in determining similarities among conditions of countries as well as in accessing correctly to the similar countries where the similar experiences can be gained. Therefore, retrieving and reusing lessons learned from experiences become tedious and troublesome and this valuable knowledge may not be reused effectively (Carrillo et al., 2011; Carrillo et al., 2013; Yıldız, 2012; Tserng and Chang, 2008). Globalization adds another dimension to difficulty of learning and transferring of knowledge in international markets. It results in various participants working in an unfamiliar environment and leads to problems due to cross-national differences. In such an environment, most of the knowledge about the country is lost and contractors may not decide easily which information related with countries should be used; so, gained lessons learned from experiences may not be evaluated and reused in a proper way effectively. As a result, selection of management strategy might be wrong and similar problems may re-occur in similar projects (Tserng and Chang, 2008; Schindler and Eppler, 2003).

In the international construction industry, a successful international organization needs to be able to understand international markets and to improve the ability to make this knowledge available to its members. The flow of knowledge should be established among the members and so, benefits of acquirement of knowledge can be multiplied (Javernick-Will and Levitt, 2010). Thanks to the advances in IT, the barriers and obstacles can be overcome and the success in transferring and sharing of this knowledge can be achieved with the help of a learning culture. Knowledge, the main outcome of learning, should be maintained and be stored in organizational memory and successful retrieving, reusing and sharing of knowledge should be established to enhance and raise its value (Fong, 2005; Javernick-Will and Levitt, 2010; Alashwal

and Abdul-Rahman, 2014; Ozorhon, 2004). Thus, in order to overcome the previously mentioned barriers, effective mechanisms to capture, store and transfer knowledge effectively within the organization are required. Knowledge can be kept and stored in an organizational memory and be used actively for the forthcoming projects in an organization (Akatsuka, 1994; Carrillo, 2005; Chinowsky et al., 2007; Eken et al., 2017). By developing/establishing mechanisms and formalizing methods, knowledge can be managed effectively. Codification of this knowledge through using standard forms and retrieval of the information through different search mechanisms can be a solution and has to be enabled when global construction is taken into consideration.

In this thesis, it is argued that country clusters can be obtained with respect to their similarities and lessons learned within the same cluster can be transferred between projects. It is hypothesised that determination of similar countries specific to construction industry may facilitate management of knowledge. Thus, a method has to be found to identify clusters of similar countries to facilitate learning.

In the literature, many researchers have investigated the similarities among countries and country groupings exist for different areas such as economy, education, health, military etc. In addition, country effects on international industries have been researched for a long time. In a variety of sectors, countries are grouped by using different features of the countries using different methods for various purposes such as entry decision, market research, etc. From the perspective of the construction industry, in the existing literature, there are several resources, which present the results of country groupings, generally used for the country evaluation process. Results of country classification researches conducted by official or private institutions and organizations such as OECD, EIU, UNCTAD, Euromoney etc. are generally based on the country risk, credit ratings, or only a limited criterion such as economic development. These available resources generally group the countries according to the predetermined criteria, which are mentioned before and provide country maps in a yearly, quarterly or monthly periods, which are kept in a special database. However, the majority of these resources are limited in presentation of the similarities among

countries for the construction industry because the construction industry is affected by several conditions of countries including both macro and construction market conditions. The country grouping studies for construction industry should group the countries according to the criteria that are combinations of these conditions.

When the available country groupings using specific variables such as GDP, population, literacy rate are reviewed, it is clearly seen that the results are different from each other and the results of the studies will change as the factors change. Therefore, when a grouping study is to be performed for the construction industry, considering characteristics of the industry in terms of the construction industry-specific variables is required since it is expected that the intended groupings would be different from the groupings would be obtained by existing resources. Similarity would change according to the determined features. Thus, it is obvious that there is a need for country groups specific to the construction industry in order to identify the similar countries with specific approaches considering the construction market in the host country and the nature of the construction industry. Additionally, studies related with preparing a comprehensive form for evaluating country conditions including both the conditions of the country state (at macro level) that have an impact on construction projects and the conditions of construction market (at industry level) that are affected by the country conditions are limited and inadequate for the contractors, according to conducting literature survey. Thus, in this study, first the host country factors that affect project success are identified and then, countries are grouped considering these factors.

Based on these ideas, the objectives of this thesis are;

1. To cluster countries considering the host country conditions that significantly affect the international projects based on the experience of Turkish contractors
2. To demonstrate how clustering may improve learning between various projects

This thesis is structured from the perspective of foreign contractors working in the host country. The perception of similarities of target countries can be different and depends

on the perspectives and capabilities of doing the business of the foreign contractors who execute his/her project in the host country and need to evaluate the countries. The scope of this thesis is limited to medium and large-scale Turkish contractors. Within the scope of this thesis, the countries where Turkish contractors have executed their projects are grouped and similar countries are determined specific to the international construction industry.

For this intent, in the proposed methodology, firstly, country factors affecting construction projects and their effects on construction projects are investigated. 12 country factors are identified through a comprehensive literature review. Following determination of the country factors affecting project performance, a country evaluation form is prepared by using the identified factors in order to obtain country data systematically for the data collection part of the analysis. Then, a questionnaire survey is designed in order to obtain the weights of importance for each section of the evaluation form. After that, interviews with experts and professionals are arranged for revision of the evaluation form. After revision studies of the form, data of 39 countries where Turkish contractors have been mostly working and undertaking projects are collected by using the evaluation form. Related country data are obtained by searching available databases, by interviewing experts in the government agencies and professionals working in the international construction markets and by surveying with the Turkish contractors who are experienced in international construction. Finally, following collection of the data, cluster analysis, which is a method of multivariate analysis and is a technique for use in data mining, is performed to group the countries and determine the similar countries within the construction industry. In this analysis, previously collected country data are used as inputs. Country groups specific to the construction industry are obtained by using the SPSS version 23.0 software for the cluster analysis. As a result of the country groups, similar countries are determined for the construction industry by interpreting the results of cluster analysis. In this thesis, according to results of cluster analysis, countries are grouped into three clusters. For validation of the research, interviews with the experts are organized to obtain their opinions by application of the face validation techniques. In addition to expert

opinions, in order to provide validation of the result of the cluster analysis, statistical methods and indices are used as well.

This thesis constituted a part of a research project, which was carried out at the Construction Management Division in METU and was funded by Scientific and Technological Research Council of Turkey (TUBITAK). The research project was related with project portfolio management in the construction industry, which is a centralized management where all projects and programs of an organization are managed simultaneously in a portfolio (PMI, 2013). A portfolio can consist of several projects, programs and sub-portfolios. Medium and large-scale construction companies execute more than one project at the same time and undertake multiple projects in the international market. The purpose of the research project was developing a portfolio management tool namely COPPMAN-COnstruction Project Portfolio MANagement, for construction companies as a decision support system especially for portfolio selection and management process. Considering the particular characteristic of the construction industry, portfolios are affected by countries and the impacts of countries are important. In a portfolio, it is difficult to determine the similarities of countries because there are many various factors need to be analysed. Finding the similarities among countries and determining similar countries can help contractors in predictions about countries, as well as support decision-making process and facilitate the management of gained knowledge within the portfolio. Therefore, the findings and proposed methodology can be used related with the project portfolio management studies as a future work.

Within the context of this thesis, Chapter 2 presents the current situation of the global construction market specialized for Turkish contractors works and analyses the trend of Turkish contractors in international markets. In this Chapter, country effects in global construction are emphasized. Chapter 3 introduces the learning from projects in international construction, organizational learning and knowledge management. Chapter 4 presents the objectives and methodology of this research. Chapter 5 introduces the country evaluation form. Chapter 6 introduces cluster analysis, which

is performed in this thesis for grouping of countries. Chapter 7 presents the application of cluster analysis. Chapter 8 presents the research findings of this thesis. Chapter 9 illustrates how research findings can be used to facilitate learning from international construction projects. Finally, Chapter 10 concludes the thesis by summarizing the research methodologies and findings as well as presenting research contributions, shortcomings, recommendations and future works.

In addition to the main text, this thesis also includes three appendices. In the first Appendix, the historical data and analysis about Turkish contractors in international construction markets are presented. The second Appendix includes the questionnaire designed for obtaining importance weights of each determined country factor. In the last Appendix, the prepared country evaluation form is presented.

CHAPTER 2

TURKISH CONTRACTORS IN GLOBAL CONSTRUCTION

This Chapter overviews of Turkish construction sector in abroad. First, Turkish contractors' success in the international construction industry is presented. Within this context of this Chapter, project information of Turkish contractors undertaken abroad and the detailed documents obtained from Turkish Contractors Association (2017) and Ministry of Economy (2017) related with contractors works in abroad are presented in Appendix A with the historical background of Turkish contractors. Related with these investigated documents, the importance of learning from projects and knowledge management in global construction considering country effects is emphasised.

2.1 Turkish Contractors Success in International Construction Industry

Construction companies operate their projects in the international markets for several reasons. Some of these reasons are spreading the risk by diversification into new markets and taking advantage of the opportunities in the global market rather than the stagnant domestic market (Gunhan and Arditi, 2005b).

In global construction, business volume is increasing all over the world. According to the Global Construction Handbook (2015), the volume of contracting and technical consultancy in the world has reached 9.7 trillion US Dollars in 2015; it is expected to reach 11.9 trillion US Dollars by the end of 2020. This can be seen in following graph (Figure 2.1).

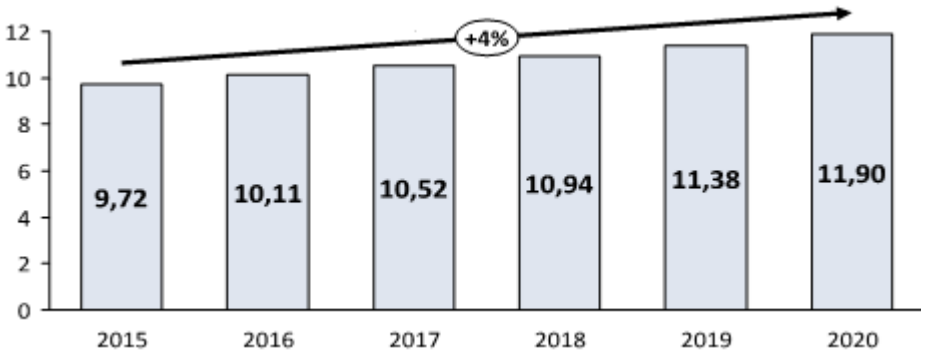

Figure 2-1. Expected increases in global construction
(Global Construction Handbook, 2015)

According to the PWC Global Construction 2030 Report, the global construction industry is expected to increase faster than global GDP and for global construction spending, it is expected to reach 17.5 trillion US Dollars by 2030. Along with the global market growth, the size of international contracting services, which show the activities that companies undertake in foreign countries is expected to increase. It is targeted to rise from the current level (470 billion US Dollars) to 650 billion US Dollars in 2023 and to 750 billion US Dollars in 2030s (TCA, 2017).

As of 2016, the revenue of the Top 250 International Contractors is 468,12 Billion US Dollars. 5.5 % of this total revenue is created by Turkish contractors (ENR, 2017; Ministry of Economy, 2017). From a global perspective, in the light of the obtained data related with the construction contractors in international markets, it can be said that Turkish contractors have successfully executed numerous projects in various geographies of the world. They have gained considerable success in abroad in the international markets in recent years (Ozorhon and Demirkesen, 2014; TCA, 2016).

According to Engineering News Record (ENR, 2017), which publishes and announces the Top 250 International Contractors list according to their annual contracting revenue for projects outside their home countries every year, Turkey has been ranked as the second country with 46 construction companies right after China. Appearance

in this list in the second order with a large number of companies can prove the success of Turkish contractors in international markets (Ozorhon and Demirkesen, 2014).

According to TCA (2017), Turkish Contractors have undertaken 9138 projects in 118 countries on 5 continents with more than 349,3 billion US Dollars project value throughout the period between 1972 and end of October 2017. The detailed data associated with the activities of the Turkish contractors operating in foreign countries during this period, which are provided by TCA and Ministry of Economy, can be found in Appendix A. In the following paragraphs, in the light of the information obtained from mentioned institutions, volume and development of the Turkish Contracting Services Sector are compiled and summarized.

In the Turkish construction sector, the first undertaken project in the international area was in Libya in 1972. Then, the sector has grown by realizing projects in North Africa and Middle East markets. Following the disintegration of the Soviet Union, Turkish contractors have expanded the former Soviet Union countries and the Central Asian markets during the 1990s. Since the beginning of the 2000s, Turkish contractors have begun to execute their projects by expanding in the Balkans, Asia-Pacific and Sub-Saharan African markets. Up until now, they have undertaken their projects in more than 110 countries on 5 continents as it mentioned before. Regional distribution of Turkish contracting services can be found in below Figure 2.2.

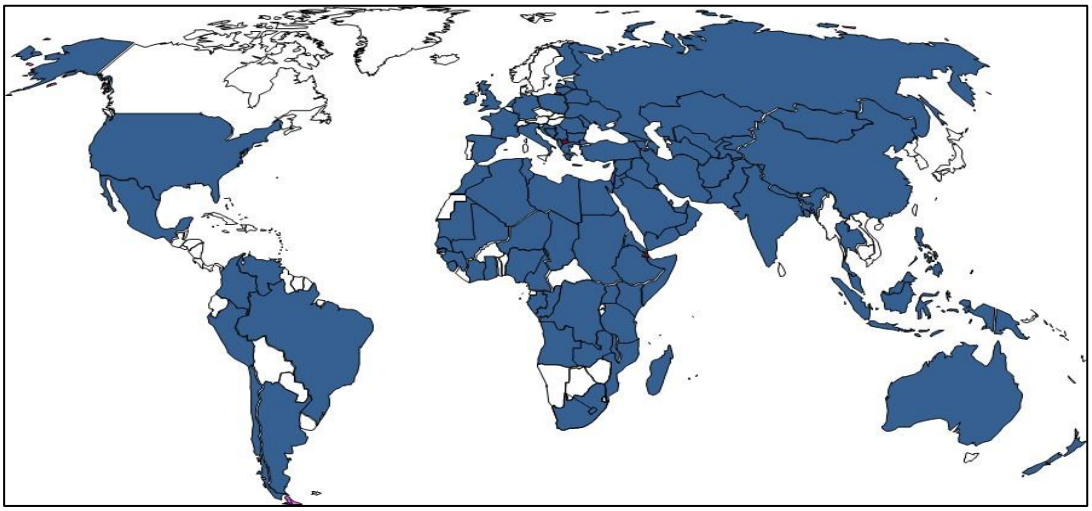

Figure 2-2. Regional distribution of Turkish contracting services
(Ministry of Economy, 2017)

The detailed information about these projects of Turkish contractors undertaken abroad in this period is presented in Appendix A. The provided data related with Turkish contracting services are given in detail (in terms of countries and fields of activities as well as the historical background, on the basis of decades) in this Appendix, as it mentioned before.

Additionally, apart from these attachments, the data related with the projects undertaken in between 2002 and 2017 are investigated to highlight the current development trends of Turkish contractors. According to investigated projects of Turkish contractors executed, they have achieved great success, especially in the last 15 years. Number of projects executed during this period, total project value of these projects and average project values are shown in tabular format for each year in Table 2.1. Furthermore, total project values of these projects are shown in the histogram with their cumulative values in Figure 2.3.

Table 2-1. Project information of Turkish contractors (2002 - 2017/10)
(Ministry of Economy, 2017)

Years	Number of Projects	Total Project Value (USD)	Average Project Value (USD)
2002	207	4.491.234.346	21.696.784
2003	337	6.240.609.988	18.518.131
2004	475	8.630.834.610	18.170.178
2005	452	12.978.472.136	28.713.434
2006	574	22.123.174.535	38.542.116
2007	615	25.006.004.457	40.660.170
2008	655	23.981.590.020	36.613.115
2009	511	20.303.961.971	39.733.781
2010	630	23.348.452.670	37.061.036
2011	561	23.761.556.523	42.355.716
2012	545	30.271.547.939	55.544.125
2013	428	30.067.675.577	70.251.578
2014	343	26.842.593.607	78.258.290
2015	260	23.101.895.899	88.853.446
2016	183	13.065.865.348	71.398.171
2017/10	143	9.743.503.306	68.136.387

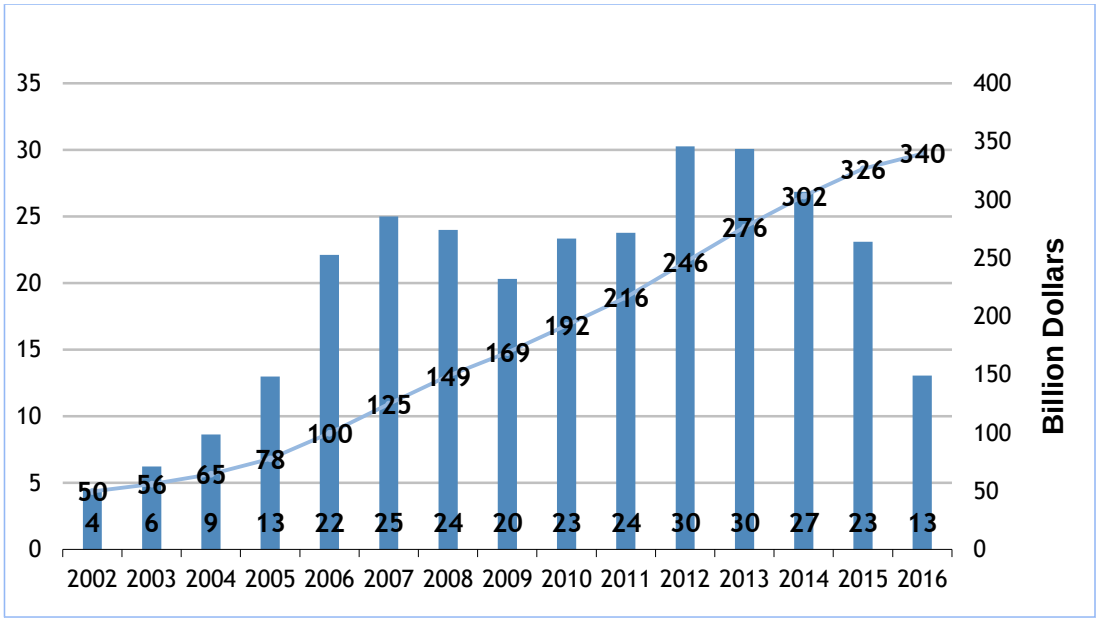

Figure 2-3 . Project information of Turkish contractors (2002 - 2016)
(Ministry of Economy, 2017)

When the related documents presented in Appendix A is investigated and detailed information is examined, it can be obviously said that Turkish contractors are developed both quantitatively and qualitatively. According to Ministry of Economy of Turkey (2017), the volume of construction sector undertaken abroad by Turkish contractors in the period 1972-2002 namely in 30 years is 49.8 billion US Dollars. On the other hand, the volume of construction sector undertaken abroad has approached 300 billion dollars since 2002. The development can be also observed by investigating the total project values and average project values. The increase in average project value is because of increasing the scope of projects undertaken (Ministry of Economy, 2017). Development in Turkish international contracting services can be related with the scope of work of contractors. The scope of realized projects by Turkish contractors in recent years includes airport, highway, metro, road, bridge, tunnel projects, industrial plants, petro-chemical facilities, natural gas-oil refineries, high speed train projects, ports and dams which are larger, technology-intensive projects and high value added projects. On the other hand, it can be said that the proportion of housing projects reduced.

These mentioned qualified projects generally required high technology, expertise and management skills. Turkish contracting companies are active in these types of projects and have a vast experience (Ministry of Economy, 2017). Some of the project examples of executed ones by Turkish contractors are New Doha International Airport, Abu Dhabi International, Sofia Subway, Mesaieed Port in Qatar and Turkmenbashi Marine Project. It can be said that these kind of projects are among the specialization of Turkish contracting sector (Ministry of Economy, 2017). In other words, it indicates that Turkish contractor companies adapted themselves to the global tendency and can execute big scaled and prestigious projects (Ministry of Economy, 2017). Today, Turkish contractors have worldwide experience and technical capacity with turning into internationally recognized powerful brands having a great project portfolio value (TCA, 2017).

Being on the ENR List as a large construction company can be an indicator of success in international construction. In following Table 2.2, a list related with the ENR is presented to emphasize the success and development of Turkish contractors. The numbers of Turkish companies in the list in the period between 2003 and 2017 are shown in the table below.

According to the Engineering News Record, 8 Turkish contracting companies listed in "Top 225 global contractors" in 2003, on the other hand, in 2017, 46 Turkish contracting companies listed in The ENR List (Ministry of Economy, 2017). Furthermore, Turkey has ranked as the second country after China in terms of number of companies for the last 5 years. This increase in the number of Turkish contracting companies in the ENR list can show the rapid growth of Turkish contractors operating abroad.

Table 2-2. Turkish companies in ENR list (Ministry of Economy, 2017)

Top Global Contractors	
Years	**Number of Turkish Contracting Companies**
2003	8
2004	11
2005	14
2006	20
2007	22
2008	23
2009	31
2010	33
2011	31
2012	33
2013	38
2014	42
2015	42
2016	40
2017	46

There are specific characteristics of Turkish contractors that encourage Turkish contractors to achieve these successes in international contracting services. Some of

these characteristics of Turkish contractors can be summarized as follows: (TCA, 2017).

Turkish Contractors have highly experienced workforce, technical capabilities and have achieved the highest quality in their projects. In addition, they are eager to build Joint Ventures with other companies and subcontractors in an international area with their rich experience in diverse markets and project types. It can be also said that Turkish contractors are risk-taker, competitive and dynamic contractors and have cost effective service at international standards as well as their credibility in partnerships. In addition, the labour force of Turkish construction is hardworking and relatively low-cost. Furthermore, they have good business relations with tender authority and contractors as well as knowledge and experience of the various business cultures of the surrounding regions. Thus, considering these strengths of Turkish contractors, it is can be said that they achieve competitive advantage in international area and they are expected to continue. However, global construction market is also competitive. According to Ozorhon and Demirkesen (2014), "*therefore strategies implemented so far may not guarantee success any more. Construction firms needs to better understand their capabilities, weaknesses and changing conditions in the international market and performs their strategic planning accordingly.”*. Thus, in order to maintain their achieved competitive advantage and obtain sustainable development in the construction industry as well as contribute to the increase this development of the Turkish construction industry, knowledge-based, innovative and market driven approaches are required (TCA, 2017).

When the obtained report of information from TCA and Ministry of Economy are reviewed and the countries worked by Turkish contractors were examined, it is observed that the conditions of the countries and various global events related with politics, economics, social conditions etc. affect the contractors' decisions such as market entry and project selection as well as the construction projects. Investigation of the obtained data, which is presented in Appendix A and related with the countries where Turkish contractors have worked, supports this opinion related with the country

effects on Turkish contractors. This mentioned report can be found in Appendix A with detailed information.

For the construction industry, there are many studies presenting that conditions of the country are important and affect the performance of executed construction projects in the international construction area. As it is mentioned before, country conditions and their effects have importance for the success and project performance of international projects in terms of time, cost, quality, client satisfaction, productivity etc. in the global construction market. Construction project performance can vary depending on the previously mentioned country conditions. The effects of the countries are examined in the further Chapter of this thesis in detail.

In global construction environment, while the impact of the countries can be seen obviously it can be said that evaluation of the encountered problems, faced conveniences and gained experiences, namely lessons learned, related with the country are extremely significant for the construction companies. For the construction companies, considering the global construction area, it is important to examine the information and the valuable experiences gained in different countries and to investigate performances in the past projects executed in abroad in order to assess own capabilities, to be aware of their abilities and to improve themselves.

Globalisation is used in connection with changes in the world and global contractors are required to respond to the needs of this global, ever-growing, challenging and competitive industry in order to adapt and survive in this environment and to achieve and maintain competitiveness (Martinez-Rojas et al., 2016). Otherwise, they may have to face some problems (e.g. time overruns, cost overruns) related with time, cost, quality etc. (Martinez-Rojas et al., 2016; Abbasi and Baldry, 2004). To avoid these problems and accomplish targeted goals, learning from the international project and managing the knowledge, experiences acquired in different markets are critical and necessary for construction companies.

The learning of the construction companies together with the ability to reuse and transfer the lessons they have learned can be considered as critical success factors for contractors. Furthermore, in international construction, companies' ability to learn from the projects is a source of competitive advantage in project-based industries. Reusing the lessons learned might facilitate the management of gained knowledge and enable learning in the company. If the lessons learned (worst and best cases) are investigated, past project performances are analysed, the problems and opportunities related with country are determined, the same problems may not be repeated and projects can result more efficiently (Akatsuka, 1994; Caldas et al., 2009; Carrillo, 2005; Graham and Thomas, 2007).

In global construction area, Turkish contractors pursue to increase their competitiveness by using extensive know-how and experience gained in different countries in all kinds of challenging projects and in all forms of business environments (TCA, 2017). Turkish contractors may become more successful when they develop their strategies by learning from the projects, evaluating their experiences and investigating the lessons that are learned. In global construction environment, organizational learning as a strategy can be a solution for the construction companies. By this way, the whole organization can benefit the mentioned outcomes of learning process. In organizational learning, implementation of knowledge management techniques is critical. With implementation of knowledge management techniques effectively, time and cost of project can be diminished and quality of the project can be improved. It can contribute companies gain a competitive advantage among construction companies (Shelbourn et al., 2006). Within the scope of this thesis, the importance of organizational learning and knowledge management concepts are overviewed in the following Chapter.

CHAPTER 3

LEARNING IN INTERNATIONAL CONSTRUCTION

In this Chapter, learning from international projects and knowledge management in construction are mentioned, the importance of knowledge management and organizational learning for construction projects are presented.

3.1 Learning and Knowledge Management in International Construction

In the information age and today's business environment, it is a widely known fact that the value of knowledge and importance of learning are attractive not only for company professionals but also for researchers. The topics related with learning and managing knowledge have been researched for a long time. There has been a wide interest and focus on organizational learning and knowledge management in the construction management literature and researches are being carried out in a wide range of research fields including construction industry (Chinowsky and Carrillo, 2007).

For the international construction industry, it can be said that organization has to be adaptable to changes in demand and to be able to analyse the environment as well as to be flexible enough to respond to changes for obtaining competitive advantage. In the construction industry, it is a widely accepted idea that the companies have to enhance their learning skills and capability in order to maintain competitive advantage, to stay competitive and to achieve sustainable continuous improvement (Malone, 2002; Zou and Lim, 2002; Hong, 1999). In the construction industry, companies can adopt, employ and implement the organizational learning concept as a strategy. Main drivers of organizational learning are stated as the achievement of efficient performance, prevention of knowledge loss due to an aging workforce, the need of

local knowledge due to globalization, need of better solutions to problems, and establishment of continuous growth (Chinowsky et al., 2007).

Construction companies have to conduct knowledge management studies/techniques in order to manage knowledge effectively and achieve learning. By managing knowledge, the companies can acquire, store, share and reuse knowledge for responding and adapting the changes in the business environment such as in customer demands, in labour force, in country conditions or in technology (Bhatt and Zaveri, 2002; Zou and Lim, 2002). As a result, for the international construction industry, such a dynamic and changing environment, it can be said that the necessity for knowledge management and organizational learning is obvious (Kamara et al., 2002; Webb, 1998; Yıldız; 2012; Ozorhon, 2004; Egbu et al., 1999). However; as a being a project-based industry, construction industry encounters industry specific barriers to learning. Globalization adds another dimension to difficulty of learning and transferring of knowledge. It results in various participants working in an unfamiliar environment and leads to problems due to cross-national differences. If organizations together with structures, processes and technologies are not well suited to deal with the increasing environmental complexity and knowledge, they are unlikely to survive (Huber, 1991; Ozorhon, 2004). Therefore, in the global construction market, construction companies have to develop their learning capability for survival and maintaining competitiveness by utilizing global knowledge and implement knowledge management techniques (Hong, 1999).

3.1.1 Organizational Learning

In the literature, there are several descriptions for organizational learning. According to Nonaka (1998), organizational learning can be described as interaction among individual learning, which creates information within an organization (Yıldız, 2012). In addition, organizational learning is explained as an ability of an organization which can capture, share and reuse knowledge in order to adopt changes, improve performance and sustain in a competitive environment (Patel et al., 2000; Carrillo and Chinowsky, 2006; Yıldız, 2012). A similar definition is given by Ozturk et al. (2016),

who define organizational learning as a continuous cycle of knowledge generation and use to meet strategic objectives and requirements of changing environment.

Therefore, in view of these definitions, organizational learning can be explained as the group of actions to create, acquire, share, interpret and transfer knowledge among the members of organization in order to increase the performance of company as well as to improve quality of decision-making in the organization (Ozorhon, 2004).

There are differences between organizational learning and individual learning. Organizational learning is related with shared knowledge and models and it is based on both intellect of members of an organization and based on institutional mechanisms (Stata, 1996).

Organization can be defined as the structure in which the individuals, groups and the organization itself learn (Ozorhon, 2004). Garvin (1993) defined a learning organization as an organization that has skills in creating, acquiring and transferring knowledge and that can be able to change its behaviour to reflect new knowledge and insights. For learning organizations, the importance of learning activity is vital (Marquardt, 1996). According to Marquardt (1996), beside from learning, organizational transformation, namely, organization, people, knowledge and technology are important for the quality and impact of the learning at the organization level (Ozorhon, 2004).

Levels of Learning: Levels of learning can be defined at three levels; individual learning (begins at individual level by intuiting, interpreting and reflection), group/team learning (maturing at group level by integration and conceptualization) and organizational learning (reaching the organizational level by institutionalizing and experimentation (Ozorhon, 2004).

Types of Learning: According to Love et al. (2000), there are three types of organization learning, these are; single-loop learning, double-loop learning, and deutro-learning (Ozorhon, 2004). Single-loop learning is also called as adaptive

learning, on the other hand, double-loop learning, is also called generative learning by Senge (1990). Deutro-learning is about learning about learnings and is a particular form of organizational learning. It is related with the development of creativity in the problem solving process and the development of a capability to learn how to learn and the institutionalization of learning processes.

Organization: As it is mentioned previously, component of an organization such as the vision of the organization, the organizational culture, the structure of the organization, the strategy of the organization and organization's strategic objectives have significance for learning organization (Marquardt, 1996). With the shared vision and culture, organization can generate new strategies and structures in order to become a learning organization (Ozorhon, 2004).

People: The people in the organization are significant for learning organization because individuals can get the information and can transform it into valuable knowledge for both personal and organizational use, in other words, they are kind of agents for learning in organizations (Hong, 1999; Ozorhon, 2004). Learning occurs when knowledge has been gained, created and captured and the knowledge is applied within individual and organizational processes (Liebowitz and Megbolugbe, 2003).

For organizational learning, the existence of a dynamic knowledge management infrastructure within the organization is important in order to identify, acquire, search, retrieve, analyse, manage, maintain and disseminate knowledge to members within the organization and also to others externally (Liebowitz et al., 1999).

In the following sections, the subjects related with knowledge and knowledge management system, which supports organizational learning and organizational effectiveness, are examined. Following this part, importance and effects of technology on learning and knowledge management is mentioned.

3.1.2 Knowledge Management Concept

In the following paragraphs, the knowledge management concept is explained. Before the explanation of knowledge management concept, indicating the differences among the concepts/descriptions of data, information and knowledge is necessary.

Data is related with raw numbers or assertions, facts or simple observations and is not directly meaningful. On the other hand, information is related with the meaningful context and relevance, organized facts, data with semantics for describing a particular situation or conditions (Becerra-Fernandez and Leidner, 2004). Information can emerge by placing data within a meaningful context (Zack, 1999). When information is given meaning through interpretation, is accumulated and combined with experience, communication or inference; it becomes knowledge (Ozorhon, 2004). Knowledge is related with experience, expert insight, perspectives, concepts, judgments, methodologies and know-how (Egbu and Botterill, 2002; Davenport and Prusak, 1998). The differences among data, information and knowledge can be seen in following Figure 3.1.

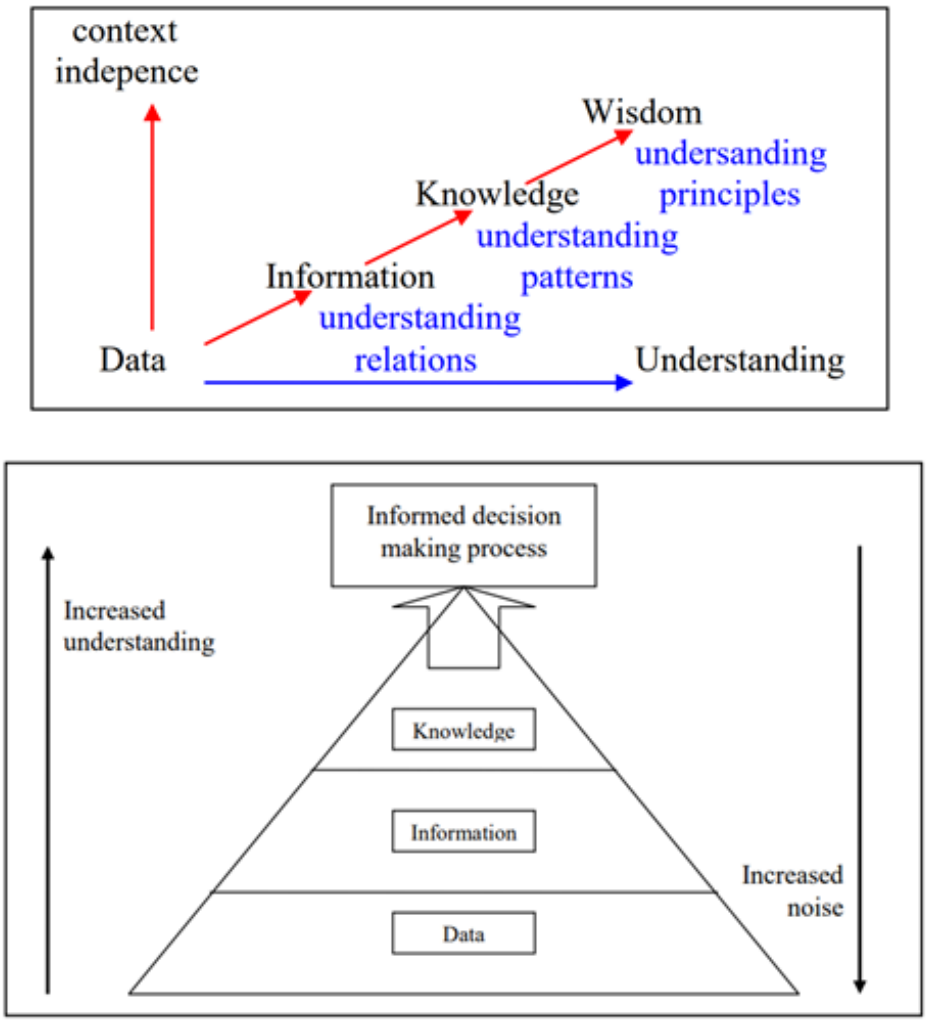

Figure 3-1. Differences among data, information and knowledge (Udeaja et al., 2008; Sheehan et al., 2005)

In the existing literature, there are the different descriptions of knowledge by various authors. In this study, the adopted description of knowledge is as follows; knowledge is a high-form of information, is the kind of outcome of learning and it includes truths, values, beliefs, expectations, judgments, perspectives and also know-how, experiences and methodologies of an individual (Orange et al., 2000; Davenport and Prusak, 1998).

3.1.2.1 Types of Knowledge

In the existing literature, it can be said that there have been several studies about the types of the knowledge. When the number of publications related with knowledge management is examined, it is seen that knowledge is divided into two types as explicit knowledge (i.e. formal or hard) and tacit knowledge (i.e. informal or soft).

Explicit knowledge, which can be found in forms of documents, specifications, manuals or instructions, is easily codified, physically stored and shared part of knowledge. On the other hand, tacit knowledge, which is intuitive knowledge and expertise obtained by the lessons learned and know-how experience constitutes the knowledge held by individuals and it is difficult to identify, articulate, codify and share (Chinowsky and Carrillo, 2007; Kıvrak et al., 2008; Yıldız, 2012).

For the construction industry, standard operating procedures or meeting minutes can be a source of explicit knowledge. Additionally, project information, design drawings and specification or risk analysis results can be a type of explicit knowledge (Patel et al., 2000). However, tacit knowledge is subconsciously understood and includes competencies, values or individual beliefs etc. and it can be gained through communication, techniques, experiences and lessons learned, etc. (Carrillo and Chinowsky, 2006; Ozorhon et al., 2005; Patel et al., 2000).

When the cycle of knowledge within an organization is considered, it can be said that the documentation and articulating of explicit knowledge is easier than the tacit knowledge (Patel et al., 2000). In addition, sharing and transferring of tacit knowledge is more difficult than sharing and transferring of explicit knowledge.

Therefore, it can be said that management of tacit knowledge constitutes the tedious, but valuable part of the knowledge management (Easterby-Smith and Lyles, 2011). Mechanisms to manage the knowledge through forming systems to change the tacit knowledge into explicit knowledge available to the whole organization are necessary (Chinowsky and Carrillo, 2007). In other words, it should be transferred into explicit

knowledge for knowledge management (Ozorhon et al., 2005). It can be said that transformation of implicit knowledge to explicit represents the connection between personal and organizational learning (Tidd and Bessant, 2013).

3.1.2.2 Phases of Knowledge Management

In general, a knowledge management system consists of phases of identifying, acquiring, maintaining, searching, retrieving and distributing knowledge (Lehner and Maier, 2000). According to Lin and Tserng (2003), knowledge management consists of five phases, which are knowledge acquisition, knowledge extraction, knowledge storage, knowledge sharing, and knowledge update. According to Kasvi et al. (2003), knowledge management includes the steps of creation of knowledge, of administration of knowledge, of dissemination of knowledge and of utilization of knowledge. In this thesis, the phases of knowledge management are accepted as five parts: acquisition of knowledge (i.e. collection, creation), codification of knowledge, storage of knowledge, retrieval and reuse of knowledge, and transfer of knowledge (i.e. dissemination, share, distribution).

In the step of acquisition of knowledge, information is collected from both internal and external sources for utilizing in further steps of knowledge management (Hong, 1999). According to Ozorhon et al. (2005), knowledge can be gathered from company's own experiences, experiences of other companies' in industry and the external resources such as external archives, government agencies, advertising agencies, societies, accounting offices, news agencies and the media. Following the capturing, in the step of codification of knowledge, knowledge is codified and documented in order to store, share, reuse and transfer. In order to codify knowledge so as to be meaningful within an organization, identification of meaningful context of knowledge, contextual categories and relationships are necessary. After that, in the step of storage of knowledge, the gathered and codified knowledge is stored. It can be kept and administrated into an organizational memory, which is explained in further sections in detail. In the step of retrieval and reuse of knowledge, accessibility of knowledge in order to reuse the knowledge in other projects by organization members who need to

retrieve any necessary knowledge is essential. In the step of transfer of knowledge, captured knowledge from previous project cases is shared and is disseminated among organization members in order to promote learning to produce and create new knowledge (Ozorhon, 2004). For the organization, which can share and can transfer knowledge both inside and outside of the organization, implementation of knowledge management concept and organizational learning is easier.

In addition, organizations should have a corporate memory to facilitate organizational learning and knowledge management. Organizational memory is essential for being an effective organization. Organizational memory is a corporate asset of an organization, which is capable of storing captured knowledge from the previous experiences and retrieving them for reusing purposes (Huber, 1991; Yıldız, 2012; Ozorhon, 2004). Additionally, it can be said that organizational memory is required to decrease the excessive time involvement in knowledge retrieval process. Knowledge can be kept and stored in an organizational memory and be used actively for the forthcoming projects in an organization (Akatsuka, 1994; Carrillo, 2005; Chinowsky et al., 2007; Ozorhon, 2004). Organizational memory can be considered as a corporate asset where the project history is stored and maintained (i.e. knowledge from the past) for usage in both present and future at the company level rather than individual level (Stein and Zwass, 1995; Ozorhon, 2004; Conklin, 2001; Yıldız, 2012).

Beside from organizational memory, utilization of technology facilitates the storing and retrieving knowledge and promotes organizational learning (Kıvrak et al., 2008; Egbu and Botterill, 2002). With the help of the technology, accessing the experiences (i.e. lessons learned) and utilizing them in forthcoming projects are assisted in organization. The necessity of technology for organizational learning is emphasized by various authors. According to Broendsted and Elkjaer (2001), technology is an important environment, which is utilized for the accumulation of a corporate memory. For example, forming information systems is beneficial for a construction of corporate memories and information technology tools can support learning in the organizations. Decision support systems can enable and enhance learning in the organizations (Robey

et al., 2000). In addition, according to Lehner and Maier (2000), establishing an information infrastructure is required in order to support and integrate organizational learning systematically. This information infrastructure can be named as Organizational Memory Information Systems (OMIS) (Ozorhon, 2004).

3.2 Importance of Knowledge Management and Organizational Learning in Construction Industry

In the construction industry, as a project-based industry, the output is a project, so, the companies learn from the activities associated with project when they produce the project. In other words, for construction companies, the project-related activities in their projects are the most important source of learning. In the literature, it is accepted that knowledge is the main outcome of learning and learning is related with the experiences. In construction projects, contractors gain experiences from each project executed throughout a project lifecycle. In addition, to own experiences, according to Ozorhon et al., (2005), construction companies can also learn from other companies' experiences and external resources. In following, the importance of the lessons that are learned for knowledge management system and organizational learning is presented.

Lessons learned which are defined as knowledge gained by experience (a positive or negative action) constitutes a crucial part and has a critical role for knowledge management system and organizational learning (Caldas et al., 2009; Graham and Thomas, 2007; Eken et al., 2017). When construction projects executed in abroad, gained lessons learned related with country become significant and valuable for international contractors as it is previously mentioned. In construction companies, increased profits and cost savings, increased application of best practices, reduced rework can be observed through utilization of lessons learned (Caldas et al., 2009). It can be said that capturing and reusing lessons learned can be considered as a strategy for utilization and transferring knowledge within an organization in the construction industry, which has multi-partied, environmentally dependent, fragmented, discontinuous and complex nature.

In a construction company, if the gained experiences from completed projects are not transferred and are not reused among other projects of company, even if the problems encountered have been solved in a project, the gained experiences would stay in this project and the company can not utilize and not benefit from these solutions as an opportunity. Furthermore, the same problem in a project may reoccur in similar ones. If contractors faced same problems in a similar project, this situation would lead re-learning with the expensive losses in terms of time, cost, labour, quality and safety (Sepehri, 2015; Graham and Thomas, 2007; Carrillo, 2005; Kartam, 1996; Eken et al., 2015). In other words, if the knowledge can not be transferred easily, it generally got lost and the loss would be costly (Kartam, 1996; Eken et al., 2017). As a result, in construction industry, knowledge is costly earned and lessons learned should be captured and these lessons learned should be evaluated, reviewed, shared and reused to eliminate reoccurrence of same mistakes and to prevent the relearning process for recognizing and remedying mistakes by taking preventive actions (Yates, 1993; Kartam, 1996). By this way, the effectiveness of companies' organization and efficiency of their operations can increase. In other words, for construction industry, it can be said that learning from experiences and acquiring, storing, sharing and utilizing knowledge by using knowledge management techniques have become more important.

Practising the knowledge management techniques become compulsory for construction companies. However, reusing and sharing knowledge within the organization become difficult because of the characteristics of construction industry such as comprising huge, voluminous and complex project data despite of their significance for performance of construction projects (Tserng et al., 2009; Eken et al., 2015). In the literature, utilization of lessons learned, learning ability of companies, knowledge management and their importance and difficulties have been studied by many researchers (Webb, 1998; Zou and Lim 2002; Shelbourn et al. 2006; Kıvrak et al., 2008; Kamara, et al. 2002; Ozorhon, 2004; Yıldız, 2012; Tserng et al., 2009).

For the construction industry, knowledge management is a systematic process in which gained experience from past projects is stored for the purpose of using forthcoming

similar projects in order to assist decision-makers (Lin et al., 2006; Tserng et al., 2009). In the literature, it is a commonly used phrase that knowledge management can prevent "re-invention of the wheel and help learning". For construction industry, with the help of learning and knowledge management, projects can be performed with better decision making and better teamwork, improved project performance by minimizing mistakes, increased flexibility and enhanced quality within an organizational growth. By effective use of knowledge management techniques, project time and cost can be diminished and quality can be improved (Shelbourn et al., 2006). In construction company, learning and knowledge management lay the foundation for effective communication and sharing of knowledge in company and the foundation for efficiently coordinated actions and strategies to achieve goals and to remain competitive (Zack, 1999). Through a successful culture of organizational learning and innovation, construction companies improve themselves continuously and increase their adaptability to the changing conditions by improved performance, long-term effectiveness and survival (Kululanga et al., 2001). Effectiveness of management of projects can be enhanced through learning from past performance and records (Cooper et al., 2002). By this way, it can be contributed to obtaining competitive advantage among construction companies (Shelbourn et al., 2006).

With the light of the reviewed literature, the importance of gained lessons learned and knowledge management for construction projects can be seen obviously. Although there is a consensus that learning and knowledge management have a crucial role for companies that are operating in the international market and in a project-based industry like construction, knowledge management techniques as a part of project management practices can not be implemented effectively.

Managing and handling knowledge is difficult in construction industry due to the industry's characteristics of being knowledge intensive, highly reliance on heuristics, having unstable nature with tight schedules and limited budgets, involving the integration of different components by a range of participants (e.g. clients, subcontractors, suppliers etc.) who come together for a temporary cooperation

(Barlow, 2000; Ozorhon, 2004). In addition, as a project-based nature, construction industry is considered as short-term and task-oriented, thus, culture for continuous learning in the industry is hardly available. Beside from these, globalization in the construction industry, increasing competition and demands, the necessity of new technologies and the requirement of the skilled workforce have significant impact on the implementation knowledge management. As a result, knowledge in construction industry can get lost easily. According to Woo et al. (2004), construction companies are poor in especially retrieval, transfer and share of knowledge rather than the storage of knowledge. In addition, for most construction companies, according to Ozorhon et al. (2005), share and transfer of knowledge steps are the most important; however, they are not facilitated effectively. Therefore, it is necessary to facilitate the retrieval, transfer and reuse parts in order to apply the knowledge management effectively and utilize the benefits, in this way, use and benefits will increase.

In the following sections, the problems related with learning and knowledge management in construction industry are mentioned. At the end of this Chapter, the proposed methodology for facilitating learning is briefly introduced.

3.3 Problems Related with Learning and Knowledge Management in Construction Industry

It is obvious that it is necessary to facilitate knowledge management for construction industry. In addition, in the construction industry it is known that the impact of countries, collection of know-how and experience of construction practitioners and country related lessons learned gained by construction practitioners' throughout a project lifecycle are important. Companies must be aware of the information about the countries. According to an evaluation of the conditions of host countries, management strategy of companies can be suitably determined. In international construction, evaluating themselves and awareness of their abilities and deficiencies are important for a company in order to make decision making and to develop the right strategy accordingly. However, it seems that there are problems in accessing the necessary information related with the countries and contractors are suffering from the utilization

of experiences from the countries and the evaluation of the lesson learned due to previously mentioned problems (Ozorhon, 2004).

For the construction projects, selection of the suitable lessons learned related with country for evaluation of the completed projects is crucial for management of knowledge (especially for retrieval and reuse) as well as the management of the "potential" or "to be started" projects. In addition, assessment of performance of the completed projects in specific countries, evaluation of lessons learned and experiences gained in these completed projects is beneficial for decision makers in companies, in case the company consciously learns from them.

During assessment of conditions for success of project, companies should effectively investigate their performance in the completed projects by accessing the necessary information easily. For construction industry, learning is important from not only the worst case but also the best case in projects. Furthermore, in international construction, companies should evaluate the countries as well as itself by using reviews of both successes and failures. For effectively managing knowledge, easily and practically accessing the related knowledge is critical. In order to access the knowledge to be evaluated, the decision maker who wants to have an idea about the past performances of the company in a specific country should search the all related and useful information. In addition, the flow of knowledge among other company members is provided (Nissen, 2007). For this process, the related information should be determined and needs to be made easily reachable.

When it is desired to conduct an analysis of the countries, it is important to decide that which country is more suitable to be evaluated and how to be assessed. However, although time is very important in the construction industry, decision for the selection of useful cases from numerous cases is time-consuming. Examining all cases in company for investigation is difficult and tedious especially for medium and large-scale companies. Therefore, a mechanism that would facilitate this process may be helpful for construction companies.

3.3.1 Importance of Identification of Similar Countries for Learning in Construction

In order to facilitate decision process, accessibility of necessary information is to be increased and the gained useful lessons learned related with the country needs to be made more accessible. By this way, searching and selection process of necessary information as well as managing gained knowledge can be enabled. In other words, in the global industry, contractors can select to be investigated lessons learned by focusing similarities among countries and by searching for similar countries. For this purpose, in this point, identification of similar countries can be a solution.

According to Oxford Dictionaries (2013), similarity is *"the state or fact of being similar"* while similar is described as "*having a resemblance in appearance, character, or quantity, without being identical*". If the countries with similar conditions in terms of construction industry are identified according to predetermined criteria, retrieving and reusing necessary information may be easier. In the following section, importance of identified similarities among countries is mentioned.

In global construction, (e.g. the case where the company decides to expand or make entry decision in target countries or the stage before conducting business in a foreign market) learning from projects is critical. Using the previous project experiences and past event histories gained by construction practitioners for the case whose situations are similar to the case where the previous project experiences are gained is particularly important. In this case, investigation of the similar lessons learned is essential for construction companies because these can reflect the similar conditions, which are desired to evaluate. The evaluation of projects in a country whose conditions are identified gives an idea of the potential projects to be undertaken in a similar country in the future.

In construction industry, although construction projects are unique and different from each other in terms of context, client requirements, etc., they have been executed in a similar process, structure of teams, processes, tools, etc. (Kamara et al., 2003). In

general, construction projects are executed according to the rules to achieve the goals that are followed during the whole life cycle of the projects. Additionally, even the projects are unique, contractors perform some repetitive and similar actions that require technical know-how and experiences are gained when these actions are performed (Carrillo, 2005). Similar problems and opportunities may be observed in projects under similar conditions. Therefore, it can be said that when the situations of the countries are similar, the gained experiences would be similar to the projects that are executed in similar countries.

As it is mentioned before, investigation of the countries is critical for successful progress of construction project. The identification of countries similar to their target country makes the investigation of the lessons learned easier and support decision-making process. Especially, considering the impact of the countries on construction industry, it can be said that evaluation of projects carried out under similar country conditions will affect the success of the forthcoming projects.

Country groups can be determined in order to establish a link between the projects held in the countries which belong the same country group and to enable the utilization of knowledge gained in one project in another. When similar countries are identified according to obtained country groups, company can evaluate itself, investigate the experiences gained in these similar countries and direct the future work as long as the repetitive actions are met. Investigation of which achievements/problems are experienced in which projects and how they were affected by the country conditions is also facilitated. With the help of identification of the similar countries, accessing the necessary related information can be enabled and countries can be evaluated easily in detail. Contractors can easily benefit from previous experiences and their knowledge through their evaluation of target country in terms of risks, opportunity etc., company can make an evaluation, forecasting, decision and assessment of country-specific information, country conditions and status of the country conditions effectively by increasing accessibility of the necessary information. Thus, identification of

similarities among countries becomes more significant and determination of country similarities needs to be determined.

Using a mechanism to determine similar country groups, including collection of country information and storage of collected information in a memory by codification through the use of a manageable format of the captured knowledge, similar countries by using the collected data can be identified. These may assist decision makers in order to make successful strategic planning, determine the strategy for management to obtain targeted project performance with desirable output in the forthcoming projects. It is beneficial for increasing accessibility of country related information and so learning and knowledge management can be facilitated. This mechanism assists contractors in selection of evaluated countries and enables contractors to capture knowledge about target country easily. Contractors can benefit from these during decision-making process.

If global contractors have country groups, when they need to investigate previous international projects in order to understand how country related factors affected the project success or lead to failure, they may easily perform this investigation process by focusing on similar countries. When they make a decision related with a specific country, they may investigate the most similar countries in addition to this specific country, rather than looking at all the countries. Experiences may be filtered for the countries in the same group. As a result, the projects executed in these countries may be investigated to learn about previous experiences.

The major idea behind this thesis is to propose a methodology for facilitating learning from projects by identification of similar countries. For this purpose, cluster analysis, which is a useful method to find meaningful groups from a number of elements and is a technique for assessment of similarities to obtain groups effectively is performed details of which will be given in the forthcoming Chapter.

CHAPTER 4

RESEARCH OBJECTIVES AND METHODOLOGY

As it is mentioned before, the objective of this thesis is to group countries specific to construction industry for determining similar countries to enable learning process by using the method, which can contribute to learning process of construction companies. The main objectives of this thesis and the methodology used for these purposes are presented in this Chapter.

4.1 Research Objectives

Through the conducted literature survey within this research, it is observed that there is a lack of studies in the construction management literature associated with country groups specific to construction industry, which are used for enabling contractors to determine what they learned from which markets easily. It can be said that there is no adequate method for grouping projects specific to construction industry for this purpose. If there is a mechanism that can obtain country groups specific to construction industry, it is beneficial for contractors and for facilitation of learning process. Thus, it can be said that contractors are in need of a construction industry specific mechanism to enable learning easily.

To respond to this need, within the context of this thesis, it is aimed to propose a methodology for contractors in which countries are systematically assessed and the gained knowledge about countries and related lessons learned from projects are effectively transferred and managed. The objectives of this research are;

- Preparing a country evaluation form including the factors affecting international construction projects,
- Clustering of countries specific to construction industry in order to identify similar countries by using the conditions of countries affecting projects and so facilitating the retrieving and reusing processes of gained lessons learned from projects thanks to the identified country groups,
- Illustrating how research findings can be used to facilitate learning from international construction projects.

4.2 Research Methodology

This section introduces the research methodology used for grouping countries in order to facilitate learning in construction companies as given in Figure 4.1.

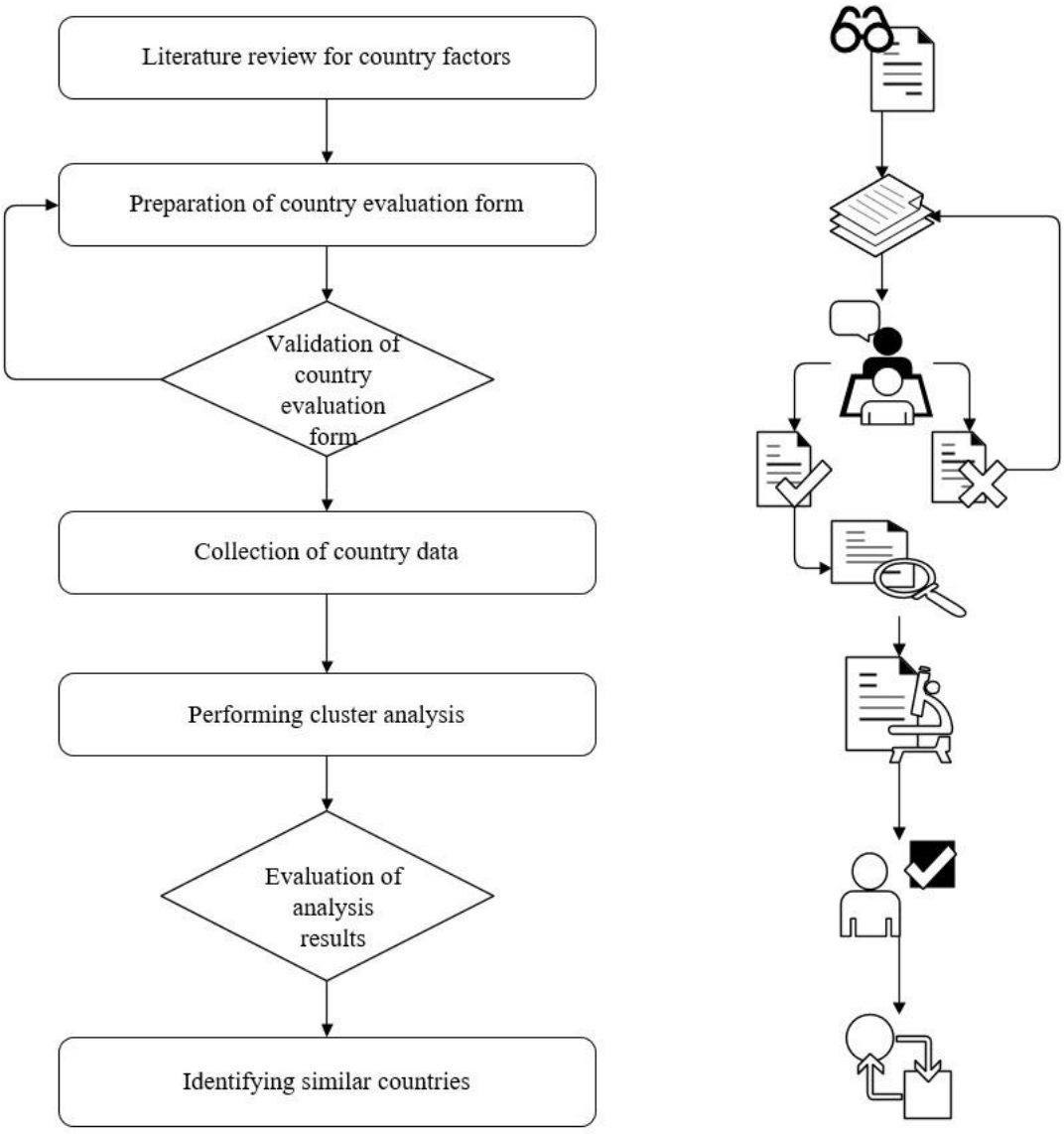

Figure 4-1. Research methodology

At the first step, country factors affecting the construction project performance and their impacts on construction projects are investigated by a literature survey. As a result of this review, 12 main country factors related with international construction are determined. Following determination of the country factors, a country evaluation form is prepared. The form is utilized for obtaining country data systematically to be used in the cluster analysis. The obtained data is considered as inputs of the cluster analysis in order to cluster the countries. After preparation of the country evaluation

form, interviews with experts and professionals are arranged for revision of the evaluation form. Following the revision of country evaluation form, country information is collected by using this revised form. The necessary country data are collected through arranged interviews, designed surveys and reviews on available databases on the internet and information sources. The country data consists of both subjective and objective data. The arranged interviews and designed surveys are performed in order to collect major of the subjective data, which are related with the country conditions that can change according to perspectives of Turkish contractors. Following the collection of the related data, at the final step of the methodology, cluster analysis is performed by using SPSS version 23.0 in order to group these countries and to identify similar countries.

This study covers the case of Turkish contractors working abroad. Therefore, clustered countries are limited with the countries where Turkish contractors have been mostly working and undertaking their projects in recent years. According to results of the cluster analysis, country groups and similar countries are determined. For validation of this thesis, interviews with the experts are arranged in order to obtain their opinions. In addition, statistical methods and indices are used in order to provide validation of the results. According to the expert opinions and results of the validation studies, the research is validated.

As it is mentioned, the first step of the methodology is related with the country evaluation form. Thus, country evaluation form is introduced in the following Chapter in detail.

CHAPTER 5

COUNTRY EVALUATION FORM

In this Chapter, identified country factors and country evaluation form are presented.

5.1 Preparation of Country Evaluation Form

Country evaluation form is mainly used to enable collection of necessary country information for cluster analysis and to facilitate collecting, storing, transferring and reusing them. By utilizing this form, the conditions related with conducting business in international markets can be examined and professionals can be aware of conveniences or problems faced during executed construction projects in host countries.

In this thesis, evaluation form is prepared as a standard form for collecting country information while the country is being assessed by the organization members such as decision makers. When the collected data are kept, in case subsequent evaluation for a different time period is performed, if there is any change in the situation of the countries, the necessary updates can be made through these standard forms. If collection of the information is to be repeated in different time periods, in case the information is collected by using the same standard form, evaluation process is also facilitated because of using the same form. This can promote its usage.

The country data collected through the form can be utilized as inputs in codified format for cluster analysis. Codification of the country information is one of the strategies for managing knowledge, which is based on codifying the knowledge, documenting and storing it in memories where it can be accessible and reachable (Hansen et al., 1999). In addition, the collection of information is important so that the information can be kept, be managed and be reused regularly. For managing knowledge effectively and

collecting information systematically, the prepared form as a standard is beneficial. In following sections, the preparation of the form is presented in detail.

5.1.1 Literature Review on Country Factors Affecting Construction Projects

Operating and executing construction projects in foreign countries are generally considered more risky than domestic construction. International construction projects can be more vulnerable because of internationalization of construction industry (Javernick-Will and Levitt, 2010). In addition to the characteristics of construction projects that emerge from industry's nature, there are also many country-based challenges for contractors while working with multinational project teams and with involvement of various participants in global construction.

When doing business in abroad, project performance may not depend on applied methods or used equipment completely. Country-specific and region-specific conditions such as cultural issues, legal systems, conditions of local construction market are extremely important as well. Both macro conditions (e.g. financial, political, legal etc.) and conditions specific to construction industry of the host country have an impact on the success and performance of the international construction projects.

As it is mentioned before, construction projects are affected from the conditions of the environment where they are being executed throughout their lifecycles. When foreign contractors undertake construction projects and manage global projects in international construction, they are faced with many difficulties or conveniences related with countries. Construction project performance in terms of time, cost, quality, client satisfaction, productivity etc. is highly dependent on the conditions of the host country. Working in a challenging environment where they can work harder or working in a favourable environment where they can work easier affects the project performances positively or negatively**.**

Country conditions affect various industries in many international markets. Almost all international business environment highly depend on the host country conditions.

Therefore, evaluation of countries has been common issue in many industries for various reasons for a long time, in addition to construction engineering and management domain. In the literature, country status and conditions have been investigated by various researchers and institutions such as OECD, World Bank, IMF etc.

In this thesis, before the determination of the country factors, publications related with the importance of country conditions for construction projects are investigated. For this purpose, a literature survey is conducted. There are various research papers in reputable journals and numerous academic studies related with the country conditions. Researchers have examined the country factors and impacts on construction industry in a major number of studies. In most of these studies, the effects and importance of the country conditions on project performance have been emphasized up until now. In this thesis, reviews on selected papers as sample studies among these reviewed publications are presented in order to highlight importance of country factors and effects in the following paragraphs.

Assaf and Al-Hejji (2006) determined 73 causes of delay factors including country related factors and relative importance of these factors related with the construction projects in Saudi Arabia. Azhar et al. (2008) determined major cost overrun factors including country related factors in the construction industry of Pakistan. Chan and Kumaraswamy (1996) investigated 83 causes of time overruns and importance of these factors in construction projects operated in Hong Kong. According to their study, delay factors include country related factors. Chua et al. (2003) researched related with important obstacles in East Asian cross-border stem from different aspects, which are business environment risk, regulatory restrictions, contractual arrangements and differences in standards and in culture. According to Chua et al. (2003), contractors could be faced with these obstacles while working in East Asian countries and these can be causes of cost growth. They investigated these obstacles and their impact especially on cost growth in tendering, construction, and overheads in international markets. Enshassi et al. (2009) determined both time overrun and cost overrun factors

including country related factors in construction projects in Gaza Strip. Gunhan and Arditi (2005a) examined the factors related with the construction company's decision to expand into international markets in international business. They determined most significant factors of company strengths and threats and opportunities. Gunhan and Arditi (2005b) researched associated with entry modes and the construction companies' decision relative to expanding their business into international markets and a particular country. Han and Diekmann (2001) proposed risk based methodology for go/no-go decision for international construction. Their model contains 32 variables including five main variables. "Country conditions" is one of them and it includes cultural and legal, political, economic, geography and climate, and environmental conditions. Their study shows the importance of impacts and the country risks have on construction projects' outcomes. Hastak and Shaked (2000) proposed a model named as International Construction Risk Assessment Model (ICRAM-1) that includes the macro level risk namely country environment for evaluating the potential risk involved in expanding operations in an international market. Their model presents the potential risk indicators at the macro levels in a foreign country as well. Kaming et al. (1997) investigated causative factors of time and cost overruns related with the high-rise construction projects in Indonesia. Their study includes country related factors as well. Ling and Hoang (2010) determined country risks namely political, economic and legal, faced by foreign companies in Vietnam. Ozorhon et al. (2007) researched the joint venture performance of international construction projects. They examined the effects of host country conditions and project related factors on performance.

Following this review on the studies related with country effects and importance, the country factors affecting the construction project to be utilized in the country evaluation form is identified in the below section.

5.1.2 Country Factors Affecting Project Success

According to findings of the conducting extensive literature review, country factors affecting international construction project performance are determined. These factors include both macro conditions of countries and market specific conditions. These

determined country factors can be used to group countries, to determine similar countries and to use in similarity studies for facilitating learning. Following the determination, these determined factors are combined, synthesized and categorized under 12 main country factors for using in the form. These 12 main factors are: “general financial conditions of the country”, “general economic conditions of the country”, “general political conditions of the country”, “the general social conditions of the country”, “legal conditions of the country”, “the development level of the construction industry and working culture”, “the construction related regulations and requirements to be applied”, “the requirements/difficulties/constraints issued specific to foreign construction companies”, “the level of bureaucracy”, “the quality and availability of local resources”, “potential problems or conveniences to foreign companies due to the religious, linguistic and cultural structure of the country”, “potential problems or conveniences to construction companies due to the geographical, physical, climatic conditions of the country”.

A total of 83 subfactors are identified under 12 main factors. The main country factors to be used in the form are demonstrated in the following Table 5.1., with their corresponding references as sources. Reviewed relevant references are listed in alphabetical order of initial author's surname.

Table 5-1. Country factors

Country factors	References
General financial conditions of the country (e.g. Value of national currency against specific key currency, availability of project financing for construction projects financed by government, foreign exchange regime, level of difficulty in money transfer etc.)	(Ahmad and Kitchen, 2008; Akçamete, 2006; Azhar et al., 2008; Birgonul and Dikmen, 2001; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Gudienė et al., 2013; Günhan and Arditi, 2005a; Günhan and Arditi, 2005b; Hastak and Shaked, 2000; Isa et al., 2014; Iyer and Jha, 2005; Ozcan, 2008; Ozorhon et al., 2006; Renuka et al., 2014; Rezakhani, 2012; Xenidis and Angelides, 2005; Yong and Mustaffa, 2013; Zhi, 1995)

Table 5-1. Country factors (Continued)

General economic conditions of the country (e.g. Gross domestic product per capita, distribution of income, current account balance, balance of payments, level and trend of economic growth rate, level of interest rate and fluctuations, level of inflation and fluctuations, unemployment rate, level of economic development and justice of taxation system, level of local tax rates and requirements etc.)	(Ahmad and Kitchen, 2008; Akçamete, 2006; Azhar et al., 2008; Birgonul and Dikmen, 2001; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Gudienė et al., 2013; Günhan and Arditi, 2005a; Günhan and Arditi, 2005b; Hastak and Shaked, 2000; Isa et al., 2014; Iyer and Jha, 2005; Kaming et al., 1997; Ling and Hoang, 2010; Ozcan, 2008; Ozorhon et al., 2006; Renuka et al., 2014; Rezakhani, 2012; Xenidis and Angelides, 2005; Yong and Mustaffa, 2013; Zhi, 1995)
General political conditions of the country (e.g. Level of stability of government and political condition, the status of international relations including neighbouring countries, the impact of the government on business, state of war , existence of terrorism, level of vulnerability of contractors to political risk etc.)	(Ahmad and Kitchen, 2008; Assaf and Al-Hejji, 2006; Akçamete, 2006; Birgonul and Dikmen, 2001; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; ; Gudienė et al., 2013; Gunhan and Arditi, 2005a; Günhan and Arditi, 2005b; Hastak and Shaked, 2000; Isa et al., 2014; Iyer and Jha, 2005; Ling and Hoang, 2010; Ozcan, 2008; Ozorhon et al., 2006; Renuka et al., 2014; Rezakhani, 2012; Xenidis and Angelides, 2005; Yong and Mustaffa, 2013; Zhi, 1995)
General social conditions of the country (e.g. Existence of internal conflicts and social unrest , occurrence of civil wars, level of class differences/ distinction among the local people, fractionalization by language, ethic and regional groups, level of crime rate, existence of nationwide strike, education level of the local people etc.)	(Akçamete, 2006; Assaf and Al-Hejji, 2006; Birgonul and Dikmen, 2001; Bu Qammaz, 2007; Fidan, 2008; Gudienė et al., 2013; Günhan and Arditi, 2005b; Hastak and Shaked, 2000; Iyer and Jha, 2005; Ozcan, 2008; Ozorhon et al., 2007; Renuka et al., 2014; Rezakhani, 2012; Xenidis and Angelides, 2005; Yong and Mustaffa, 2013; Zhi, 1995)

Table 5-1. Country factors (Continued)

Legal conditions of the country (e.g. Maturity and reliability of the legal system, level of applicability of the legal system, level of clarity of the laws and regulations, legislations, specifications and policies , level of predictability of the change of laws and regulations, legislations and policies etc.)	(Akçamete, 2006; Assaf and Al-Hejji, 2006; Birgonul and Dikmen, 2001; Azhar et al., 2008; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Gudienė et al., 2013; Günhan and Arditi, 2005b; Hastak and Shaked, 2000; Isa et al., 2014; Ling and Hoang, 2010; Ozcan, 2008; Ozorhon et al., 2006; Xenidis and Angelides, 2005; Zhi, 1995)
Quality and availability of local resources (e.g. Availability and quality level of materials, equipment and spare parts, availability and efficiency level of workers, labours and subcontractors, availability and quality level of infrastructure systems etc.)	(Ahmad and Kitchen, 2008; Akçamete, 2006; Assaf and Al-Hejji, 2006; Azhar et al., 2008; Birgonul and Dikmen, 2001; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Gudienė et al., 2013; Günhan and Arditi, 2005a; Günhan and Arditi, 2005b; Hastak and Shaked, 2000; Isa et al., 2014; Iyer and Jha, 2005; Kaming et al., 1997; Ozcan, 2008; Renuka et al., 2014; Rezakhani, 2012; Yong and Mustaffa, 2013)
The development level of the construction industry and working culture (e.g. The size of the construction market and related trend of the growth rate, level of attractiveness of the local construction market, level of competition in the local construction market, level of construction control and inspection mechanism in the market, level of corruption, level of development of business ethics and local working culture etc.)	(Ahmad and Kitchen, 2008; Akçamete, 2006; Azhar et al., 2008; Birgonul and Dikmen, 2001; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Günhan and Arditi, 2005a; Günhan and Arditi, 2005b; Hastak and Shaked, 2000; Isa et al. , 2014; Ozcan, 2008; Ozorhon et al., 2006; Xenidis and Angelides, 2005; Yong and Mustaffa, 2013; Zhi, 1995)

Table 5-1. Country factors (Continued)

Potential problems or conveniences to foreign companies due to the religious, linguistic and cultural structure of the country (e.g. Problems/ obstacles or conveniences/ supports related to the religious and cultural features of the country, problems/ obstacles or conveniences/supports related to the linguistic features of the country, perspective attitudes of local people foreign companies and workers etc.)	(Akçamete, 2006; Assaf and Al-Hejji, 2006; Birgonul and Dikmen, 2001; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; ; Gudienė et al., 2013; Günhan and Arditi, 2005a; Günhan and Arditi, 2005b; Hastak and Shaked, 2000; Isa et al., 2014; Ozcan, 2008; Ozorhon et al., 2006; Rezakhani, 2012; Xenidis and Angelides, 2005; Zhi, 1995)
Potential problems or conveniences to construction companies due to the geographical, physical, climatic conditions of the country (e.g. Geological, hydrological, meteorological, natural disaster risk, the advantages or disadvantages of geographical location of the country, conveniences/ supports and suitability of the climate and weather conditions of the country, conveniences/supports and suitability of the geological structure and physical conditions of the country etc.)	(Akçamete, 2006; Assaf and Al-Hejji, 2006; Azhar et al., 2008; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Gudienė et al., 2013; Hastak and Shaked, 2000; Iyer and Jha, 2005; Kaming et al., 1997; Ozcan, 2008; Ozorhon et al., 2006; Renuka et al., 2014; Rezakhani, 2012; Xenidis and Angelides, 2005; Yong and Mustaffa, 2013; Zhi, 1995)
Requirements/difficulties/constraints issued specific to foreign construction companies (e.g. Level of requirements and constraints for partner and partnerships, level of requirements to hire local labour and staff, level of requirement of travelling and visa status, level of requirement for special residency permit, level of requirement to use local contracts etc.)	(Akçamete, 2006; Bu-Qammaz, 2007; Chua et al., 2003; Hastak and Shaked, 2000; Isa et al., 2014; Ozcan, 2008; Ozorhon et al., 2006; Rezakhani, 2012; Zhi, 1995)

Table 5-1. Country factors (Continued)

Construction related regulations and requirements to be applied (e.g. Level of social and environmental policies, requirements and enforcements, level of occupational health and safety system and requirement and enforcements, level of specifications and standards to be applied during construction process, level of quality requirements and standards to be applied during the construction process etc.)	(Akçamete, 2006; Azhar et al., 2008; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Gudienė et al., 2013; Hastak and Shaked 2000; Isa et al., 2014; Kaming et al., 1997; Ozcan, 2008; Ozorhon et al., 2006; Renuka et al., 2014; Rezakhani, 2012; Zhi, 1995)
Level of bureaucracy (e.g. Bureaucratic procedures and stages, bureaucratic procedure durations /delays, level of variations of applied bureaucracy etc.)	(Akçamete, 2006; Assaf and Al-Hejji, 2006; Azhar et al., 2008; Birgonul and Dikmen, 2001; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Hastak and Shaked, 2000; Ling and Hoang, 2010; Ozcan, 2008; Zhi, 1995)

5.1.3 Factors within the Country Evaluation Form

As a result of literature survey findings, following factors are included in the country evaluation form. These main factors and their sub-factors are introduced briefly.

5.1.3.1 General Financial Conditions of The Country

Financial conditions of the countries have impacts on international construction. Construction projects are affected by the financial conditions. For example, changes in financial condition have a very high chance to cause problems or convenience, having difficulty in money transfer could have adverse effects on the construction project, or vice versa. In this form, the main factor related with financial conditions of the countries contains value of national currency against specific key currency, availability of project financing for construction projects financed by government, foreign exchange regime, level of difficulty in money transfer, membership of the

international financial institutions, trade organizations, chambers and insurance associations and relations, credit rating grade according to credit rating agencies, and level of vulnerability of contractors to financial risks.

5.1.3.2 General Economic Conditions of the Country

Construction projects are affected by economic conditions of countries. For example, level of inflation and fluctuations, tax rates and requirements have dramatic effects on projects which can lead to an increase or decrease in cost and time. General economic conditions of the country contain gross domestic product per capita (PPP), distribution of income, current account balance, balance of payments, level and trend of economic growth rate, level of interest rate and fluctuations, level of inflation and fluctuations, unemployment rate, level of economic development and justice of taxation system, level of local tax rates and requirements, government incentives and supports specific to construction industry, economic crisis and level of vulnerability of contractors to economic risk.

5.1.3.3 General Political Conditions of the Country

Political developments can directly affect international construction environment. Political conditions of the countries are crucial for construction projects. For example, stability of government can have a massive impact on the project. The status of international relations may cause loss of money and lead to delays. General political conditions of the country contain level of stability of government and political condition, the status of international relations including neighbouring countries, the impact of the government on business, state of war, existence of terrorism, and level of vulnerability of contractors to political risk.

5.1.3.4 General Social Conditions of the Country

Social conditions of the country can affect the construction projects. For example, if there is threat of social conflicts or unrest in the host country such as protest and demonstrations or street violence, the contractors and employees working in site can

be affected, the progress of the projects causing a decrease in productivity. As a result, these negative factors may threat the progress of a construction project and there may be delays. General social conditions of the country contain existence of internal conflicts and social unrest, occurrence of civil wars, level of class differences/distinction among the local people, fractionalization by language, ethnic and regional groups, level of crime rate, existence of nationwide strike, education level of the local people, level of social awareness and environmental sensitivity of the local people, development level of the institutions for protection of human right and labour practices, level of vulnerability of contractors to social risk.

5.1.3.5 General Legal Conditions of the Country

Legal system of the country is important for the construction industry. Legal conditions such as maturity and reliability of the legal system affect construction projects in terms of cost and time. For instance, immature and undependable legal system or insufficient legal infrastructure can cause problems like delays in project. Legal conditions of the country contain maturity and reliability of the legal system, level of applicability of the legal system, level of clarity of the laws and regulations, legislations, specifications and policies, level of predictability of the change of laws and regulations, legislations and policies, compliance with internationally-accepted/ universal rules and laws, efficiency of legal process and bureaucratic decisions.

5.1.3.6 Development Level of the Construction Industry and Working Culture

Development level of the construction industry and working culture affect construction projects inevitably. The conditions related with development level and working culture have a tremendous impact on construction projects. For example, if level of corruption like bribery in the local construction market is high, there may be a need for additional payments to proceed. It naturally affects the projects adversely. This main factor contains the sub factors, which are mainly related with the construction market of the host country. Construction industry that has high development potential makes achieving a successful project outcome possible.

Development level of the construction industry and working culture contain the size of the construction market and related trend of the growth rate, level of attractiveness (construction demand, forthcoming projects etc.) of the local construction market, level of competition in the local construction market, level of construction control and inspection mechanism in the market, level of corruption in the local construction market, level of development of business ethics and local working culture, the effect of illegal organizations on the construction sector, development level of industrial relations, trade unions and employers associations, development level of technology used in the industry and openness of the industry to innovation, collaboration level with academic institutions, existence of internationally famous executed construction projects, level of vulnerability of contractors to domestic construction market risks.

5.1.3.7 The Construction Related Regulations and Requirements

Construction related regulations and requirements applied in host country have an important role in project success. When there is a difference in these regulations and requirements, project performance can change dramatically. Working in a country that has strict requirements can be challenging for contractors. Thus, it may affect their productivity. In that kind of country, projects performances are affected. On the other hand, these regulations and requirements are essential for projects, for example, health and safety management includes protecting the safety, health, well-being and welfare of people engaged in work. Thus, it is necessary for construction projects. If there is not a current policy, it affects construction projects as well and this case is not suitable for international projects. Construction related regulations and requirements to be applied contain level of social and environmental policies, requirements and enforcements, level of occupational health and safety system and requirement and enforcements, level of specifications and standards to be applied during construction process, level of quality requirements and standards to be applied during the construction process.

5.1.3.8 Requirements/Difficulties/Constraints Issued Specific to Foreign Construction Companies

The requirements/difficulties/constraints issued specific to foreign construction companies are generally recognized as source problems that affect time and cost of construction project. When there are strict requirements / difficulties / constraints issued specific to foreign construction, foreign contractors have problems related with these issues. Executing a construction project in that kind of country causes loss of time and money because it can influence the duration and the budget. Requirements / difficulties / constraints issued specific to foreign construction companies contain level of requirements and constraints for partner and partnerships, level of requirements to hire local labour and staff, level of requirement of travelling and visa status, level of requirement for special residency permit, level of requirement to use local contracts, level of requirements to obtain work permits and licences, level of requirements regarding local tax, level of requirements to obtain construction license, level of restrictions of import and export, customs procedures, level of strict bureaucracy special to foreign contractors.

5.1.3.9 Level of Bureaucracy

Every construction project requires some approvals, permits or licences to be got from institutions, authorities or government officials, departments and agencies. If there exists bureaucratic difficulties, complex and difficult procedure stages, slow decision-making or unnecessary paper work with long and excessive durations, contractors have to wait until the process is completed. It may bring extra paperwork to obtain necessary documents and may cause project time overrun and delays. On the other hand, working in a country having effective bureaucratic process, simple and easy procedure stages and short duration without delay, projects can be affected positively. Bureaucracy level of the country contains bureaucratic procedures and stages, bureaucratic procedure durations/delays, level of variations of applied bureaucracy.

5.1.3.10 Quality and Availability of Local Resources

Resources have a tremendous effect of the progress of the construction project. For instance, materials, equipment, spare parts, workers, labours and subcontractors are main source of construction projects throughout the execution period. The quality and availability of local resources have direct impact on project performances. If there were a scarcity of materials, there would be difficulties for purchasing. In this case, extra time and money may be required to be spent, project might be delayed. So, availability and quality of resources are essential for project success. In addition, labour productivity is important and has a drastic effect on outcome of projects. As a result, working in a country that has availability of qualified or specialized workers, special equipments, skilled labours has positive effects on projects. Quality and availability of local resources contain availability and quality level of materials, equipment and spare parts, availability and efficiency level of workers, labours and subcontractors, availability and quality level of infrastructure systems.

5.1.3.11 Potential Problems or Conveniences to Foreign Companies Due To the Religious, Linguistic and Cultural Structure of the Country

In international construction, there can be differences in religions, languages and cultural structure of the country related with reflecting the beliefs, customs, habits etc. If there are problems related with the religious, linguistic and cultural structure of the country for foreign companies, these problems may result in delays, decreasing productivity and quality. For example, cultural clashes can be observed working in a multinational environment that affects the construction projects in international area. If the perspectives and attitudes of local people in country are negative, or there exists different cultures, languages and beliefs, this may increase the chance to observe clashes and cause misunderstandings that have detrimental effects on the project. Potential problems or conveniences to foreign companies due to the religious, linguistic and cultural structure of the country contain problems/obstacles or conveniences/supports related to the religious and cultural features of the country,

problems/obstacles or conveniences/supports related to the linguistic features of the country, perspective attitudes of local people foreign companies and workers.

5.1.3.12 Potential Problems or Conveniences to Construction Companies Due To the Geographical, Physical, Climatic Conditions of the Country

Suitability of the climate and weather conditions of the country as well as suitability of the geological structure and physical conditions of the country affect construction projects. In addition, natural risk such as landslides, volcanic eruptions, floods, tsunamis is recognized as a considerable threat while conducting a project. Disasters have big adverse effects in a project, the project has to be stopped and this directly increases time and cost in projects. Potential problems or conveniences to construction companies due to the geographical, physical, climatic conditions of the country contain geological, hydrological, meteorological, natural disaster risk, the advantages or disadvantages of geographical location of the country, conveniences/supports and suitability of the climate and weather conditions of the country, conveniences/supports and suitability of the geological structure and physical conditions of the country.

5.1.4 Structure of the Country Evaluation Form

As it is mentioned before, collection of information is significant for performing cluster analysis correctly. For facilitating evaluation and collection of information processes, it is necessary to decide how to evaluate each factor to be used in the evaluation process of the countries.

The form is constructed including factors with their evaluation options for the evaluation process of country conditions. In other words, during preparation of this country evaluation form, the evaluation options of each sub-factor on the form should be determined. While determining the country factors and the options, it is noted that these factors and these options on the form are identified for demonstration of the country situations.

Country factors can affect the construction projects both positively or negatively. According to evaluation options of each factor, the conditions of the countries could

have positive, negative or neutral effects on contractors. In other words, the options are determined so that they could be evaluated on a scale, which is mentioned in forthcoming paragraphs in detail.

Through the determined options of the factors, country information can be codified as well. In addition, the verbal terms can be investigated in a quantitative analysis by codifying or by quantifying the qualitative information. By this way, the collected information is easily used in the cluster analysis.

The options of each factor are determined to make them easily evaluable by investigating available resources related with evaluation of countries. During this investigation, journal and conference papers, which are indicated as references in the previous section and available online databases, are reviewed.

According to review of these sources, the options of evaluation for each factor and their evaluation scale to be used for them are assigned. While this evaluation scale is being developed, the situation of countries is considered. Countries can be evaluated by investigating the sub-factors that have all possible options for evaluation process (i.e. favourable conditions to have positive effects, unfavourable to have negative or neutral effects). The form should be constructed in a similar approach for each factor by using their evaluation options so that it remains consistent across all the factors. In other words, all evaluation options of all factors on the form are determined using the same logic in order to provide being consistent throughout of the form.

The form facilitates evaluation process of the countries by presenting all possible evaluation options for the existing status of countries. With the help of the prepared evaluation options, the country conditions are easily reviewed. By this way, the person who evaluates the country by using this form can easily examine the related conditions.

While 12 main factors are being evaluated, it is decided that they should be evaluated over their own sub-factors to make it easier to understand the factors. The sub-factors of each main factors are evaluated by selection of the appropriate option according to

the conditions of the country. For evaluation process, the previously mentioned resources are investigated.

In this research, it is intended to cluster selected countries and to determine similar countries specific to construction industry by using the collected information. Therefore, the cluster analysis is conducted by using these 12 main factors on the form. However, these determined country factors may not be equally weighted and equally important in determining the similarities of countries. It is required to reflect the relative differences in the importance level of the factors. For this reason, it is necessary to determine the importance weights of main country factors in determining similar countries. An online questionnaire is designed to evaluate the importance weights. The weights for importance of each factor are found by rating on 1-5 Likert scale by using the designed questionnaire. The designed questionnaire can be found in Appendix B.

5.1.5 Determination of Importance Weights of Country Evaluation Factors with a Questionnaire

Within context of the preparation of the country evaluation form, a web-based questionnaire consisting of three parts is designed. In the first part of the questionnaire, as an introduction part, the objective of the survey are introduced briefly. In the second part, the questions about general information of the respondent are asked. The last part of the questionnaire includes one question that is related to importance levels of the determined country factors. In this part, previously determined country factors are listed and are inquired for evaluation by assigning ratings according to their importance level in similarity assessment of the countries for global contractors. The evaluation of importance levels of the factors has been performed based on the five-point Likert scale where, “1” indicates the least importance and “5” indicates the highest importance. In addition, respondents are inquired to define any other country factor that may affect construction projects and to rate its importance in similarity assessment, if there exists any.

5.1.5.1 Respondent Profile

The designed questionnaire is conducted with Turkish company professionals working abroad to rank importance of the determined factors. A web-based questionnaire has been distributed online as published in the metusurvey.metu.edu.tr. Answers are requested through electronic mail invitations. Before distribution of the designed questionnaire, the ethical approvals are provided from Applied Ethics Research Center, Human Research Ethics Committee in METU.

As a result of the questionnaire survey administered to company professionals who have international construction experience in various types of projects (i.e., industrial, building, engineering, etc.), a total of 84 responses are obtained. Characteristics of the respondents and their company information are presented in Table 5.2. This part of thesis is related with the questionnaire that has been published in an international conference (Ozyurt et al., 2017).

Table 5-2. Characteristics of respondents and their companies

Frequencies of Respondent and Company Characteristics	
Respondent Characteristics	
Education Level	
Undergraduate	57%
Master Degree	43%
Professional Experience	
0-5 years	17%
6-10 years	25%
11-15 years	26%
16-20 years	17%
21 years and over	15%

Company Characteristics	
Age	
0-10 years	2%
10-20 years	14%
20-30 years	23%
30-40 years	25%
40 years and over	36%
Type of Company	
Owner	62%
Contractor	89%
Designer	2%
Consultancy	2%
Other	2%
Types of Projects	
Residential	54%
Commercial	75%
Transport	70%
Energy	70%
Water Construction	57%
Industrial	54%
Other	10%
Annual Turnover	
0-100 Billion TL	8%
100-500 Billion TL	18%
500 Billion TL and over	74%

5.1.5.2 Findings of Questionnaire Survey

In this section, findings of the questionnaire are given. The collected data through the questionnaire survey have been analysed by calculation of indices. Importance index

of each country factor are calculated according the following formula in order to identify the importance of these factors (Abdul-Rashid et al., 2007).

$$I = \sum_{i=1}^{5} \frac{a_i \times X_i}{5}$$

In this formula, "I" indicates the importance index of each factor; "i" is the response category index where i = 1, 2, 3, 4, 5; "a_i" indicates the weight of the i^{th} response ranging from 1 to 5; "X_i" indicates the frequency of the i^{th} response given as a percentage of the total responses for each factor.

Importance index of each factor used in the form has been calculated by using the given formula. Following this process, averages for ratings and importance weights for each factor have been calculated. The calculated rankings of the each country factor can be seen in Table 5.3.

According to the results; development level (maturity) of and culture in the construction industry, political condition of the country and financial condition of the country factors are found as the most significant factors for similarity assessment of countries with the average ratings of "3.607", "3.583", "3.559" respectively. On the other hand, results present that the least important factor is "religious, linguistic and cultural structure of the country" with the average rating of "2.929". As it can be seen from Table 5.3., importance index and average ratings of the all factors are close to each other. So, it can be said that all of these factors have significant roles on the similarity assessment of countries.

Table 5-3. Importance weights of the country factors

Country Factors	Average Rating	Importance Index (%)	Importance Weight (%)	Rank
Financial conditions of the country	3.559	71.18	0.0876	3
Economical conditions of the country	3.417	68.34	0.0842	8
Political conditions of the country	3.583	71.66	0.0882	2
Social conditions of the country	3.167	63.34	0.078	10
Legal conditions of the country	3.226	64.52	0.0794	9
Development level of construction industry and working culture	3.607	72.14	0.0888	1
Regulations and requirements associated with construction to be applied	3.44	68.8	0.0847	7
Difficulties/constraints issued to foreign construction companies	3.476	69.52	0.0856	6
Level of bureaucracy	3.535	70.7	0.0871	4
Quality and availability of local resources	3.523	70.46	0.0868	5
Religious, linguistic and cultural structure	2.929	58.58	0.0721	12
Geographical/physical/climatic conditions of the country	3.143	62.86	0.0774	11

5.2 Validation and Revision of the Country Evaluation Form

Following presentation of the list of country factors and preparation of the country evaluation form specific to construction industry, validation and revision studies of the form are provided. The evaluation form is validated through reviews on the form by interviews that are arranged with three experts by conducting face-to-face validation

technique. The “face-validity” of the form is performed by these interviews that are held with these experts in order to test the applicability, to validate suitability of determined country factors and to validate the reliability of these findings. The following sections of this Chapter present the administration and content of the interviews and also comments and suggestions of the experts related with the form.

5.2.1 Administration of Interviews

Several face-to-face interviews with the company professionals are carried out in order to review the country evaluation form and investigate its applicability for country evaluation process in the international construction industry. The respondents of these interviews are construction experts who are experienced both in international construction and in domestic construction. Three experienced people, who are all civil engineers with having master degree and industry professionals in Turkish construction companies, participated in the interviews. The information about these experts is presented in following Table 5.4. All of the interviews have delivered to respondents in a face to face and one by one fashion and each of these processes took about 2-hours.

Table 5-4. Information about experts

Respondent	Position	Experience
Expert 1	Director of Ireland and CIS countries regional manager and coordinator	more than 25 years
Expert 2	Business assistant at top management	8 years
Expert 3	Consultant for international construction	more than 40 years

Expert 1 is experienced in both developing and developed countries such as Kazakhstan, Tajikistan, Turkmenistan, and Ukraine. Azerbaijan, Qatar, Bulgaria, Ireland, Poland, Russia. Expert 2 has management-based experiences in European and Russian countries as well as experienced in project management in international construction, especially in strategic management, risk management, performance management. Expert 3 has experiences in Libya, Bosnia and Herzegovina, Turkmenistan, UAE and is specialized in FIDIC contracts and claim management.

Each interview consists of three sections mainly. In the beginning of the interview, the aim and objective of the research and the expectation from the respondents for this interview are explained with a brief presentation. In addition, the ethical rules and conditions are presented before the administration of the interviews. Following these presentations, experts are requested to review the each section of the country evaluation form as well as its factors and options to be revised for investigating the suitability of country factors and applicability of the form. In addition, they are requested for revising the form including its all factors and sub-factors in terms of adequacy of the scope and concept of this research. Furthermore, they have been requested to review whether the form is suitable for utilization in international construction industry as well as whether the countries could be evaluated by using this form or not. Following this question about factors, experts are requested to state their opinions about the evaluation options of each factor and their comments on the form. In addition, they are requested to state their opinions about the sources of the factors and evaluation options in use for preparation of the form to investigate the reliability of the form. The investigated and researched sources for the preparation of the country form are asked for reliability and the sources are compared with the responses of the experts. Furthermore, how contractors can evaluate the country factors by using their options during the evaluation process of the countries for international construction is discussed. In this context, it is questioned to what extent the country factors and the evaluation form could be used for country assessment process.

5.2.2 Content of the Interview

The interview is delivered to respondents in two parts. In the first part, the personal information is collected from respondents. In this part, respondents are requested to state their educational background and their experiences and interests. The last part of interview consists of the questions related with the form as well as the suggestions and comments of the experts. In the following sections, their suggestions on the form are presented.

5.2.3 Suggestions for Country Evaluation Form

As a result of the interviews with experts and according to experts' opinions, validation of country evaluation form is provided. Reliability and applicability of the form are tested. It can be said that the country evaluation form is sufficient and it is suitable for the objectives of the research and can be used in the following parts of this thesis.

Experts stated that countries have not been evaluated in such a detailed way in the methods used in their evaluations. In other words, the evaluation process is not performed as comprehensively as in this proposed methodology. However, it is stated that this form can be utilized and the countries should be evaluated in detail with a evaluation form such as this form.

Generally, Turkish contractors do not make a detailed evaluation and it takes usually short time to evaluate a country. Therefore, they said that this is a long evaluation form. It may be a disadvantage because evaluation process of countries by using this form takes long time. However, when the analysis is performed, the interpretation and examination of the results may lead to situations such as the situation where there are some factors on the form giving the same response for almost all countries for each evaluation. In this situation, the form may be shortened further, if the form is to be used again for subsequent evaluations.

When the country effects and importance are considered, it is necessary to carry out a detailed investigation. Experts said that the implementation of this methodology could

be difficult within the sector, but the results would be useful. In the case, the evaluation process is performed systematically and is repeated dynamically in regular periods, and when it is observed that the results are beneficial and applicable, the utilization of the form would be promoted.

Although experts stated that the country form covers the aspects related with the country effects on the construction projects and the prepared form can be used for country evaluation process, they suggested that the form should be revised for assessing target countries and for collecting the relevant country data suitably. They claimed that there can be some sub-factors that are important for the international construction project and country evaluation process. So, experts suggested that some additional sub-factors should be added in order to make it more comprehensive. Some of these additional factors are credit rating grade of countries and existence of internationally famous executed construction projects. For example, experts suggested that credit rating score can be involved under the financial related main factor as a sub-factor. In addition, experts suggested some factors should be changed or describing terms should be rephrased in order to be more apprehensible and clear. In the light of these suggestions of experts, additional factors are added and the necessary revisions for each factors and also options are provided. The final revised version of the form can be seen in Appendix C.

Following the completion of seven meetings conducting with these three experts, it can be said that the prepared form is validated by the expert opinions and domain knowledge in terms of adequacy and its applicability.

Following the revisions and validation of the country evaluation form, the required country information for filling the form can be acquired by using revised form through searching online or printed resources as well as the opinions of experts and professionals who are experienced in the international construction industry. Within this context, collection process of the country information is further introduced in detail in the forthcoming Chapter related with data collection for cluster analysis.

In the forthcoming parts of this thesis, application of the cluster analysis is presented and countries are clustered using this collected information by using this prepared form. Before application of the cluster analysis, it is more suitable that cluster analysis is mentioned. Thus, the following Chapter for introducing the subjects related with cluster analysis is presented.

CHAPTER 6

CLUSTER ANALYSIS

This Chapter includes the general information about cluster analysis, which is applied for the grouping of countries within the context of this thesis in accordance with thesis scope. Literature review on cluster analysis and its concepts are presented throughout this Chapter.

6.1 Definitions Related with Cluster Analysis

In the information age, with the usage of increasing number of data, the developments in computer and communication technologies allow the more number of data to be stored, processed and transformed quickly. By using these technologies, techniques that enable the use of large amounts of data and make these data meaningful are generated. Data mining is one of the widely used technologies in today's information age.

According to Han and Kamber (2001), data mining is a process of discovering the interesting information within large amounts of data in databases, data warehouses or other data repository and it is to extract previously unknown and useful information from within the data. It is an analysis that discovers and reveals unexpected associations through finding previously unknown associations and summarizing the data as both useful and understandable for the researcher (Hand et al., 2001). Grouping objects (i.e. clustering and classification) is one of the main objectives of the data mining.

One of the most used fields of data mining is grouping and the subjects related with this are widely studied. As the number of data increases, it becomes more difficult to cluster the data and it is required to find new techniques. In the literature, there are several available methods for grouping. One of the commonly used methods is cluster analysis, which has had an important role in data mining research. In the following paragraphs, definitions, aims, and steps of cluster analysis are presented. Then, data types, (dis)similarity measurements and clustering methods used in cluster analysis are examined.

Cluster analysis was first used as a term by Tryon in 1939 (Budayan, 2008). Cluster analysis concept has developed and wide application areas in many engineering and scientific disciplines such as genetics, medicine, biology, zoology, marketing, archaeology, economics, education, geology, political science, market research.

Cluster analysis is used to separate data into the consistent cluster (Everitt, 1974; Karypis et al., 1999). There are several definitions for the term cluster. (Han and Kamber, 2001). One of the definitions of Everitt (1974) is as follows: "*A cluster is a set of entities which are alike, while entities from different clusters are not alike*." In addition, cluster can be defined as "*A cluster is an aggregation of points in the test space such that the distance between any two points in the cluster is less than the distance between any point in the cluster and any point not in it*." (Yigit, 2005). According to Budayan (2008), clustering is a mathematical technique generated for finding out the classification structures.

The cluster analysis is a method that divides previously non-clustered elements into groups according to their similarities and differences, in such a way that the elements in the same cluster have similar characteristics and the similarities in the elements in the different clusters are minimized (Kaufman and Rousseeuw, 2005). The division process is performed so that the elements in the same group are similar to each other whereas the elements in the different groups are different from each other (Neil, 2002). In other words, the units in the same cluster are obtained so that their similarities are maximized and the units in different clusters such that their similarities are minimal.

Therefore, high homogeneity within the clusters and high heterogeneity between the clusters is essential for cluster analysis (Kantardzic, 2003; Sharma, 1996).

The main purpose of the cluster analysis is to obtain groups by dividing sub-clusters into a group of data, according to the predetermined criteria, so as to reveal similarities of the units by summarizing information of the units without loss of significant information (Romesburg, 1984). By this way, comprehension of the relations in the data is facilitated in a short time and minimum effort as a result of the cluster analysis. There should be a maximum similarity between the data belonging to the same cluster according to the predetermined criteria and should be a minimum similarity, as different as possible, with those of the other groups. In addition, the major aims of the analysis are finding a true typology, prediction based on groups, hypothesis generating, data exploration, data reduction and model fitting (Yigit, 2005).

In the literature, there are several methods for grouping apart from clustering analysis. According to Jain and Dubes (1988), there are two type of grouping methods, namely, exclusive and non-exclusive. In exclusive grouping operations, each object can belong to only one cluster. In non-exclusive grouping operations, each object can be included in more than one cluster. It can be seen from Figure 6.1. exclusive grouping methods are generally divided into supervised and unsupervised.

In supervised grouping, objects are predefined and each object has a class label. In supervised grouping, there are predetermined groups and the elements are assigned into these predetermined groups (Fayyad et al., 1996). In supervised learning, a supervisor determines the classes according to a predetermined criterion and gives examples for each class for starting. These methods are conducted according to these given examples and classes. It is used to group objects that are newly added or not specified whereas, in the unsupervised grouping, objects do not have a predefined class label (Jain and Dubes, 1988). In the unsupervised method, identification of the classes is provided by observing the related samples and by using the similarities between the properties of these samples. In addition, there are not predetermined classes but they are generated from models and data.

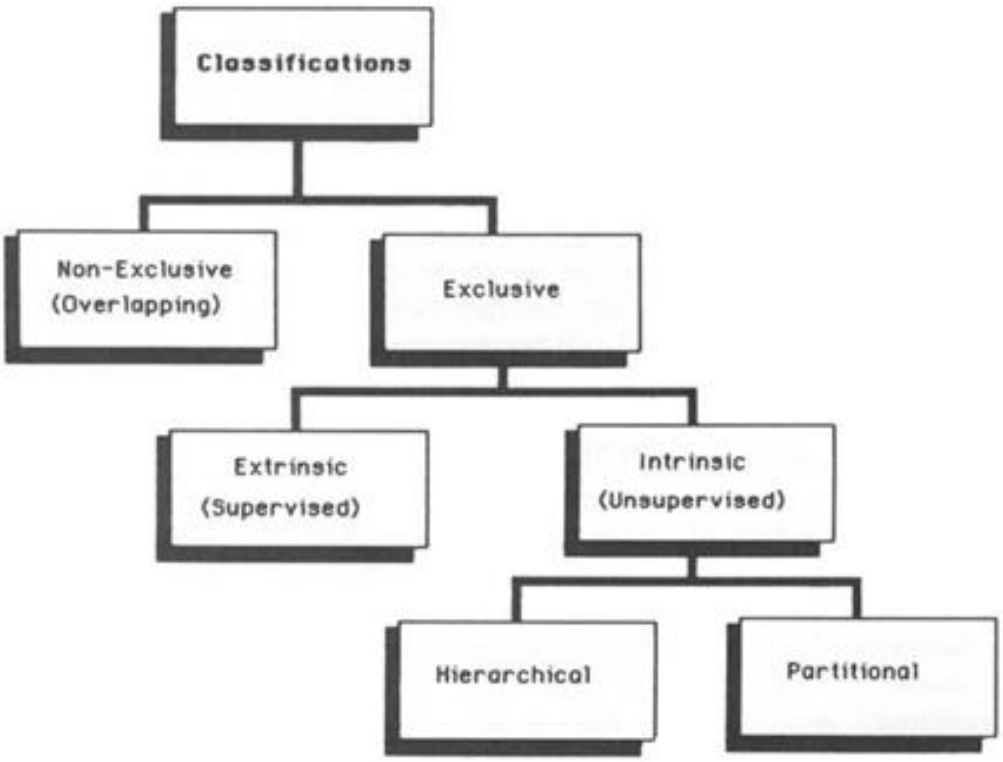

Figure 6-1. Tree of grouping types (Jain and Dubes, 1988)

Cluster analysis is one of the unsupervised learning method. Cluster analysis is distinct from supervised methods because, in this type of grouping, identification of category labels or group names are not necessary before the analysis for beginning.

According to Jain and Dubes (1988), cluster analysis tries to obtain right organization of data tries to achieve right organization of data without category labels and the determined class names.

In this thesis, cluster analysis is preferred for application, because category labels or group names for countries specific to the industry as well as the number of the clusters and the members of these clusters (i.e. countries) are not determined easily for country grouping before the analysis.

There are different methods of clustering analysis such as partitioning methods, hierarchical methods, density-based methods, grid-based methods and model-based methods (Han and Kamber, 2001). Application of each of these methods may result in different clustering of the same data.

In addition, in the literature, the clustering methods can be categorized in two, namely Hierarchical Methods (clustering by creating dendrogram) and Non-Hierarchical Methods (clustering called partitioning). The objective of both techniques is to maximize the differences between clusters and the similarities within clusters. In this thesis, these two methods, which are widely used in literature for clustering, are explained (Blashfield and Aldenferder, 1978). These two methods are preferred to use in analysis depending on the size of the dataset or whether the number of clusters to be obtained can be determined in advance or not. These two methods both have some advantages and disadvantages. The main difference between these two methods is whether cluster numbers are predetermined or not. In non-hierarchical clustering, the cluster number is selected before the analysis and selections are arbitrary. (Blashfield and Aldenferder, 1978). The selection of these widely used methods depends on the analysis. Furthermore, it is observed that both methods are used together in some studies in the literature (Budayan, 2008).

Cluster analysis can be applied for different data types. In the following sections, these data types are explained.

6.1.1 Data Types

In the cluster analysis generally four data types (i.e. interval, nominal, ordinal, and ratio) are used. The types of data used in the analysis are described briefly in below.

Interval-scaled variables: These are represented in continuous and linear scale.

Nominal variables: For these variables, there is categorical representation without an ordered scale.

Ordinal variables: There is a meaningful order. However, the scale of order is unknown. There is only ordering or ranking without an actual magnitude of the number used for representation.

Ratio scaled variables: These are positive continuous measurements on a nonlinear scale.

6.1.2 Data Standardization

The fact that variables used in the analysis are comparable scales is important for the analysis and can affect the results of the analysis. It is necessary to examine the data and to conduct a pre-processing before the similarity measurement is applied on. For example, if the data have different data types or different units, scales and range, where there are large differences between the values of the variables, the data should be standardized to be coherent and converted to similar scales before distance or similarity measures can be calculated for the analysis (Milligan and Cooper, 1988; Harrigan, 1985). For this reason, data may need to be standardized (transformed or normalized) before calculating necessary measurements on the data and performing the analysis (Everitt et al., 2001).

There are different methods for standardization of the data. In this thesis, the most widely used ones namely, Z-Score Normalization and Min-Max Normalization are explained. In following paragraphs are mentioned these methods.

Z-score Normalization: This method is applied to the data in proportional or interval scales type with a normal distribution. A general formulation is:

$$Zi = \frac{x_i - x}{S}$$

Min Max Normalization: It is a technique applied for rescaling to change the values in a positive 0-1 range when the values are heterogeneous. A general formulation is:

$$Xi = \frac{x_i - x_{min}}{x_{max} - x_{min}}$$

As it mentioned before, cluster analysis can be used with different data types. Clustering analysis is based on similarities or differences between elements. Analysis divides elements into groups according to determined similarities (Johnson and Wichern, 1992). The similarity between elements is calculated according to a distance measurement. A measurement of the similarity depends on the application. In other words, the utilized (dis)similarity measurements and clustering techniques depend on the data type of variable. Different (dis)similarity measurements may need to be used for different data types. Thus, selection of (dis)similarity measurements depends on the type of data. Similarity measures commonly used in the literature are described below.

6.1.3 Similarity Measurements

The purpose of clustering analysis is to achieve intra-cluster homogeneity, inter-cluster heterogeneity. This is ensured in the way that similar elements are gathered in the same cluster. The similarities of elements are related to the position they are in. Elements who are close to each other by their positions are gathered in the same cluster. When they are clustered, their closeness to each other is calculated according to (dis)similarity measurements in the literature. It is decided which similarity measure should be used according to whether the variables are nominal, ordinal or interval-scaled. There are numerous (dis)similarity measurements used in the literature. The most commonly used (dis)similarity measurements together with the data types are given in below.

For interval scaled variables, Euclidean distance, Manhattan distance, and Minkowski distance are the mostly used. These are described as follows respectively (Budayan, 2008).

Euclidean distance is the most common measurement technique used to measure distances between two points. The formula is:

$$d_{ij} = \sqrt{\sum_{k=1}^{p} (x_{ik} - x_{jk})^2}$$

where d_{ij} is the distance between i and j cases, and X_{ik} is the value of k^{th} variable for i^{th} case.

Manhattan (City-Block) distance is calculated by summing the absolute distances between objects. Formula is:

$$d_{ij} = \sum_{k=1}^{p} \left| (x_{ik} - x_{jk}) \right|$$

where d_{ij} is the distance between i and j cases, and X_{ik} is the value of the k^{th} variable for the i^{th} case.

Minkowski distance is basically a different form of Euclidean and Manhattan distance function. In other words, Minkowski distance measure function is in the generalized form, while Euclidean and City-Block distance measures are a special form of Minkowski distance measure. (Jain and Dubes, 1988). The formula is:

$$d_{ij} = \left[\sum_{k=1}^{p} \left| x_{ik} - x_{jk} \right|^q \right]^{1/q}$$

where d_{ij} is the distance between i and j cases, and X_{ik} is the value of the k^{th} variable for the i^{th} case.

Apart from these, there are different measurements in the literature such as Chebychev distance, Power distance: Hotelling T2 , Canberra etc. However, within this context of this thesis, these data types are not explained in detail.

Nominal variables generally are coded by letters, symbols or numbers, however, these are not in order (Kaufman and Rousseeuw, 2005). For nominal variables, the distance between the elements is found by using the distance table. In this thesis, first, binary variables, which are the special form of nominal variables, are introduced.

The simplest form of nominal variables is called a binary variable, which can take two different values, such as 0 or 1. For these variables, measurements are related to matches and mismatches in cross-classification in the p variable for two elements (Everitt et al., 2001). In the calculation of distances, 2x2 Table is created for binary variables, whose general representation is presented in (Budayan, 2008). The general representation of this cross-classification is presented in the Table 6.1.

Table 6-1. Counts of binary outcomes for two elements (Budayan, 2008)

	Individual i			
	Outcome	1	0	Total
Individual j	1	a	b	a+b
	0	c	d	c+d
	Total	a+c	b+d	P=a+b+c+d

Different similarity measurements are proposed for binary variables. There are two kinds of binary variables (i.e. symmetric and asymmetric) depending on whether or a preference in coding is concerned or not. The coefficients for binary variables, their formulas and properties are tabulated by Bacher (2002). It can be shown in below.

Table 6-2. Coefficients for binary variables (Budayan, 2008; Bacher, 2002)

Similarity coefficient	Formula	Properties
Jaccard	$\frac{a}{a+b+c}$	Conjoint absence (0,0) is ignored.
Dice	$\frac{2a}{2a+b+c}$	Conjoint absence (0,0) is ignored, conjoint presence (1,1) is double weighted.
Sokal and Sneath	$\frac{a}{a+b+c}$	Conjoint absence (0,0) is ignored, mismatches are double weighted.
Russel and Rao	$\frac{a}{a+b+c+d}$	Conjoint absence (0,0) is not evaluated as similarity, but used in the denominator.
Simple matching	$\frac{a+d}{a+b+c+d}$	Absence and presence as well as matches and mismatches have equal weights.
Sokal – Sneath II	$\frac{2(a+d)}{2a+b+c+2d}$	Matches (conjoint absence and presence) are weighted double.
Rogers and Tanimoto	$\frac{a+d}{a+2(b+c)+d}$	Mismatches are weighted double.

For nominal variables, simple matching is a common used technique to measure similarity, whose formula can be found as follows. According to (Everitt et al., 2001), a score showed as S_{ijk}, is assigned to each variable k, depending on whether the two elements i and j are the same on that variable or not. These scores are averaged over all p variables (Budayan, 2008).

$$S_{ij} = \frac{1}{p}\sum_{1}^{p} S_{ij}$$

Additionally, in the literature, there are several matching coefficients for nominal variables (Gan et al., 2007). These matching coefficients for nominal variables can be found as follows.

Table 6-3. Matching coefficients for nominal variables
(Budayan, 2008; Gan et al., 2007)

Measure	S(x,y)	Weighting of matches, mismatches
Russell and Rao	$\frac{N_{a+d} - N_d}{N_{a+d} + N_{b+c}}$	Equal weights
Simple matching	$\frac{N_{a+d}}{N_{a+d} + N_{b+c}}$	Equal weights
Jaccard	$\frac{N_{a+d} - N_d}{N_{a+d} - N_d + N_{b+c}}$	Equal weights
Dice	$\frac{2N_{a+d} - 2N_d}{2N_{a+d} - 2N_d + N_{b+c}}$	Double weight for matched pairs
Rogers-Tanimoto	$\frac{N_{a+d}}{N_{a+d} + 2N_{b+c}}$	Double weight for unmatched pairs
Kulczynski	$\frac{N_{a+d} - N_d}{N_{b+c}}$	Matched pairs excluded from denominator

In this table, N_{a+d} shows the number of the states on which the two records match, N_d is the number of states on which two records match in a "not applicable" category, and N_{b+c} is the number of the states on which the two records do not match (Budayan, 2008).

In the literature, there are several (dis)similarity measurements for different data type. However, within the context of this thesis, these available measurements are not mentioned.

As it is mentioned before, the first step in cluster analysis is to select a (dis)similarity according to the data type. Following the selection of the measurement, the decision about the technique to be used (i.e. hierarchical or non-hierarchical) is made. In the third step, the linkage method to be used in selected technique is selected. In the last stage, the cluster number is determined, results are interpreted and validated (Sharma, 1996).

Within the context of this thesis, hierarchical clustering techniques are used for grouping of countries. Thus, first hierarchical clustering techniques are introduced, then, non-hierarchical techniques are mentioned briefly.

6.2 Hierarchical Clustering Techniques

In hierarchical clustering techniques, the number of clusters is not determined at the beginning. The number of clusters (k) becomes apparent at the end of the cluster analysis. The process applied in hierarchical clustering techniques is not based on global optimization. In these techniques, clustering is continued by repeating the applied techniques until the completion of the analysis (Kantardzic, 2003). At the end of the analysis, clusters obtained as output are hierarchical. In the following paragraphs, the generally applied steps of cluster analysis are mentioned.

The steps of the analysis can be summarized below. Data collection is the first step in the analysis. The values of the n elements to be clustered, which are not precisely known about the natural groups, are collected according to the number of p variables used in the cluster analysis (Romesburg, 1984). In cluster analysis, the inputs' structure is usually in the form of a matrix. Generally, the rows in the data matrix show the elements to be clustered, the columns represent variables. Then, the pairwise distances between the elements are calculated through suitably selected measurement type for the analysis. These are shown in the matrix, which is used in the analysis. Using this obtained matrix, the elements are assigned to clusters using the linkage method appropriately determined for the analysis. The elements are grouped according to this applied method, which is determined. Then, the number of clusters is determined. Validation studies and interpretation of meaningful clustering results are the last step of the analysis. Analysis results can be tested and interpreted by analytical methods, a specified comparison technique, or through indices available in the literature (Sharma, 1996).

For hierarchical analysis, various algorithms are available in the literature. It can be said that agglomerative hierarchical techniques (known as AGNES - AGglomerative

Nesting) and divisive hierarchical techniques (known as DIANA - DIvisive ANAlysis) are the most commonly used ones. These are two main approaches of hierarchical clustering algorithms. Both of these techniques create a tree-like graph named as a dendrogram. The hierarchy among the clusters obtained is visually presented with the dendrogram. In this dendrogram, hierarchical clustering can be shown in two ways: bottom-up and top-down (Bandyopadhyay and Sriparna, 2013). In accordance with the dendrogram structure, it is called as agglomerative or divisive (Jain et al. 1999; Han and Kamber, 2001).

Dendrogram can be described as the graphical representation of the hierarchical procedure how each element is merged each other at the steps of the procedure until all are contained in a single cluster or vice versa (Budayan, 2008). The nodes of the dendrogram show clusters and the lengths of the stems (height) represent the distances at which clusters are joined. (Everitt et al., 2001). Dendrogram demonstrates how much the obtained clusters are similar to each other by considering heights of the connection of the nodes (Budayan, 2008).

In hierarchical clustering, as it is mentioned before, obtained clusters are hierarchical. At the end of the analysis, a set of clusters is obtained. Clusters can be observed on the dendrogram. Depending on whether it is agglomerative or divisive, each cluster shown in the dendrogram is a combination or disjunction of the clusters obtained in the each previous or next stage.

The dendrogram shown as an example of the most used representation method is presented in below (Han and Kamber, 2001). The procedure of agglomerative and divisive can be shown in this dendrogram. In the following paragraphs, agglomerative hierarchical clustering is introduced, and then divisive hierarchical clustering is mentioned.

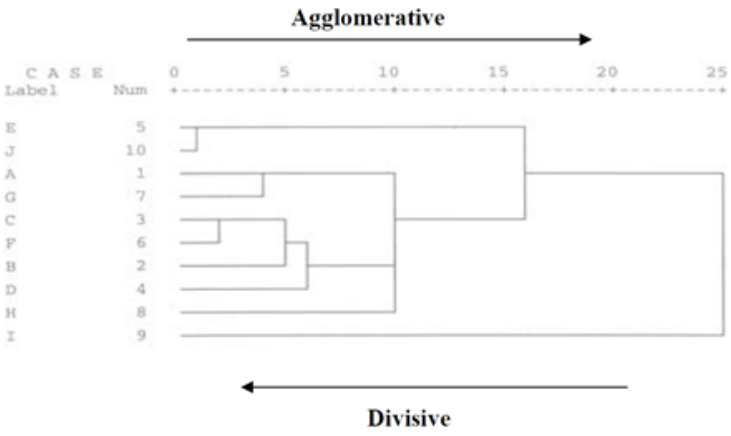

Figure 6-2. Dendrogram (Budayan, 2008)

6.2.1 Agglomerative Hierarchical Clustering

Agglomerative hierarchical clustering process is mentioned as follows. If the data set to be clustered contains n number of elements, the algorithm starts with n number or clusters. Each element is initially considered as one set. Once the data to be clustered has been prepared for analysis (i.e. pre-processing), similarity measurement to be used is determined. Following the selection of suitable similarity measurement, proximity matrix is obtained by using the pair wise distances. These distances are calculated by appropriate measurements for each pair of elements. The proximity matrix is a matrix of [n x n] dimensions in which the similarity values of elements are shown. Proximity matrix is a symmetric matrix because the similarity between elements has the property of commutative (Jain and Dubes, 1988). The general form of this matrix, where d(n,m) is the distance between n and m cases is shown in below.

$$\begin{bmatrix} 0 & & & & \\ d(2,1) & 0 & & & \\ d(3,1) & d(3,2) & 0 & & \\ \vdots & \vdots & \vdots & & \\ d(n,1) & d(n,2) & \cdots & \cdots & 0 \end{bmatrix}$$

Figure 6-3. Data matrix

Following the previously mentioned matrix ([n x n]) is determined, elements are assigned to the clusters. For this, the linkage method to be applied, which is further introduced in detail, should be selected. The objects are assigned to the homogeneous clusters by using the proximity matrix through selected linkage method. The algorithm combines the closest clusters together and constructs a new proximity matrix in size of [(n-1)x(n-1)]. The two closest clusters are then merged into a new cluster. Merging process is carried out repeatedly. This reduces the number of clusters at each step. This process is repeated until all the elements in the initial data are collected in one cluster. The clustering process moves according to "bottom-up" approach (Bandyopadhyay and Sriparna, 2013). This process can be illustrated by the dendrogram (Jain and R. Dubes, 1988).

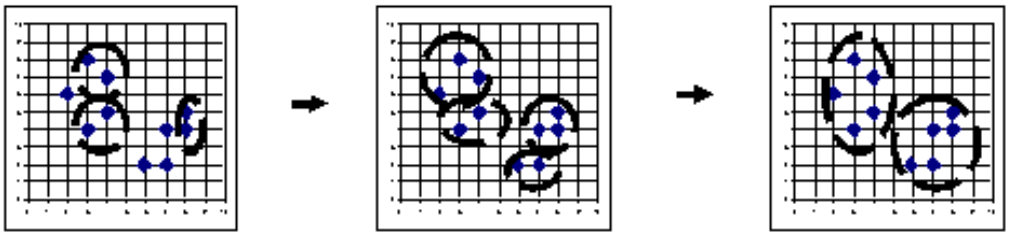

Figure 6-4. Agglomerative clustering example

Clustering techniques use different linkage methods when assigning elements to appropriate groups. According to these methods, it is determined which clusters are to be obtained at each step, or which clusters are to be divided into new clusters. If different linkage methods are used in the clustering analysis, the same data may be clustered differently, as in the case where different similarity measurements are used in the analysis. In other words, the determined linkage methods to be applied and measurement to be used in clustering analysis is critical for analysis. In following section, the mostly used linkage methods for hierarchical clustering are given.

6.2.1.1 Linkage Methods

In cluster analysis, different types of linkage method are available for agglomerative clustering. The generally accepted methods among these linkage methods are Single

linkage method, Complete linkage, Average linkage method, Ward's method, Median Method and Centroid Method (Khattree and Naik, 2002). These are explained in the following sections briefly.

6.2.1.1.1 Single Linkage Method

Single linkage method, also known as the nearest neighbor, is based on combining the closest (least distance) elements to each other by comparing the similarity distances and selecting the least distance (Johnson and Wichern, 1988). The representation of single linkage method is as follow.

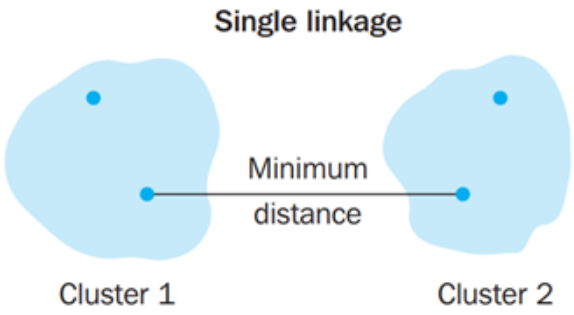

Figure 6-5. Single linkage method (Malhotra and Birks, 2006)

6.2.1.1.2 Complete Linkage

This method is also known as the furthest neighbour (Hubert, 1974). The difference in this method is that the maximum distance between pairs of elements is considered instead of the minimum distance (Sharma, 1996). The representation of complete linkage method is as follow.

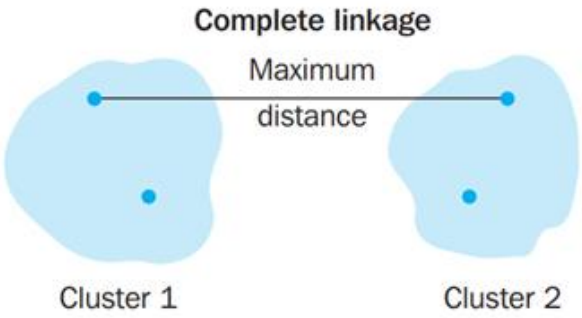

Figure 6-6. Complete linkage (Malhotra and Birks, 2006)

6.2.1.1.3 Average Linkage Method

In this method, the process starts as in single and complete linkage techniques. However, in this method, the average distances between the elements in a cluster and the elements in the other cluster are used. In other words for distance between two clusters, the average distance between all pairs of the two clusters' elements is considered (Sarstedt and Mooi, 2014). The average linkage method combines two elements if the distance between them is less. This method is proposed as an alternative method because it gives results between Single Linkage and Complete Linkage methods. In the literature, different methods for taking the average of the elements of the clusters are proposed. The representation of average linkage method is as follow.

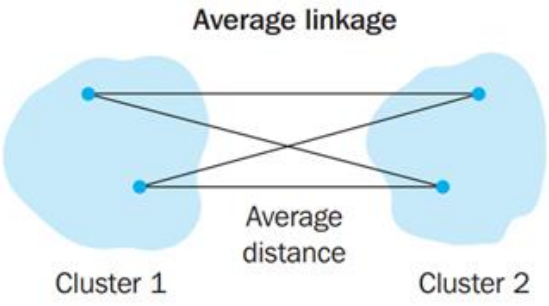

Figure 6-7. Average linkage method (Malhotra and Birks, 2006)

These three linkage methods have the same algorithm. The distances between the elements are calculated, and the clusters are grouped with the greatest similarity. However, calculations and selections of distances are different.

6.2.1.1.4 Ward's Method

This method was created as a hierarchical clustering technique for "least information loss" in 1963. In order to ensure that the loss of information is at a minimum level, there should be a minimum increase of the sum of squared Euclidean distance. This is also called the minimum variance method. At each step of the process, subsets are combined with the minimum variance (Budayan, 2008). The ward method tends to cluster elements with relatively equal sizes and shapes. Furthermore, this method is sensitive to outliers. (Everitt et al., 2001).

6.2.1.1.5 Centroid Method

This method is based on distance between the centroids (geometric center) of the two clusters (Sarstedt and Mooi, 2014).

6.2.1.1.6 Median Linkage

Gower developed this method in 1967 (Gan et al., 2007). In this method, median distance between all pairs of points from the different clusters is calculated (Budayan, 2008).

6.2.2 Divisive Hierarchical Clustering

In the divisive hierarchical method, the process is the inverse/opposite of the agglomerative hierarchical method. The algorithm starts with the whole data set consists of all elements and divides the data set by sub-sets through extracting the similar ones. The algorithm continues by subdividing the clusters into smaller clusters. This process is continued until each element alone forms a cluster (Everitt et al., 2001). In this technique, the clustering is a process from "top-down" approach, as opposed to agglomerative clustering technology (Bandyopadhyay and Sriparna, 2013).

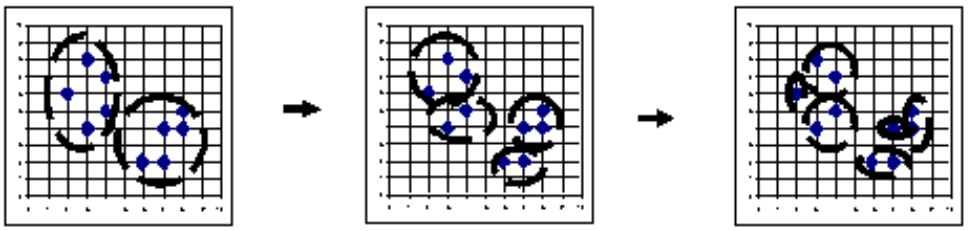

Figure 6-8. Divisive clustering example

When the divisive clustering technique is compared to the agglomerative clustering technique, the divisive clustering is more likely to produce erroneous results as more processing is needed. For this reason, agglomerative clustering is generally preferred. It can be said that the most widely used method between hierarchical methods in the literature is agglomerative one (Everitt et al., 2001). In this thesis, agglomerative clustering is used as well.

Hierarchical clustering techniques have both advantages and disadvantages. Some of which are mentioned in this thesis. For example, once elements are combined, the process continues through the newly created clusters. So, it is not possible to be returned with the aim of improving the cluster (Berkhin, 2006). On the other hand, it is flexible to the density of data objects. There is no need to determine the number of clusters before analysis and it is applicable with all of the distance measures.

As it is mentioned before, the hierarchical clustering continues until a desirable criterion is met. In hierarchical techniques, there is not a global optimal solution. Therefore, if there is not a threshold value for the cluster analysis, it is suggested that the several different techniques are applied and compared. Following these several analyses, the obtained dendrograms are investigated. The necessary interpretations are performed and the number of clusters is determined. Although there are some generated investigation method in the literature for determination of cluster number (such as investigating agglomeration schedule, plotting scree plot or calculating the number using generated indices), the number of clusters is generally determined subjectively (Budayan, 2008).

The methods to validate the results can be used for the determination of cluster number as an alternative. For example, silhouette index can be calculated for each application of analysis and the obtained values of indices can be compared. The most suitable one is selected as the best solution.

If there is a preliminary information about the number of clusters or if the researcher can decide on the number of clusters, it can be used non-hierarchical clustering techniques instead of hierarchical techniques (Anderberg, 1973).

6.3 Non-Hierarchical Clustering

In the literature, there are several non-hierarchical clustering methods. Some of them are k-means, k- medoids, Partitioning Around Medoids, Clara, Clarans algorithms. (Halkidi et al., 2001). In this thesis, the most commonly used non-hierarchical clustering method, which is named as k-means by Ball-Hall and MacQueen in 1967 is introduced. (Budayan, 2008).

In this method, in case the number of clusters is previously known before the analysis (i.e. predetermined), it is intended that the closest elements are collected in the same cluster. The objective of this method is to divide n elements into k clusters with the p-dimensional variable. The determined number of clusters for the operation of this method is to be fixed throughout clustering. The number of clusters is usually denoted by k, the determined k value shows the centroid of the cluster for the initial step. This method is based on that the cluster centroids represent their clusters.

At the beginning, the method assigns each element to a random cluster. After the first assignment, it creates cluster centroids. Then, each element is reassigned to the cluster most similar to itself by the distance between itself and centroid of its cluster. Cluster similarity is measured by the average value of the distances between a member considered as the centroid of the cluster and other elements of the cluster. If the elements are closer to one of the recalculated new centroids, they are moved to this suitable cluster. The centroids of each cluster are recalculated and the process

continues in an iterative manner. The assignments are performed in each iteration and optimized using the k-means algorithm. The assignment mechanism of K-means allows each data to belong to only one cluster. The sum of intra-cluster squares is reduced by moving the elements from one cluster to another. The algorithm selects the local optimum of the clustering solutions by repeating with different partitioning. The solution of clusters remains until the stage where the new assignments do not change the results. At the end, the local optimal solution is found (Han and Kamber, 2001; Budayan, 2008).

6.4 Validation Studies of Cluster Analysis

There are numerous (over 100 different clustering methods) generated algorithms for cluster analysis. Because cluster analysis is an unsupervised process, predefined classes or groups are not available. So, there are no examples or references can show what type of relations should be valid among the data to compare the analysis results (Halkidi et al., 2001). After completion of the obtaining results of the analysis, it is required to apply validation studies on the analysis results. In the literature, there are lots of validity methods generated for hierarchical and non-hierarchical cluster analysis separately. These cluster validation techniques can be categorized as internal (e.g. Davies–Bouldin index, Dunn index, Silhouette index) and external (e.g. Rand measure, Jaccard index) validation studies (Budayan, 2008; Desgraupes, 2013).

In addition to proposed indices and coefficients, there are various statistical techniques to validate the cluster analysis results. Furthermore, because cluster analysis can not obtain global optimal solution, generally, there is not only one best solution. For many researchers, applying different clustering techniques and methods on data set, and then comparing the results is an alternative suggested method. Cluster analysis results can be validated by interpretation and their reliabilities can be tested subjectively (Budayan, 2008).

Within context of this thesis, Silhouette index, which is widely used for validation studies and also suggested to use for validation of cluster analysis is used for validation of this thesis. In following section, silhouette index is introduced.

6.4.1 Silhouette Index

According to Rousseeuw (1987), silhouette refers to a method of interpretation and validation of consistency within clusters of data. Silhouette width S(i) determines the quality index and it is valid for different distance metrics. It can be obtained by using following formula (Budayan, 2008).

$$S(i) = \frac{b(i) - a(i)}{\max\{a(i),\ b(i)\}}$$

where a (i) represents the average dissimilarity of i to all other objects of A, C represents any cluster different from A and d (i,C) represents the average of i to all objects of C, and for all clusters not equal to A, d (i,C) is computed and the smallest one is identified as b(i).

S(i) is between −1 and 1. The value s(i) may be interpreted as follows:

• s(i) =1 object i is well classified (in A);

• s(i) =0 object i lies intermediate between two clusters (A and B);

• s(i) =−1 object i is badly classified (closer to B than to A).

The quality index of clusters is the overall average silhouette width of the silhouette plot, defined as the average of the s (i) over all objects i in the data set (Budayan, 2008).

CHAPTER 7

GROUPING OF COUNTRIES BY USING CLUSTER ANALYSIS

This Chapter presents application of cluster analysis for grouping of countries in which Turkish contractors frequently work. In order to perform the analysis, the hierarchical clustering method, which is mentioned in the previous Chapter is used. The implementation of analysis consists of two parts, namely country data collection and application. In context of this Chapter, collection of necessary data and application of hierarchical cluster analysis are presented.

7.1 Data Collection

For grouping countries, first, necessary data to be used in the analysis should be collected. In this thesis, necessary data of countries to be clustered are obtained by the previously prepared country evaluation form. The evaluation form is grouped under 12 main sections related with characteristics of the host country. Some factors in sections of this form can be collected objectively (i.e. through searching online databases or websites, from available information sources). On the other hand, some of the other factors of the form should be obtained from personal perspective of contractors by using their opinions. Thus, the form is divided into two parts for the collection of the country data.

In the first part, the country factors, which can be related with subjectivity, are asked for evaluation of industry professionals. The main reason behind dividing the form into two parts is that the received values of these factors can be affected by the point of view of the professionals who evaluate the country during evaluation process. In

other words, their evaluations depend on the perspective and subjective judgments of the professionals. The first part of the form is used for obtaining country data through both an online survey and face-to-face meetings with industry professionals who are experienced in international construction. The professionals have been working in international construction projects as contractor and been working in reputable construction companies for a long time.

This part of the form is mailed to a list of these professionals. Requests for this survey are made by e-mails and telephone calls to industry professionals. 40 of the requests were answered. This analysis is performed in order to group countries according to the their situations in the recent years. Thus, professionals are asked to select the countries that they have worked in and have information about and are asked to evaluate the conditions of these countries considering the conditions in the recent years (last 5 years). The country list that is sent with the evaluation form can be seen in Appendix C.

In addition to the online survey, for this part of the form, the face-to-face meetings with extensive discussion and with immediate clarification of the questions and responses are arranged. For these meetings, 2 professionals who have the same respondent profile are interviewed. As a result, totally, 42 professionals have responded to the survey and as a total number, data of 39 countries is collected. The response numbers for each country are presented in the Table 7.1.

Table 7-1. List of evaluated countries and number of responses

Country	Responses	Country	Responses
Afghanistan	**1**	Morocco	**2**
Albania	**2**	Mozambique	**1**
Algeria	**3**	Nigeria	**2**
Azerbaijan	**4**	Oman	**3**
Belarus	**1**	Pakistan	**2**
Djibouti	**1**	Poland	**1**
Georgia	**1**	Qatar	**8**
Germany	**1**	Romania	**2**
India	**1**	Russia	**13**
Iran	**2**	Saudi Arabia	**7**
Iraq	**5**	South Africa	**1**
Jordan	**2**	Tajikistan	**1**
Kazakhstan	**4**	Tanzania	**1**
Kosovo	**1**	Turkmenistan	**4**
Kuwait	**3**	UAE	**7**
Kyrgyzstan	**1**	UK	**1**
Libya	**3**	Ukraine	**2**
Macedonia	**1**	Uzbekistan	**2**
Malaysia	**1**	Yemen	**1**
Moldova	**1**		

The collected data are in the form of qualitative data. For the analysis, codifying the collected data is better for easiness of the application. This part is important because it can directly affect the results of the analysis.

In this analysis, one of the main concern is the effects of countries on project performances. As it mentioned before, the form is prepared by considering all situations of countries that can be observed in both negative effect and positive effect in terms of their effects. The situations that can adversely affect the projects can be considered by the smallest number (i.e. one, 1) among the codified numbers for representation of their effects on the project. On the other hand, situations that have

positive effects on projects should be considered by the value that would greater number in codification.

As a result, each sub-factor to be evaluated is codified and each has a representative number on the number line. These codified numbers are ranging from number one (1) to any positive number that is used for the best situation of the country, which has the most positive impacts. It is noted that not all the sub-factors have to be on the same scale for evaluation. It depends on the evaluation option of each sub-factors set. Thus, the scale used for representative numbers can be different from each other. In the literature, significance of determination of the intervals used for representing and codifying is emphasized. In this thesis, due to the fact that the determined intervals on the scale are important for the calculations of measurements, codifying process of the each evaluation option is performed carefully with obtaining expert opinions and by reviewing literature related with the country factors and their effects. In other words, the differences between representative numbers of each evaluation option have an importance for the analysis. It should be carefully determined how much difference between the values of evaluation options is needed for representing their effects on projects. In addition to intervals of each evaluation option in itself, the relative relations among the sub-factors should be considered during codification process.

In order to determine the numerical values for each sub-factor, comprehensive and considerable efforts have been expended. As a result, all the obtained responses for each country are investigated in detail and have been quantified and codified, as it is mentioned before. Following the codification process, necessary calculations are made for preparation of the data for analysis through pre-processing.

As it is presented previously, for some country evaluations, which are made more than once for the same country, the average values of these multiple evaluations are found. Related with this issue, opinions of experts who present their opinions in validation studies of this research are obtained. Thus, one modified/adjusted and completed evaluation form is obtained for each country.

In addition to the first part of the form obtained through surveys and meetings, the second part of the form is also investigated. The second part of the form includes the factors that are based on objectively quantified variable such as GDP, unemployment rate etc. can be evaluated in an objective way. These are obtained from available databases, online information sources and websites, as it is mentioned before. Evaluation period of the second part is for the recent years, same with the first part.

For this part of the form, an extensive research has been conducted to obtain related country data. There are numerous resources, some of which are presented below.

- Economist Intelligence Unit,
- Eulerhermes,
- Euromoney,
- Eurostat,
- COFACE,
- Global Construction Outlook,
- IHS Global / IHS Markit,
- IMF,
- OECD,
- UNCTADStat,
- Worldbank,

Some of these resources are fully accessible whereas some of them are partly accessible. In this study, most of the databases that are open to the public and to registered users have been reviewed. As a result, the all of these available and accessible information sources have been examined to obtain necessary country information.

Some resources are limited in use such as EIU; however, accessing these data sources is provided with the help of the expert who has been working in the Ministry of Economy of Turkey. Additionally, country reports are provided through similar way. Therefore, country reports are examined in addition to online resources.

In addition to these sources, there are various online sources for data collection. Furthermore, there are also additional information resources such as consulates, ministries, chamber of commerce, consulting firms, government agencies, archives advertising agencies, societies, accounting offices, news agencies and the media, etc. (Lehner and Maier, 2000; Akçamete, 2006).

The country sub-factors whose information can be collected through these mentioned sources are listed below by grouping under their main factor.

For general financial conditions; value of national currency against specific defined/key currency, membership of the international financial institutions, trade organizations, chambers and insurance associations and relations, credit rating grade according to credit rating agencies.

For general economic condition; gross domestic product per capita (PPP), distribution of income, current account balance, balance of payments, level and trend of economic growth rate, level of interest rate and fluctuations, level of inflation and fluctuations, unemployment rate, economic crisis.

For general political conditions; state of war, existence of terrorism.

For general social conditions; existence of internal conflicts and social unrest, occurrence of civil wars, fractionalization by language, ethic and regional groups, level of crime rate, existence of nationwide strike, education level of the local people, level of social awareness and environmental sensitivity of the local people, development level of the institutions for protection of human right and labour practices.

For development level of the construction industry; the size of the construction market and related trend of the growth rate.

For geographical, physical, climatic conditions of the country; geological, hydrological, meteorological, natural disaster risk.

Following the data collection by using two parts of the form, these two parts are combined and all the values of the sub-factors evaluated for each country are investigated once again over this combined form in detail.

Taking into consideration that the sub-factors constitute the main factors, the averages of the sub-factor values of each main factor are calculated to obtain the value of main factors. Thus, the final country data of 12 main factors are obtained for 39 countries.

For obtaining the data matrix to be used in the analysis, following the collection of the final country data, the relative importance of each main factor should be taken into account. Considering the importance levels of each factor, the obtained country data are multiplied with their importance weights, which are determined previously through an online questionnaire.

Then, these collected data are investigated for preparing the analysis as inputs. Since the evaluation scale (i.e. range) can be different for each factor instead of being fixed, the collected country data should be standardized to be in the same scale due to the fact that the range can be different for each factor. The standardization of the data is important for the results of the analysis as it is previously explained. Within context of this thesis, method of normalization between 0 and 1 is used which is previously introduced. Thus, all the factors have values in between the same scale (to 0-1 range). Because of the importance weights are too small in terms of decimal values, in order to be more convenient for transactions, all the data obtained is multiplied by 100. As a result, the country data become ready for analysis.

7.2 Application of Hierarchical Cluster Analysis

In this study, it is decided to apply the hierarchical clustering method since there is not adequate information about the number of country groups and in this method, it is not preferable to determine the number of clusters before the analysis. Although non-hierarchical clustering method (k-means) is also tried in this thesis, hierarchical clustering method is selected for the grouping of countries.

Following the standardization of data, agglomerative hierarchical cluster analysis is performed, which is the most widely technique between hierarchical clustering in the literature (Everitt et al., 2001). For the analysis, "SPSS 23.0" is used, which presents the hierarchical clustering analysis methods in a user-friendly software. In cluster analysis applications, it is difficult to determine the most appropriate clustering linkage method before the analysis because the necessary information does not exist, as it is mentioned previous Chapter.

In the literature, there are many linkage methods for combining clusters, assignment of the elements and identification of the membership of each cluster in agglomerative hierarchical clustering. Applying a different method to the same data results in different clustering. It is obvious that the most appropriate method should be selected. To achieve this, instead of simply choosing and applying a single method, all of the methods available in SPSS are applied on the collected data. Namely, the methods of average linkage within groups, average linkage between groups, single linkage (nearest neighbor), complete linkage (furthest neighbor), centroid clustering, median clustering and Ward's method are applied.

There is the same situation for determining suitable similarity measurement. The calculations that are made by using different measurement result differently. Therefore, all possible and logical combinations of the available similarity measurements and linkage methods among from the Cartesian products of these two are tried for applications within context of this thesis.

Following these applications, outputs of the analysis are compared and are assessed in order to obtain the best result. In this thesis, the application with Euclidean measurement by using Ward Linkage is selected among them as the most appropriate one.

During application of agglomerative hierarchical cluster analysis, a dendrogram is obtained as an output according to the selected technique as it is previously mentioned. The obtained dendrogram can be found in the Figure 7.1.

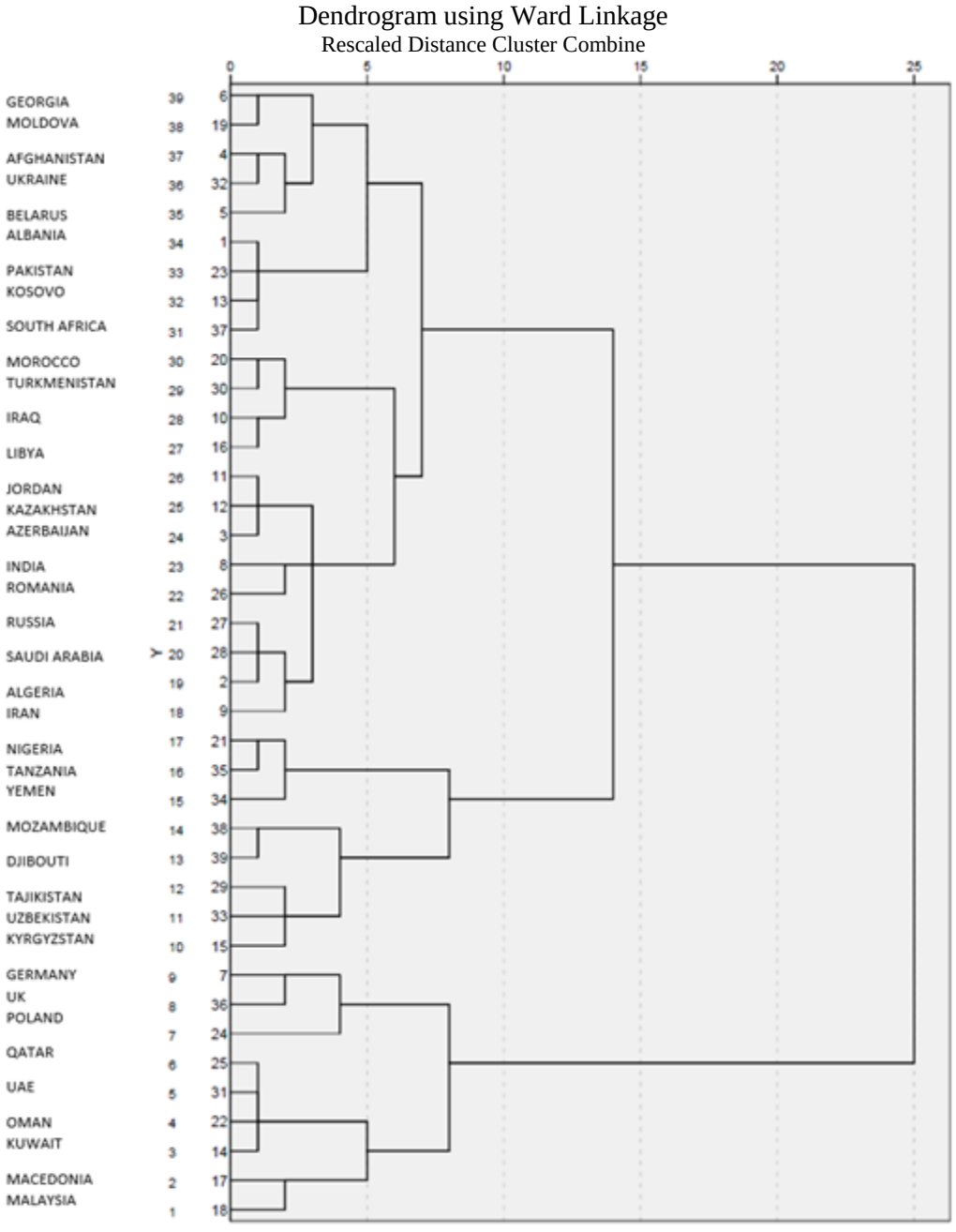

Figure 7-1. Dendrogram (taken from SPSS)

The horizontal axis of the dendrogram shows distances between the clusters in rescaled distances. On the other hand, the vertical axis of the dendrogram shows clustered countries with their names.

Determination of cluster numbers can be done with the help of the obtained dendrogram. When the dendrogram is examined, in case of going left to right along the horizontal axis, it appears that there are fewer new cluster formations and they are covering a larger number of countries.

For determining the most appreciated number of the clusters, similar clusters and intercluster distances can be interpreted by using the dendrogram, which is a graphical summary of the analysis results (Everitt et al., 2001). The number of clusters can be determined by dividing the dendrogram manually. However, determination of cluster numbers only with dividing the dendrogram is a subjective process. In other words, the number of the clusters can not be directly determined through only these outputs. It can be obtained with the investigation of these outputs subjectively. For this reason, the findings of the analysis obtained from the same outputs may vary from case to case (Budayan, 2008).

In addition to investigation of dendrogram, there are several methods for determination of number of clusters such as investigating scree plot or using indices recommended in literature. It is important that the cluster number is determined in a way that they are as homogeneous as possible within the cluster and their heterogeneity among the clusters is protected as much as possible. So, when determining the number of clusters, it is appropriate to select the highest value of Silhouette index, as it is mentioned. Thus, the number of clusters is determined by maximizing silhouette of the result of each application in the analysis as well as through obtained dendrogram in this thesis. Following the investigation of dendrogram, silhouette indices for each number of the clusters obtained from the dendrogram are calculated additionally.

In this thesis, the suitable number of cluster is selected as “three” clusters, which are further investigated in detail. The obtained results of the analysis according to the selected number of clusters such as dendrogram and tables are presented in the following Chapter.

CHAPTER 8

RESEARCH FINDINGS

In this Chapter, results of cluster analysis are presented. The obtained dendrogram as an output of the selected clustering techniques according to the appreciated method and measurement, membership tables of the obtained clusters and related tables for comparing the results are given. Interpretations and validations of the results are mentioned.

8.1 Findings of Hierarchical Cluster Analysis

In this thesis, Ward Linkage with Euclidean measurement are found the most appreciated linkage method and measurement for applying agglomerative hierarchical clustering on this data set. According to the results of the cluster analysis, the suitable number of clusters is found as three clusters, which have 22, 8 and 9 elements (i.e. country), in separate clusters respectively. Silhouette Index value is used for determining number of clusters and validation studies. In this thesis, according to the analysis results, Silhouette index of the selected application as the best solution is found as 0.283. According to Sarstedt and Mooi (2014), value of Silhouette index between 0.2 and 0.5 indicates that solution is fair. Thus, Silhouette index of 0.283 represents a fair cluster solution. Thus, the best solution for this application is three clusters. The number of clusters is also validated with expert opinion, which is mentioned in detail at the end of this Chapter. The related evaluations and interpretations of these clusters by experts are given in the last part of this Chapter.

The obtained dendrogram from SPSS 23.0 according to the analysis results can be shown with representations of each obtained clusters and countries in the following Figure.

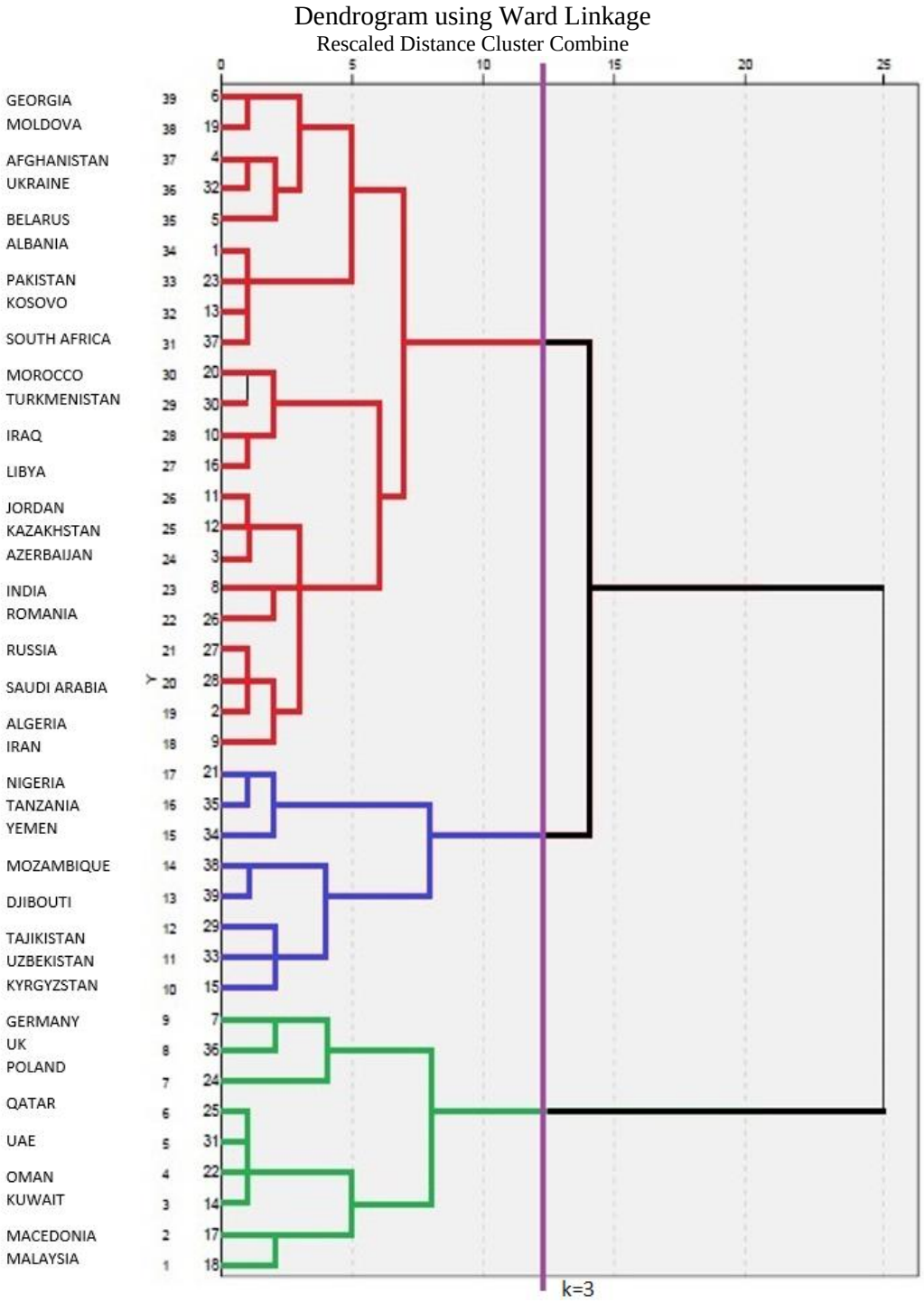

Figure 8-1. Dendrogram (with coloured representations of clusters)

Within this thesis, according to the obtained dendrogram, the cluster shown in red is called as Cluster A, the cluster shown in blue is called as Cluster B and the cluster shown in green is called as Cluster C, until they have their own cluster labels. Because there is no class or group label before the analysis. Thus, firstly, these obtained clusters are named as letters. There are 22, 9 and 8 countries in each of these three clusters. The members of these clusters are presented in a type list of countries in Table 8.1. The countries are listed according to their clusters.

Table 8-1. Cluster memberships

CLUSTER A, n=22	**CLUSTER B, n=8**	**CLUSTER C, n=9**
Afghanistan	Djibouti	Germany
Albania	Kyrgyzstan	Kuwait
Algeria	Mozambique	Macedonia
Azerbaijan	Nigeria	Malaysia
Belarus	Tajikistan	Oman
Georgia	Tanzania	Poland
India	Uzbekistan	Qatar
Iran	Yemen	UAE
Iraq		UK
Jordan		
Kazakhstan		
Kosovo		
Libya		
Moldova		
Morocco		
Pakistan		
Romania		
Russia		
Saudi Arabia		
South Africa		
Turkmenistan		
Ukraine		

Following the analysis, namely determination of number of the clusters and country groups, the countries in each cluster are investigated. The analysis results can be interpreted for each factor according to the average of each cluster. The average values of the countries in each cluster according to 12 main factors are calculated for each cluster. Table 8.2 shows average values of each country factor for each cluster.

Table 8-2. Clusters and averages

Country Factors	**A**	**B**	**C**
General financial conditions	4,23	2,01	7,51
General economic conditions	4,63	2,47	7,31
General political conditions	3,65	1,53	6,53
General social conditions	2,09	2,92	4,47
Legal conditions	2,89	3,67	5,70
Development level of the construction industry	3,58	1,90	6,37
Regulations and requirements	7,07	4,18	5,59
Difficulties for foreign companies	2,36	2,97	2,59
Level of bureaucracy	2,88	3,77	4,04
Local resources	3,59	0,81	6,38
Religious, linguistic and cultural structure of the country	5,15	6,36	4,88
Geographical, physical, climatic conditions of the country	3,35	1,10	5,42

In the following paragraphs, each cluster is investigated in terms of country factors. Regarding financial conditions of the countries, as it is seen, Cluster C has the highest average value whereas Cluster B has the lowest value. For economic conditions, the same cases are observed. Similarly, for political conditions, the highest and lowest values belong the same Clusters. Thus, for the first factors of the form, which are related with the macro conditions, Cluster C has the highest, therefore, it can be said that countries in Cluster C have the most favourable macro conditions, whereas

countries in Cluster B have the most challenging environment. The similar comments can be made for other country factors. For instance, in terms of development level of the construction industry, Cluster C is the most developed one whereas Cluster B is the least developed one. For the construction related regulations and requirements to be applied, it can be said that Cluster A has the highest value followed by Cluster C. One of the case where Cluster B has the highest value is the requirements/ difficulties/ constraints issued specific to foreign construction. For this factor, Cluster C is the second whereas Cluster A is the last. In terms of quality and availability of local resources, Cluster B has almost zero value. In terms of potential problems or conveniences to foreign companies due to the religious, linguistic and cultural structure of the country, Cluster B has the highest value whereas the lowest value belongs to Cluster C. As a summary, Cluster C has the highest value in terms of macro conditions. It can be seen that Cluster A, which has large number of countries, generally takes a value between the values of the other clusters. The other clusters namely Cluster B and Cluster C have the boundary value for majority of the country factors.

In the Table 8.3., countries in each cluster and their continents can be seen. If investigation of the structures of the clusters in terms of their continents is preferred, the following table can be examined. When it is examined, it is seen that majority of the countries belong to Cluster A. Cluster A consists of the countries that are located in each three continental namely, Africa, Europe and Asia. In Cluster B, there are countries from Africa and Asia, without Europe. On the other hand, in Cluster C, there are countries from Europe and Asia.

Table 8-3. Countries in each clusters and their continents

	Cluster A	**Cluster B**	**Cluster C**
Africa	Morocco South Africa Algeria Libya	Tanzania Mozambique Nigeria Djibouti	
Europe	Albania Azerbaijan Belarus Georgia Kosovo Moldova Romania Ukraine Russia		Poland Macedonia UK Germany
Asia	Afghanistan India Iran Iraq Jordan Pakistan Saudi Arabia Turkmenistan Kazakhstan	Uzbekistan Yemen Kyrgyzstan Tajikistan	Qatar UAE Kuwait Malaysia Oman

As an example, the same clustered countries are grouped based on only the results of country risk ratings of COFACE, which is an institution related with country risk ratings. When investigating the country risk map generated by COFACE for 2016, it is observed that country groups according to this risk map provided by COFACE are different from the obtained similar countries according to the cluster analysis. The main reason of this situation is that COFACE groups the countries according to country risk by using the variables related with the only macro conditions. It shows that, only country risk based country grouping (without consideration of industry

factors) may not show the desired clusters accordance with the aim of this thesis. The aim of COFACE is presenting country risk map, which is different from the aim of this thesis. Thus the variables are different and so, the results are different.

Similarly, only geographical location based grouping also can not assist for facilitating learning. Similar countries specific to construction industry do not have to be consisting of geographically neighbouring countries. Thus, these two examples (continental and risk) prove that there is a need for additional efforts for identification of similar countries specific to construction industry to facilitate learning. In addition to these comparisons, the existing country classifications made by UNCTAD and OECD are investigated as well. In a similar way, the results are different. This is reasonable and not surprising because OECD groups countries according to development level. However, it is not enough for country groups specific to construction industry. These results also show that the requirement of determined of country clusters specific to construction industry.

In addition, for observing how geographical location (i.e. continentals) and country risk ratings affect distribution of the clustered countries, clusters are shown in a tabular format that include both country risk levels and information about the continentals. This tabular format can be found in the Table 8.4.

Table 8-4 . Countries and their risk levels (adapted from COFACE Risk Rating)

	CLUSTER A	CLUSTER B	CLUSTER C
LOW	India Morocco Romania		Kuwait Malaysia UAE Qatar Poland Germany UK
MEDIUM	Albania Azerbaijan Georgia Russia Kazakhstan Saudi Arabia Pakistan Jordan South Africa Algeria	Djibouti Tanzania	Macedonia Oman
HIGH	Libya Turkmenistan Iran Afghanistan Iraq Belarus Kosovo Moldova Ukraine	Tajikistan Kyrgyzstan Uzbekistan Yemen Mozambique Nigeria	

AFRICA - EUROPE - ASIA

In addition to these presented outputs according to these analysis results, the world maps are coloured in order to present these results virtually. Three maps are coloured in order to show the locations of the clustered countries, results of the cluster analysis and country groups of the clustered countries according to COFACE risk ratings. By

this way, the results of country risk ratings according to COFACE and the results of cluster analysis that is performed in this thesis can be compared. Therefore, the differences between the country groups only based on risk ratings and the similar countries obtained according to cluster analysis can be observed. These prepared world maps are presented for illustrating the results of the cluster analysis in following figures.

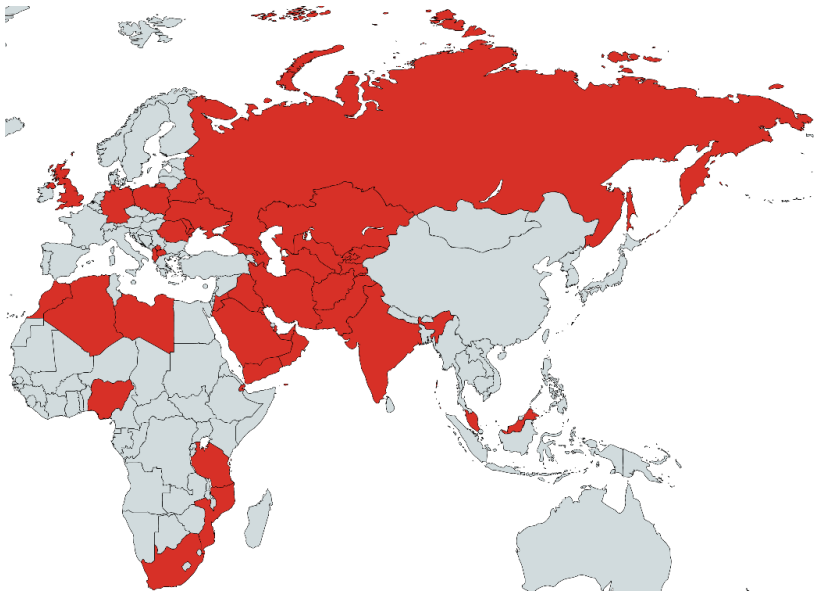

Figure 8-2. Clustered countries

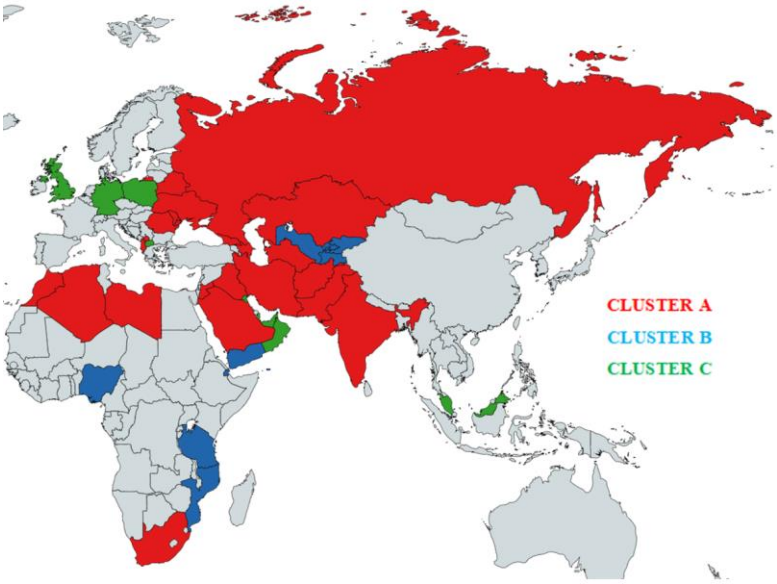

Figure 8-3. Obtained country groups according to cluster analysis results

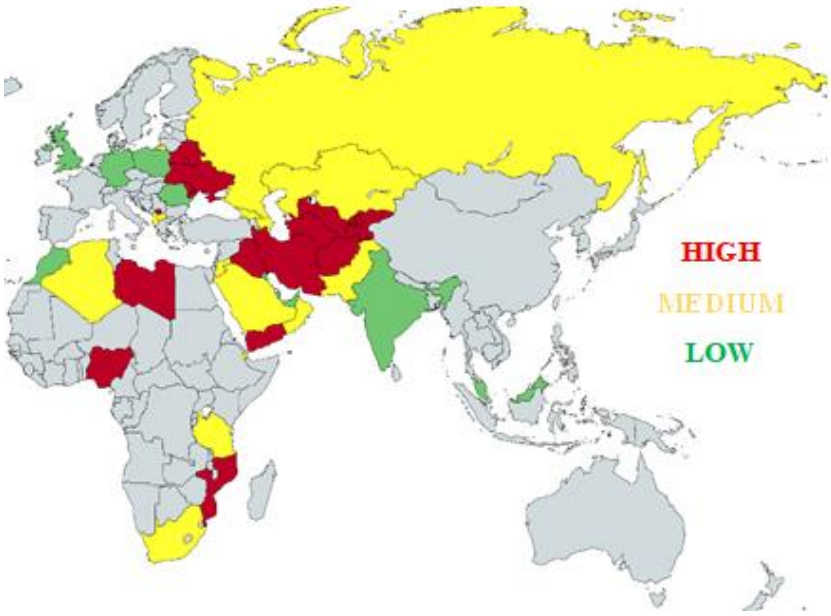

Figure 8-4. Country groups according to country-risk level (from COFACE)

8.2 Evaluation of the Results and Findings

In this thesis, as it is previously mentioned, the application using Euclidean measurement and Ward linkage is selected as the most suitable solution for this thesis. While determining the suitable number of clusters, the all possible methods are applied to the collected data, as it is mentioned before. The solutions, which have the maximum number of Silhouette indices, are selected. Then, the obtained clusters are investigated in detail and are compared to determine the best solution.

According to conducting necessary analysis, the final solution, which has three clusters, is selected. Following the determination of number of clusters, the obtained clusters are investigated and interpreted through interviewing with three experts who also assist validation studies for this thesis. These experts have been working in Ministry of Economy of Turkey at the Department of Overseas Contracting and Engineering Consultancy Services for a long time. All of these experts are specialized in international construction as well as international relations. One of these experts is Head of the Department. They all have great experiences about Turkish contractors' works in various foreign markets. Interpretation of results and findings as well as the validation studies of this thesis are provided with the regularly arranged interviews with these experts in the Ministry of Economy.

For cluster analysis studies, one of the most important and critical steps of the analysis is determination of the labels for the obtained clusters. Because there are no predetermined classes or labels in cluster analysis, these labels can be determined following the completion of the analysis and the appearance of the clusters. For this stage of this thesis, labels are determined with the help of these experts' opinions. Before determination of labels of clusters and validation studies, experts interpreted the obtained clusters, which are findings of this thesis.

For Cluster A, experts stated that the main reason for the appearance of the countries together in this cluster could be the applied methods of Turkish contractors in these markets. They can apply their methods of doing business in these countries relatively

easily. In other words, it is relatively easy to sustain their strategies and policies for business from their perspectives. Experts made some additional comments for this Cluster. For example, they said that Turkish contractors have determined and adopted some style of doing business and can behave by using this style. Thus, they may feel more comfortable in these countries, maybe because they have worked in these countries for a long time. Constructing and doing business with their own style make them confident and they feel more comfortable. Although there are risky situations, they may feel comfortable. In addition, it may be related with the Turkish contractors' risk-taking behaviour and risk attitude.

However, the situation is different for relatively new markets such as Sub-Saharan and also the countries that are in mostly poor conditions with under developed construction market. Experts said that Turkish contractors have faced some difficulties in these hard conditions. Thus, they might mostly evaluate the countries in Cluster B with the low value.

For the last group of countries, namely Cluster C, it can be said that majority of these countries have rich conditions especially for financial and economic conditions that are extremely important for construction industry with developed construction market. Experts said that together with the good macro conditions, they have strict structure for foreign contractors and most of these countries in this cluster have similar structure in terms of their adopted policies to apply. This makes the construction process harder for Turkish contractors. Thus, international contracting may not be done relatively easily in these countries. For example, most of the Arab countries in this cluster and their legal conditions are similar with Anglo-Saxon style, in a similar way; the European countries such as UK have strict bureaucracy. Thus, these conditions may make doing business relatively harder according to Turkish contractors.

Following interpretation of these obtained clusters, cluster labels can be described considering the characteristics of the majority of countries in the clusters. The labels are intended to reflect the majority of the countries in the group concerned. As a result of the interpreted clusters, labels can be determined as follows,

For Cluster A, which has “risky, average macro conditions with good doing business environment”

For Cluster B, which has “very risky, bad macro conditions and average doing business environment”

For Cluster C, which has “low risky, good macro conditions with good doing business environment” can be expressed in three different labels.

These experts also assist for validation studies of this thesis. These studies are provided with the regularly arranged interviews with these experts, as it is mentioned before. As a result of the necessary investigations are carried out, it is decided that the solution has three clusters is the appropriate solution for this data set according to this analysis, then this result is asked to experts for validation.

Experts said that although the obtained clusters are mostly reasonable, some countries could be in different clusters such as Uzbekistan and Tanzania. They said that the places of these countries might change, if the analysis is repeated in 2018. One of the reasons for these cases is that the results of the analysis directly depend on the collected data as inputs of the analysis. In addition, they said that country conditions as well as the perspectives of Turkish contractors are changeable. For example, they said that the position of Uzbekistan may be related with the events in 2016, experts said that it may not expected that Uzbekistan falls in to Cluster B, so its reasons may be seasonal.

Additionally, they said that another reason for these cases might be subjectivity. In addition, experts said that these clustered countries are difficult to group specific to construction industry; however, they said that the clustering in this thesis is one of the possible solutions.

Considering the experts’ opinions and comments, it can be said that these clusters are representative for this research within context of thesis and the obtained results are found reasonable. Experts stated that the results are suitable to reflect the majority of the perspectives of contractors. Additionally, the profile of contractors who evaluate

the countries by using the form is tested for reliability and it is found suitable. Furthermore, the obtained similar countries are reasonable for Turkish international construction market and also proposed methodology is applicable, which provides the validation studies of this thesis within its scope. As a final remark, this thesis is open to improvement. Discussions and several suggestions are presented in the conclusions part of this thesis.

CHAPTER 9

FACILITATING LEARNING FROM COUNTRIES BASED ON SIMILARITIES

Construction companies may need to identify similar countries for investigation of similar lessons learned gained in international markets in order to benefit from the previously mentioned advantages of transferring knowledge and learning. In this thesis, cluster analysis is proposed as a method for grouping of countries and identification of similar countries. An application of cluster analysis is presented to show how countries can be clustered and similar countries can be identified. Discussions on how findings of this analysis can be used to facilitate learning from international construction projects are provided in the following sections of this Chapter.

The findings of this thesis can be utilized in the research project, which is previously mentioned in introduction of this thesis. Within this context, the tool namely COPPMAN which is developed in this research project is firstly introduced briefly. Then, possible use of the proposed methodology and findings of this thesis by incorporation in this developed tool is mentioned.

9.1 COnstruction Project Portfolio MANagement (COPPMAN)

When international construction companies execute several projects concurrently, portfolio management provides effective management of the suitably selected projects for the companies considering their resources, capabilities, strategic objectives, environmental factors, etc. (Bilgin et al., 2018). In the construction industry, construction companies need a decision support system at the portfolio level for

successful project, portfolio and strategic management when companies implement project portfolio management. The research project aims to develop a decision support tool for the project portfolio management for the construction companies named as COnstruction Project Portfolio MANagement (COPPMAN).

COPMANN facilitates capturing project knowledge and utilizing of previous project knowledge to portfolio analysis, performing similarity analysis between projects, performing analysis of portfolios considering interdependencies between projects, incorporating strategic fit into analysis of portfolio value and enabling selection of the best portfolio considering strategic priorities of the company, making decisions by providing visual representations of alternative scenarios. Companies may assess the similarity and dependency between their projects, make predictions based on past project information, evaluate the risk and strategic fit of a portfolio through this developed tool. Details of this tool are presented in study of Bilgin et al. (2018) in detail.

COPPMAN consists of five main modules. One of these modules is Knowledge Management Module, which is examined in study of Eken et al. (2017). This module also related with the retrieval of the lessons learned, which is the important step of the knowledge management. With the help of this module of tool, lessons learned may be retrieved and to be used as a supportive information for evaluation of the current projects of the company. In the tool, there are several mechanisms for retrieval of the lessons learned, one of them is similarity-based search.

In this existing tool, user may assign the similarity percentage of each attribute of similarity, one of which is country similarities. The country similarities are assigned by the user as a percentage of pairwise similarities between countries without any evaluation process of the country. These assigned similarities are used for determining similar lessons learned. In this developed tool, there is only one section for assigning country similarities, as can be seen in the Figure 9.1. for searching similar lessons learned.

The assignment of similarities is exemplified as follows. If the company has a potential project in Russia, the professionals may want to investigate the similar lessons learned. Thus, they assign the similarity percentage of each attribute of similarities, one of which is country similarities. In this existing tool, both the similar countries and percentage of similarities between countries is assigned by the user manually. As an example, Russia and Latvia are assigned as similar countries with 40% similarity by the user as can be seen in the Figure 9.1, which is taken from COPPMAN. Following the assignment of similarities, tool presents the most similar lessons learned. A list of lessons learned is presented by the tool according to the obtained similarities as can be seen in the Figure 9.2, which is taken from COPPMAN.

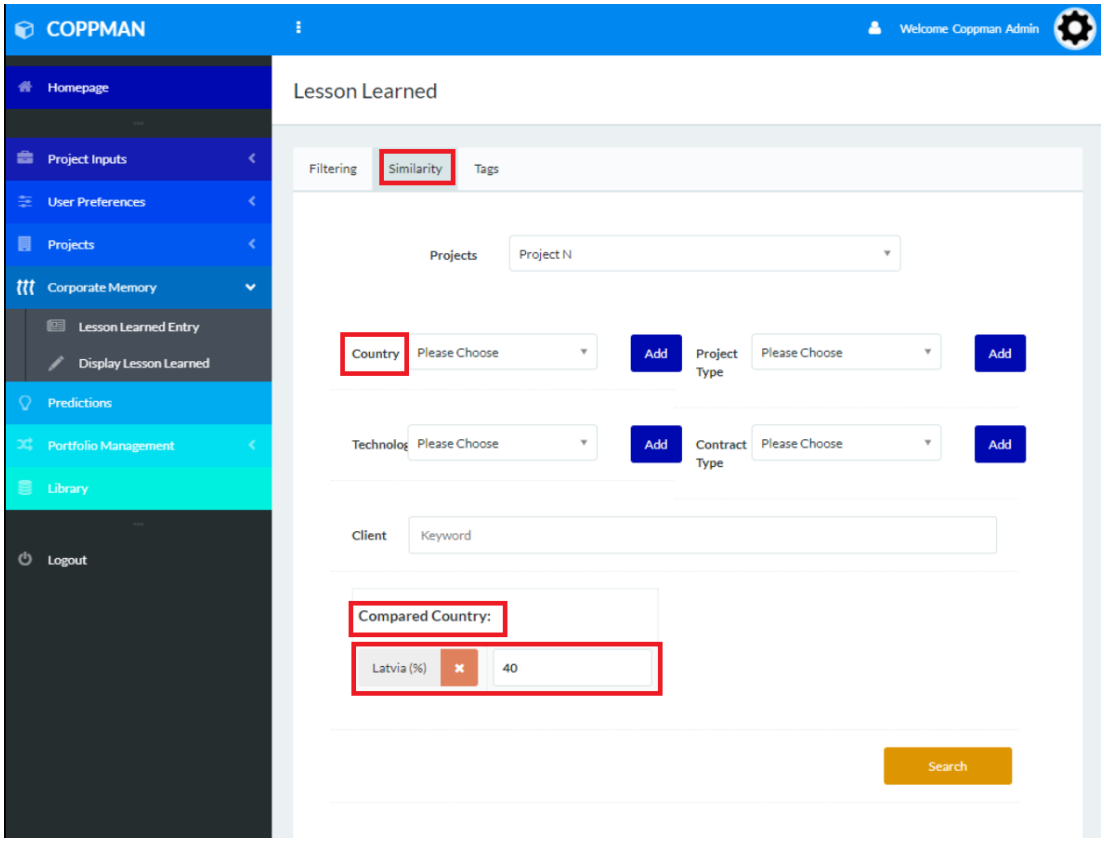

Figure 9-1. Interface of searching similar lessons learned

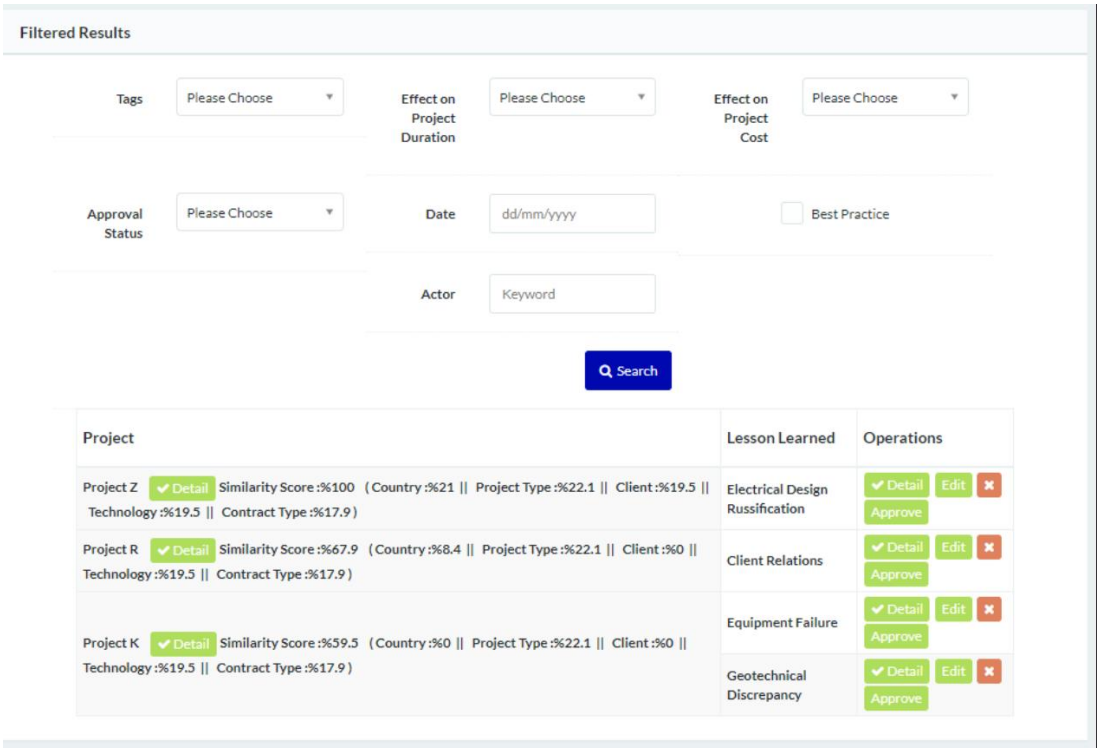

Figure 9-2. Lessons learned list according to similarities

Following the assignment of similarities, user can search and select the most similar ones from the provided lessons learned list in order to investigate the projects further by using the lessons cards. The same process can be applied for investigating similar lessons learned for each project.

In this case, assigning the percentage of similarity between the target country and the other countries in the portfolio of the company may be difficult for the user without any comprehensive country evaluation process. For country evaluation process, there should be several country factors to be evaluated, as it is highlighted in this thesis. These country factors should be analysed. Thus, multivariate analysis such as cluster analysis can be used for this purpose.

In addition, user has to determine the most similar country for the searching of similar lessons learned in the tool. When the proposed methodology is incorporated in this developed tool, user could search according to country clusters and could investigate more lessons learned.

As a result, the proposed methodology of this research can be a solution for the part of identification country similarities in this tool. If the proposed methodology is incorporated in COPPMAN, the findings of the cluster analysis can assist the user for the identification of country similarities.

Example for illustrating how the findings of this analysis can be used to transfer knowledge and to facilitate learning from international construction project is provided in following section.

9.2 An Illustrative Example

As it is previously mentioned, the similar lessons learned can be retrieved by using similarities between countries in the COPPMAN. The country clusters obtained by cluster analysis could be used for identifying similarities. If the countries are clustered, the results might present the similar countries to the user of this developed tool and could assist for determination of country similarities.

Within the context of this thesis, countries are clustered specific to construction industry, considering that identification of the country clusters would enable the investigation of similar lessons learned gained in these similar countries. Handling similarities among countries can improve accessibility of related necessary information. By this way, transferring lessons learned between countries can be facilitated. A global contractor company example will be given in order to illustrate how identification of the similarities and obtained groupings may facilitate learning.

If a medium or large sized construction company is considering undertaking a project in UAE, company professionals may want to investigate the conditions related with UAE. As it is mentioned before, competitiveness of companies in the global construction industry can be maintained by using the right strategies and making the right decisions (Eken et al., 2017). Therefore, the global construction company should make suitable decisions according to investigation results of their past project experiences, post-project appraisals and project review practices (Akatsuka, 1994;

Ozorhon, 2004). In addition, company professionals should investigate previous international projects in order to understand how country related factors and conditions of UAE affected project success or led to failure.

For the specific case in hand, in UAE, it is important to determine which experiences and reviews are more related and more suitable for investigation to use them for planning and decision making during execution processes of this project. If the company has worked in UAE before and also has a current project executed in UAE, the lessons learned and experiences gained in UAE are the most valuable ones for decision making. However, the number of lessons learned gained in construction may be limited or some of them might be lost because of the previously mentioned characteristics of the industry. In this case, company may need more lessons learned to investigate. If this construction company applies the methodology, which is recommended in this thesis, and performs the cluster analysis in a similar way, company can use the obtained clusters to access related lessons learned. By this way, company professionals can search for similar countries rather than looking at all the countries where they have executed projects.

Within this illustrative example, UAE falls into Cluster C according to results of the performed analysis. Thus, lessons learned gained in the countries, which are placed in Cluster C, may be investigated to learn about their previous experiences. For this, first, the cluster analysis results should be examined in detail. Then, the lessons learned gained in these countries in the Cluster C can be investigated, starting from the most similar countries. For UAE, one of the most similar countries is Qatar. Thus, the lessons learned gained in Qatar can also be investigated in addition to UAE. It can be said that retrieval of necessary lessons learned and accessibility of the related information is important for managing knowledge gained from international projects (Kartam, 1996). Thus, this attempt can assist decision makers to identify which additional lessons learned should be investigated. As a result, related lessons learned can be more accessible; so, retrieval process is facilitated with the quick access of the related lessons learned. This would save time in the potential project in UAE of this

global construction company comprising voluminous and complex information. In addition, the more number of related lessons learned could be identified easily and the more number of similar lessons learned could be investigated for this project. As a result, accessibility of the related lessons learned within the same cluster of countries, which could be transferrable to UAE increases with savings in time and money.

In addition to the determination of which countries should be investigated for learning from, results of cluster analysis can enable to make some predictions about conditions of the countries by using the calculated averages for each country factor. By this way, the company may have a general idea about the status of these countries such as their macro conditions. For example, it can be said that the cluster of UAE (Cluster C) has favourable financial conditions, thus it is expected that the possibility of encountering a worst case about financial conditions is low.

In addition, clustering can provide the company an indicator to be used during knowledge retrieval. The main factors that the similarity between the country pairs originates can be identified as "learning opportunities". The problems that are generally faced or conveniences that are frequently met in these countries can be identified according the investigation of the analysis results. Therefore, experiences and lessons learned generally gained in these similar countries can be determined. These lessons can be transferred between countries in order to reuse them for decision-making. As an example for this illustrative case, "learning opportunities" can be identified as "financial conditions of the country". As an additional information, financial conditions of the country have high importance weight for determining similarities among countries according to the obtained findings of the related questionnaire (as in Chapter 4).

In this thesis, it is expected that lessons learned related with financial conditions in Qatar and UAE can be similar. Investigation of these lessons learned in Qatar can assist the company during decision making related with financial issues. In this thesis, it is recommended that lessons learned related with financial issues gained in Qatar should be examined. In addition, the questions of which problems related with the financial

issues were faced or which conveniences were met, how and why these happened and what solutions were found, which methods were applied should be asked. Decisions related with financial issues in UAE can be made and strategies can be selected according to the answers of these questions. For the case in UAE, level of difficulty in money transfer in UAE and Qatar can be given as an example to be more illustrative.

If there are gained lessons learned related with the conditions of money transfer in Qatar, and if it is considered as a best case example, the gained experiences and encountered conveniences would be transferred to be used in the project to be executed in UAE. For example, money transfer in Qatar can be carried out easily, in other words, there can be favourable conditions about money transfer. In this case, it is expected that conditions of money transfer in Qatar may be similar to UAE and would also be observed in UAE. Thus, decisions related with the money transfer for the projects to be executed in UAE can be made according to investigation results of the previously gained lessons learned.

Company professionals can evaluate themselves and investigate performances in the past projects realized in Qatar. They can examine how these conditions of money transfer affected their project performance in Qatar and how the potential project would be affected by the similar conditions. For instance, as a strategy, lessons learned in Qatar about management of the financial issues can be transferred to UAE. Financial planning of the potential project in UAE can be made considering these lessons and the previous financial conveniences for the project executed in Qatar. In case money transfer in project is carried out without delay, because of the conveniences of money transfer, they would make decisions and develop the right strategy accordingly. As a result, it can be said that retrieval of the related knowledge and transfer of this knowledge between UAE and Qatar could be facilitated. By this way, reuse of necessary lessons learned to make mentioned decisions could be enabled. As a final remark, if the company applies this proposed methodology, they could manage the gained knowledge and benefit from the gained experiences in Qatar, with facilitation of retrieval and reuse of knowledge. Thus, they could be aware of their abilities and

could assess their own capabilities under these financial conditions that provide conveniences and they could perform their strategic planning by understanding and improving themselves (Caldas et al. 2009).

Additional examples of similar analysis can be performed considering the similarities in availability of project financing for construction projects between UAE and Oman (the another most similar country to UAE according to clustering results).

Additionally, potential project in Djibouti can be given as an additional example. In this case, Djibouti falls into Cluster B, so, the countries in Cluster B are the most similar to Djibouti. As in the example of potential project in UAE, first, investigation of the lessons learned gained in Djibouti is the most suitable approach. In addition to these, investigation of lessons learned gained in Mozambique (the most similar country to Djibouti in Cluster B) can be beneficial, if there is a need for additional lessons learned investigation. As an example, for decisions related with the local resources to be used for the potential projects in Djibouti, lessons learned related with the conditions of local resources in Mozambique could be investigated. For this case, it is obvious that investigation of the all local resources-related lessons learned of the countries in other clusters is both time consuming and disincentive. As a result, it is recommended that the most similar ones should be investigated.

It is expected that the countries in Cluster B generally have difficulties in availability in terms of local resources, according to the cluster analysis results. Thus, it can be said that the local resources-related lessons learned of this Cluster can be considered as the worst-case example. Thus, the faced problems and project outcomes should be investigated. Determination of how these difficulties affected the performance of the project in Mozambique could be made. The company would learn how they could handle and manage these resource problems or which solutions could be found to minimize disadvantages of the similar scarce resources, when the company is to be faced with the similar challenging environment for the potential project in Djibouti. They could reuse these lessons to perform project in Djibouti with better decision-making.

For instance, if there were mistakes made by a local supplier related with the local resources such as spare parts in Mozambique, the outcomes could be examined and found solutions could be followed. During execution of project in Djibouti, the company would be aware of the responsible suppliers and developed strategies, then, they would make decisions accordingly. Thus, the project in Djibouti could be executed more efficiently with improved project performance under similar resource problems by recognizing the problems, taking preventive actions and minimizing mistakes. Therefore, as it is mentioned in literature, "the wheels will not have to be reinvented" (Javernick-Will and Levitt, 2010; Carrillo and Chinowsky, 2006).

CHAPTER 9

CONCLUSIONS AND RECOMMENDATIONS

Organisational learning is a critical success factor for construction companies. Construction companies should utilise effective tools and methods to facilitate learning from projects and transfer lessons learned between various markets. This is not an easy task as projects are temporary undertakings vulnerable to macro factors which are hard to codify, transfer and re-use. Especially, in the global construction market, knowledge on host country conditions is a source of competitive advantage. Although learning from valuable experience is important for the industry, there are various problems especially related with retrieval and reuse of knowledge. Within the context of this thesis, it has been discussed that if countries are grouped according to their similarities, construction companies can learn from the experiences gained in similar markets and sustain competitive advantage in the global construction market by not repeating the same mistakes or adopting best practices in similar conditions. For this purpose, first the country factors that affect performance of global construction projects were identified, country information was collected based on these factors and countries in which Turkish contractors have frequently worked were grouped using statistical cluster analysis. How companies may benefit from cluster analysis findings have been discussed from the perspective of organisational learning.

10.1 Contributions of This Thesis

One of the contributions of this study is determination of host country factors that affect project success. Based on the findings of a comprehensive literature survey and interviews with experts, factors affecting international project success have been identified and categorized. Although grouping of countries has been reported by many

researchers from different areas and disciplines, the possibility of using these standard groupings for the purpose of transferring lessons learned in global construction projects is limited. Thus, as well as the list of country factors that affect project success in global markets, a methodology is required for grouping of countries based on these factors. So, another contribution of the study is preparation of a country evaluation form composed of these factors that can be used to collect the required host country information which can further be used for clustering. As the third contribution of the thesis, a clustering method is proposed for grouping of countries. Various information resources including the data provided by international organisations and expert opinion were utilised to find out the related information about the countries in which Turkish construction companies have been working in. Using this data, the markets, actually 39 countries have been grouped into 3 groups by statistical cluster analysis using SPSS 23.0. Using the form proposed in this thesis, utilising the data sources and carrying out a similar cluster analysis as proposed in this study, companies can establish their own information systems and enhance their lessons learned retrieval processes. The fourth contribution is demonstration of how country similarities can be utilised to facilitate learning from projects in similar markets, as the illustrative examples in Chapter 9 such as transferring knowledge about local resources between countries.

This study has been carried out as a part of a research project funded by TUBITAK. The research project aims to develop a portfolio management tool, namely COPPMAN in which users can select the best portfolio option considering the risk, opportunities and strategic fit. One of the functions of COPPMAN is lessons learned database so that lessons can be transferred between similar projects. The clusters obtained as a result of this study is utilised during similarity assessment of projects and retrieval of lessons learned in similar countries.

10.2 Limitations, Recommendations and Future Work

One of the shortcomings of this study is subjectivity of information regarding similarity of countries. Most of the evaluations are based on perceptions of experts

who participated in this study; but, it is tried to cross check the data coming from various sources and data was compared by using various online databases. Also, since some countries are evaluated only once, averages can not be calculated for these countries which is another shortcoming of this study. It has to be mentioned that it would be better if all the countries are evaluated more than once. In order to increase data reliability, the input data has been discussed and double checked during the interviews with government agencies.

Additionally, some of the country factors, which are evaluated by contractors, have been evaluated by several institutions objectively by using specific methods or generated indices (e.g. corruption index). For decreasing subjectivity, these evaluated country factors could be used especially for evaluation of "the development level of the construction industry and working culture", which has the highest importance weight for determining similarities among countries according to the related questionnaire.

In this thesis, the scope has been limited to Turkish contractors and their international experience. Thus, the clusters are not generic and valid only for Turkish contractors. Moreover, the identified clusters are not static as country conditions tend to change in time. The data has to be updated in forthcoming years and clustering analysis has to be repeated. However, the identified factors and methodology of data collection and clustering are generic, meaning that by updating the country information over the years, contractors can update clusters and monitor the change in clusters to learn from similar country experiences in time. The country factors that are proposed to be included in databases and used for clustering may also be tailored according to the needs and preferences of construction companies.

As a future work, some other statistical analysis techniques (e.g. factor analysis, principal component analysis) can be further tried as well as artificial intelligence methods such as self-organizing maps. Additionally, the prepared form and the findings of this research can be further used for the studies related with the Bid/ No-bid (Go/No-go) subjects as a future work.

This thesis mainly focused on assessment of similarity of countries to facilitate learning from similar markets. However, it is known that construction projects are affected by several other factors such as project specific factors (type, size etc.), owner/client, contract conditions, project delivery system and/or partners. Thus, similarity assessment of projects is necessary to facilitate learning from projects, by taking into account of all project related factors as well as country related factors, which can be a subject of a further study.

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APPENDICES

APPENDIX A

TURKISH CONTRACTING IN THE INTERNATIONAL MARKET (1972-2016)

Information about trends and developments in Turkish contracting in the international market can be presented in following paragraphs. These reports are taken from TCA (2016).

Construction plays a crucial role in Turkey's economic development, accounting for 5.7% of GDP and employing some 1.9 million people. When the direct and indirect impacts on other sectors are taken into account the share of the construction sector in the Turkish economy reaches 30% and the employment rate excluding agriculture reaches 10%.

After a period of rapid growth in the 1980s, the two economic crises of 1999 and 2001 had a negative impact on the construction industry. The sector experienced the start of a recovery in 2002. Increased economic stability, decreasing exchange and interest rates and attractive long-term loans stimulated a demand for housing, playing a major role in this process. The sector grew by 13.9% in 2002, 7.8% in 2003, 14.1% in 2004, 9.3% in 2005, 18.5% in 2006 and 5.7% in 2007. Suffering under the effects of the global crisis, the sector experienced 8.1% and 16.1% decrease in 2008 and 2009 respectively, but made a remarkable progress and grew by 18.3% in 2010. The growth trend in the industry continued and realized 11.5% in 2011. In 2012, global and regional economic development slowed down and due to the impact of this deceleration on construction industry the growth rate increased only by 0.6% in 2012. By showing an increase the construction sector growth rate was realized as 7.4% in 2013 and it decreased to 2.2% and 1.7% in 2014 and 2015 respectively.

Turkey's unique geographical location contributes a great deal to the global competitiveness of the Turkish contracting services abroad. Turkey’s strength in the field is not only due to its location, but also the cost effective service provided at international standards, high client satisfaction, credibility in partnerships, extensive knowledge and vast experience in a wide variety of projects, familiarity with the business environments in the neighbouring regions, qualified manpower and a calculated risk-based approach to business.

The development of the Turkish construction sector over the last 91 years since the foundation of the Turkish Republic can be evaluated in five successive periods: Preparation, internal market activity, international market penetration, market and product diversification and global competition. The first two periods continued until the beginning of the 1970s.

Following its foundation in 1923, the Republic of Turkey experienced a rapid modernization process along with political, economic, social and cultural reforms with major infrastructure and industrial investments made throughout the country. In the 1920s special measures, including the employment of foreign experts in public agencies, had to be undertaken by the government to overcome the shortage of local engineers and architects. Under the influence of these public policies, and partly due to the economic crisis witnessed in Europe in those years, many European engineers, architects and entrepreneurs came to Turkey; and in 1925–1926 at least one third of the 28 construction companies established in Istanbul were of European origin.

The 1930s was the period of formation of the first generation of Turkish engineers, who founded many large scale construction companies in the following years and successfully executed numerous challenging projects both in Turkey and abroad.

The political change experienced in Turkey in 1950 and the country's accession to NATO in 1952 were the important milestones in the history of the Turkish construction sector with regards to infrastructure investments realized in the following years. In the same period, the first wave of Turkish engineers graduated from universities and began

their careers in an environment that offered great opportunities for the establishment of their own companies; and it was those businessmen who founded in 1952 the oldest non-governmental organization in the Turkish construction sector, the Turkish Contractors Association (TCA).

Construction of water supply projects in the 1950s, large dams and power plants in the late 1960s and early 1970s provided many opportunities to Turkish contractors to spread their activities throughout Anatolia.

1970–1979 Period

In the 1970s, Turkish contractors began pursuing business opportunities in foreign markets. Libya was the first country to export Turkish contracting services in 1972, whereas in less than 10 years Turkish contractors extended their activities to the Middle Eastern countries. With a share of 72.52% in the overall business volume Libya was the number one market for Turkish contractors in this initial period of international business, followed by Saudi Arabia (15.45%), Iraq (7.25%), Kuwait (4.71%), Greece (0.06%) and Iran (0.01%).

The major field of activity in this period was housing (32.1%), followed by seaport (%18.1), industrial plant (15.6%), road/bridge/tunnel works (11.7%), and urban infrastructure projects (8.2%)

Table A-1. Distribution of international works (1972-1979)

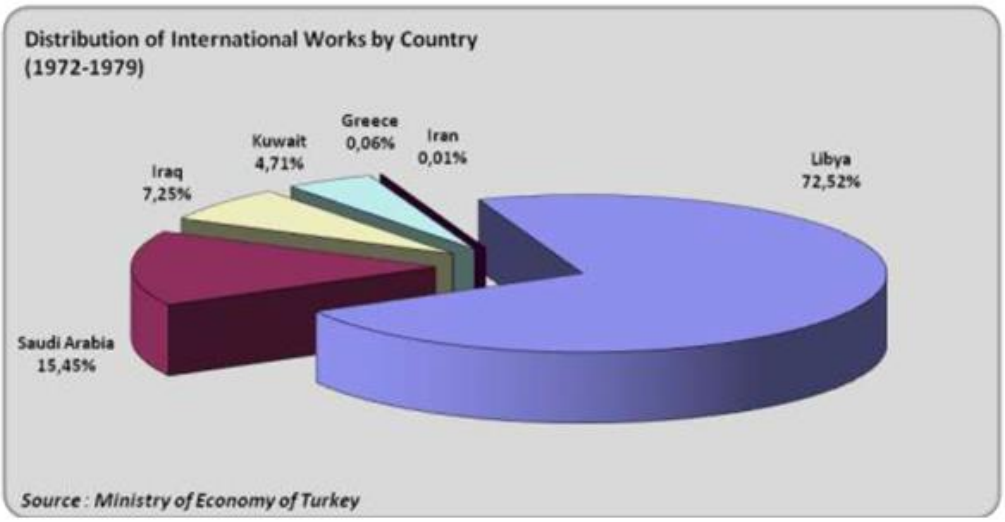
Distribution of International Works by Country (1972-1979)

1972-1979	
COUNTRY	(%)
Libya	72.53
S. Arabia	15.45
Iraq	7.25
Kuwait	4.71
Greece	0.06
Iran	0.01
TOTAL	100.00

Distribution of International Works by Nature of Work (1972-1979)

1972-1979	
FIELDS OF ACTIVITY	(%)
Housing	32.1
Seaport	18.1
Industrial Plant	15.6
Road/Bridge/Tunnel	11.7
Urban Infrastructure	8.2
Irrigation	4.0
Treatment Plant	2.9
Administrative Building	2.7
Power Plant	1.6
Other	3.0

Other: Military Facilities, Soc. Cult. Facilities, Commercial Centers, Airports, Drinking Water



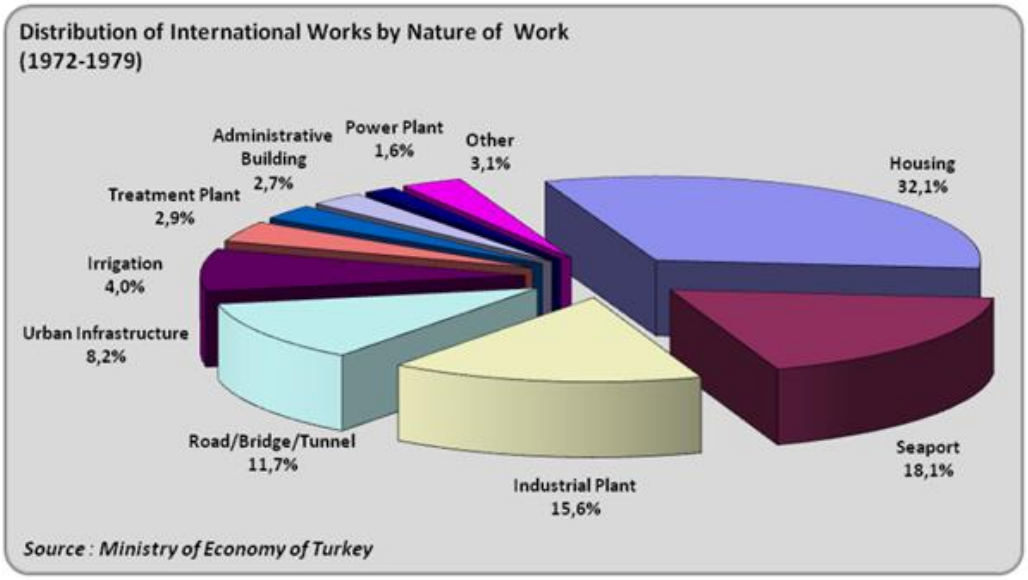


Figure A-1. Distribution of international works (1972-1979)

1980–1989 Period

The 1980s was an important decade in the restructuring of Turkey's economy. Starting from 1983, parallel to the developments in western countries, the country experienced a significant transition from closed economy of the 1970s to the market economy. Together with convertibility of Turkish currency, new agencies, such as the Housing Development and the Public Participation Administration were founded and new concepts, such as privatization and liberal economy were introduced to the country's economic system.

In the same period important infrastructure investments started in Turkey. Ataturk Dam (2400 MW), highway projects (approximately 2000 km) and telecommunication investments provided excellent opportunities for Turkish firms to cooperate with international partners, and thus improve their technical and managerial skills and become acquainted with the global finance system.

At the end of the 1980s the political changes in Eastern Europe provided further opportunities to Turkish contractors. Many companies focused on the Russian Federation as well as the newly formed Central Asian republics. In the same period they extended their activities to other markets including Jordan, Yemen, Iran, Saudi Arabia, the United States, Tunisia, the United Arab Emirates and Kuwait.

Despite a relative decrease in proportion (55.2%), the majority of foreign business continued to be in Libya, with Saudi Arabia (23.4%) and Iraq (11.5%) ranking second and third, maintaining position they had occupied during the previous decade. Dissolution of the Soviet Union and emergence of the new Central Asian republics besides the Russian Federation (3.8%) were the new developments of this period.

During this period the shares of housing (36.7%) and urban infrastructure projects (17.2%) increased, followed by road/bridge/tunnel (7%) and irrigation projects (5.4%).

Table A-2. Distribution of international works (1980-1989)

Distribution of International Works by Country (1980–1989)

1980-1989	
COUNTRY	(%)
Libya	55.2
S. Arabia	23.4
Iraq	11.5
Russian Federation	3.8
Yemen	1.5
Jordan	1.4
Other	3.2

Other: TRNC, Iran, Kazakhstan, Georgia, United States, Ukraine, Tunisia, United Arab Emirates, Algeria, Kuwait

Distribution of International Works by Nature of Work (1980-1989)

1980-1989	
FIELDS OF ACTIVITY	(%)
Housing	36.7
Urban Infrastructure	17.2
Road/Bridge/Tunnel	7.0
Irrigation	5.4
Health Facilities	4.1
Pipe Line	3.6
Industrial Plant	3.5
Seaport	3.4
Dam	3.3
Soc. Cult. Facilities	3.0
Other	12.8

Other: Drinking Water, Commercial Centers, Tourism Facilities, Treatment Plants, Administrative Buildings, Depots, Airports, Petrochemical Plants, Power Plants, Energy Transmission Lines, Military Facilities

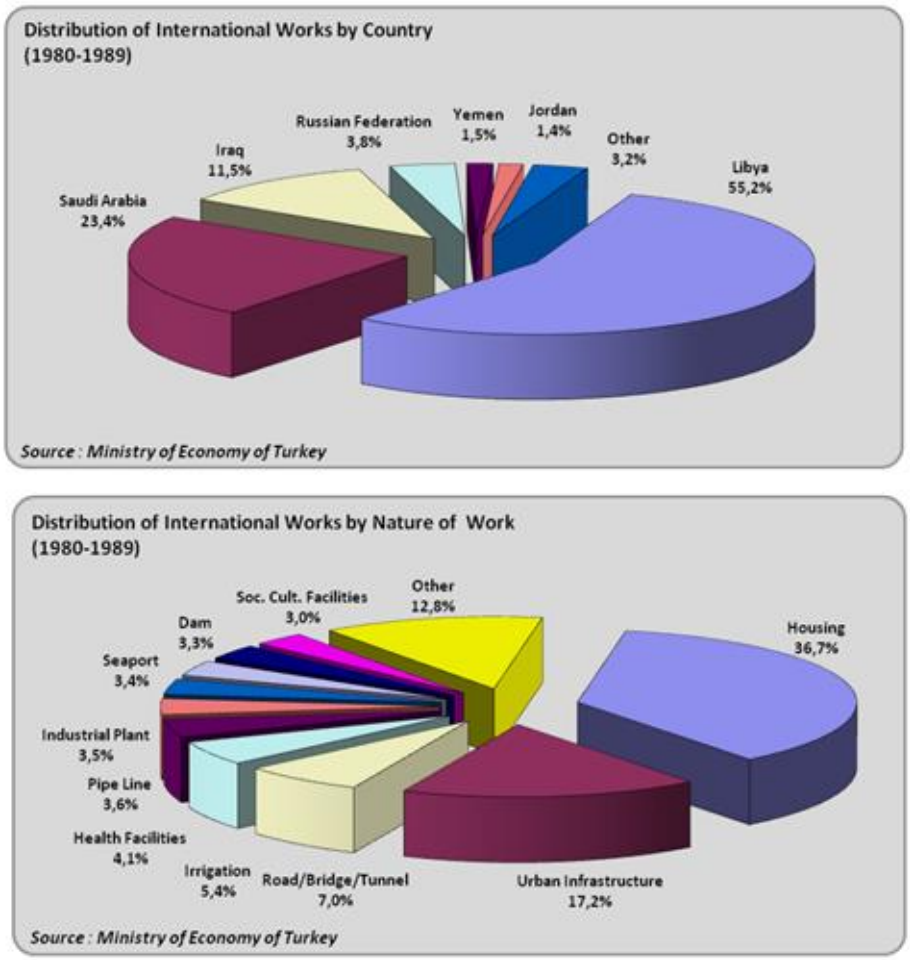


Figure A-2. Distribution of international works (1980-1989)

1990–1999 Period

In the 1990s, economic depression and political uncertainties in the Middle Eastern countries and Libya forced Turkish contractors to turn their attention to other countries in the nearby regions, with the new focus on Eurasian, Balkan and Asian countries. Many large-scale projects in the Russian Federation, Ukraine, Central Asian Republics, Germany and Pakistan were realized in this period.

In 1990–1999 period the projects completed in the Russian Federation and other Eurasian countries accounted for almost 60% of the total international business.

Market diversification was the major trend that characterized this decade. While the share of the Russian Federation increased to 34.5%, Libya's share decreased drastically to 13.7%, followed by Kazakhstan (7.8%) and Turkmenistan (6.7%). Pakistan (6.6%), Uzbekistan (3.9%), Saudi Arabia (3.1%), Azerbaijan (2.6%), Bulgaria (2.6%), the United States (2.5%) and Croatia (2.2%) emerged as new markets in this period. Other important developments were considerable decrease in the proportion of works in Saudi Arabia and disappearance of Iraq from the scene.

Despite a decrease in the share of housing works (24.9%) compared to the previous period, housing continued to be the number one activity in this period as well. Housing was followed by road/bridge/tunnel works (12.7%), industrial plants (9%) and commercial centers (8.1%).

Table A-3. Distribution of international works (1990-1999)

Distribution of International Works by Nature of Work (1990-1999)

1990-1999	
FIELDS OF ACTIVITY	(%)
Housing	24.9
Road/Bridge/Tunnel	12.7
Industrial Plant	9.0
Commercial Center	8.1
Tourism Facilities	5.9
Soc. Cult. Facilities	5.7
Administrative Building	5.3
Health Facilities	5.2
Petrochemical Plant	5.0
Power Plant	3.3
Urban Infrastructure	3.0
Seaport	2.3
Airport	2.1
Pipe Line	2.0
Irrigation	1.9
Other	3.9

Other: Depots, Energy Transmission Lines, Treatment Plants, Dams, Telecommunications, Military Facilities, Railways

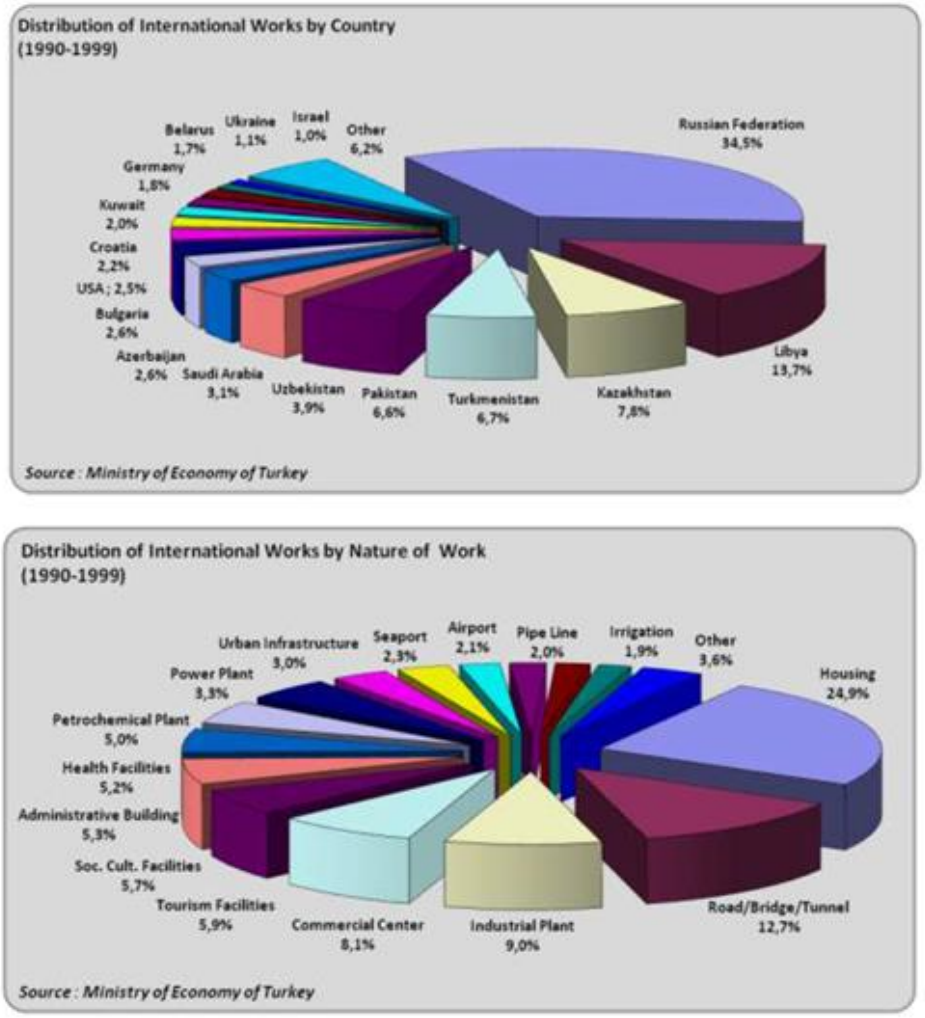


Figure A-3. Distribution of international works (1990-1999)

2000–2009

Until the end of 2000, Turkish contracting companies have undertaken 1897 projects with a total value of approximately 41 billion USD. After the economic crises of 2001, foreign contracting services have experienced a very rapid development. The annual volume of business undertaken abroad increased sharply from 4.1 billion USD in 2002

up to nearly 25 billion USD in the years of 2007-2008. Under the effects of the global crisis, this figure decreased to 20.2 billion USD in 2009.

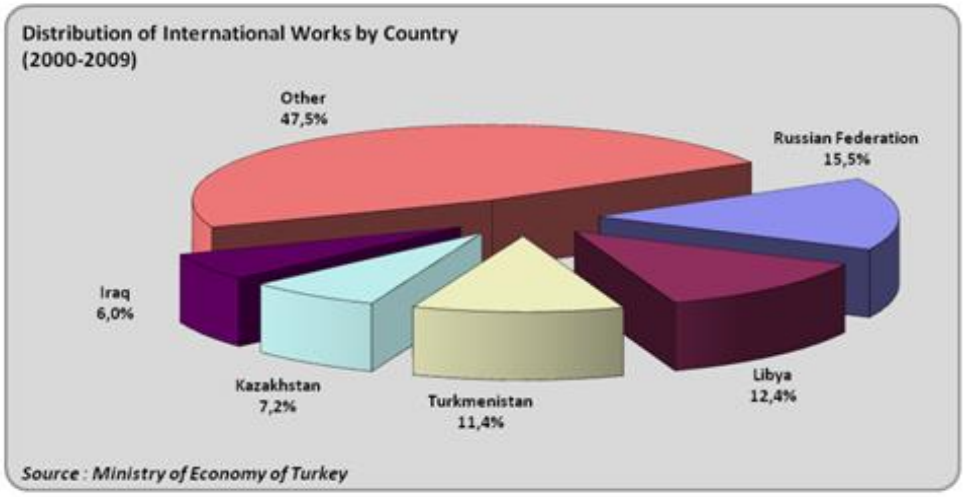
In the 2000–2009 period, the majority of foreign contracting business was undertaken in the Russian Federation (15.5%) and followed by Libya (12.4%), Turkmenistan (11.4%), Kazakhstan (7.2%) and Iraq (6%).

Up until 2000, over 30% of the international works carried out by Turkish contractors was in the housing sector, however the share of housing works decreased to 9.8% in the period of 2000-2009; meanwhile the share of road/bridge/tunnel (15.8%), commercial center (11.8%), industrial plant (8.8%) and pipe line (8.3%) projects showed a significant increase.

Table A-4. Distribution of international works (2000-2010)

2000-2010	
COUNTRY	(%)
Russian Fed.	15,5
Libya	12,4
Turkmenistan	11,4
Kazakhstan	7,2
Iraq	6,0
Other	47,5

2000-2010	
FIELDS OF ACTIVITY	(%)
Road/Bridge/Tunnel	15,5
Commercial Center	10,5
Housing	9,6
Industrial Plant	8,9
Airport	7,8
Other	47,7



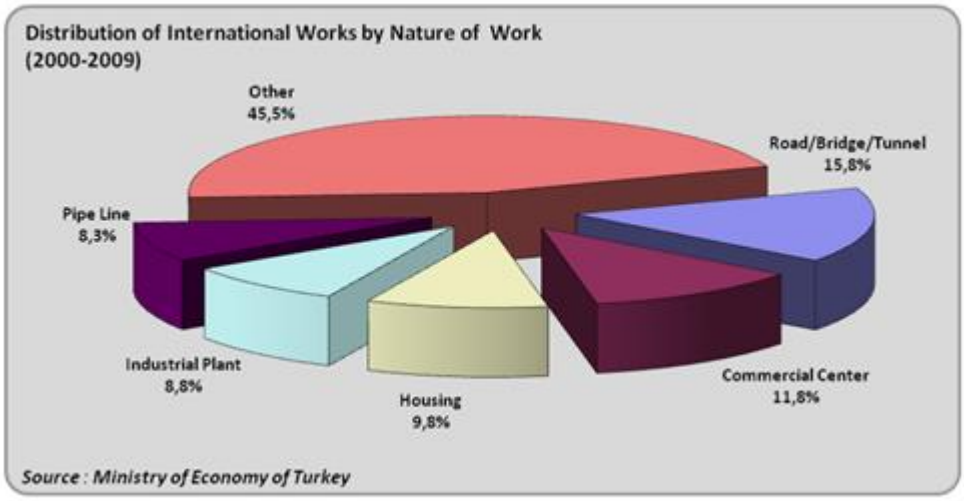


Figure A-4. Distribution of international works (2000-2010)

The factors which contributed to the rapid development of overseas contracting services during the period of 2000-2009 can be grouped under three main categories: reduced business opportunities in Turkey; the attractiveness of business opportunities abroad; and the increasing competitiveness of Turkish contractors:

- Domestic investments decreased significantly after the crisis in 2001. Furthermore, the "abnormally low tenders" in bids created unfair competition

for qualified companies and forced them out of the internal market, eventually turning their attention to the international market.

- Having realized large-scale infrastructure projects in cooperation with foreign partners in Turkey between 1985 and 2000, Turkish contracting firms gained significant experience in production at international standards, project management and relations with international financial institutions.
- Investments in oil and gas exporting countries, which are geographically close and culturally familiar to Turkey increased as a result of booming oil prices and this development created attractive business opportunities for the Turkish contractors.

Due to the above mentioned factors the annual international business volume of Turkish contractors grew at a pace that far surpassed the annual targets.

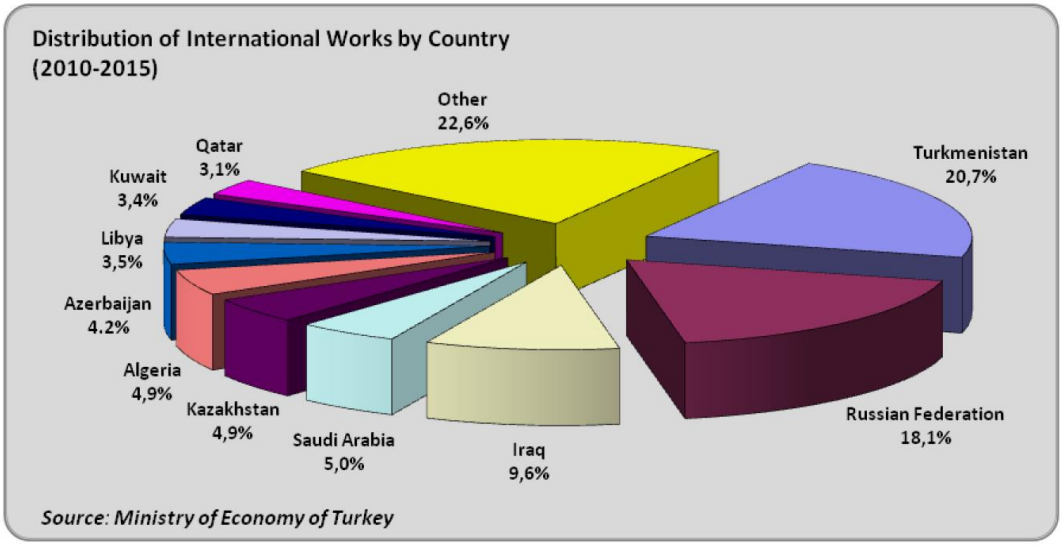
In this period, market diversification and specialization in certain types of projects were the major trends. The number of countries in which Turkish contractors were working increased considerably, causing the percentage of work in each country to decrease relatively.

In the aftermath of the interventions in Afghanistan and Iraq, the rebuilding activities in these ountries were closely followed by Turkish contractors, and as a result, Iraq in particular has become one of the most important markets for Turkish contractors in recent years.

2010-2015 Period

During 2010-2013 period, the annual volume of international business undertaken by Turkish contractors grew by 28% and reached its peak, increasing from 23.5 billion USD in 2010 to 30 billion USD in 2013. In 2014, with a decrease 12%, the annual business volume realized as 26.5 billion USD. It continued falling afterwards, accounting for 21,3 billion USD in 2015 and 1.1 billion USD in the first three months of 2016.

Russian Federation (20.7%), Turkmenistan (18.1%) and Iraq (9.6%) have been the leading markets for Turkish contractors in this period. The projects completed in these countries accounted nearly half (48.4%) of the total amount of international works while the major fields of activity were road/bridge/tunnel (14.5%), housing (11.7%), airport (8.9%), commercial center (8,3%) and power plant (6.7%) projects respectively.



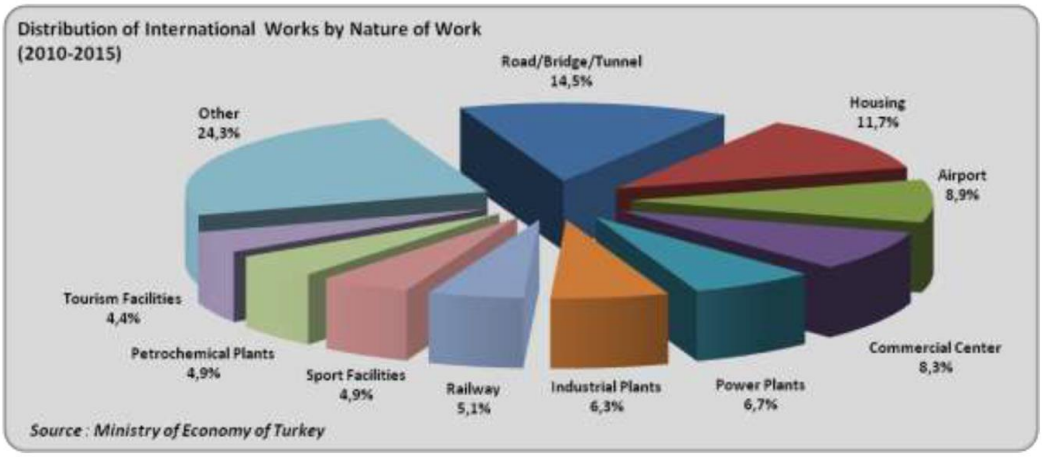


Figure A-5. Distribution of international works (2010-2015)

Turkish International Contracting Services (1972–2016/3 months)

In the 1972–2016 March period, according to the country distribution of international works undertaken by Turkish contractors, the Russian Federation has been the leading market with a share of 19.9%, followed by Turkmenistan (14.8%) and Libya (9.0%). Russian Federation has maintained its position as the largest market for the Turkish contractors in terms of total projects undertaken.

Within the period between 1972 - 2016 March, according to the regional distribution of international works, the share of Eurasian countries took the lead with 48.8% and was followed by Middle Eastern (25.3%), African (17.3%), European (5.2%), South Asian and Far Eastern (2.9%), North and South American (0.5%) countries.

It can be said that almost half of international works of Turkish contractors have been undertaken in Eurasian countries, in other words 91% of the projects have been realized in Eurasian, Middle Eastern and African countries in 1972-2016 March period.

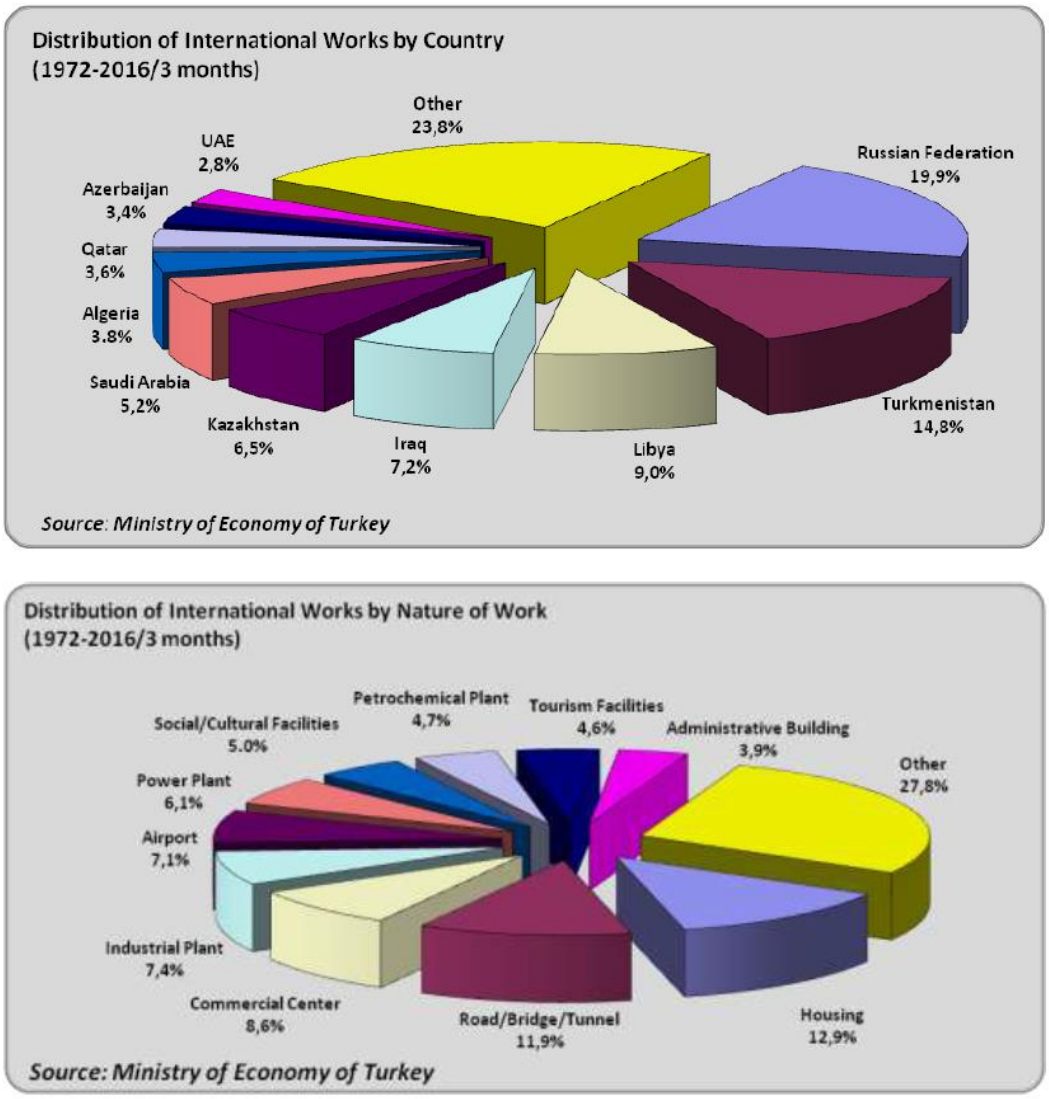


Figure A-6. Distribution of international works (1972-2016/3 months)

Within the period of 43 years, significant progress has been made in the sector in terms of market, product and business diversification, while several Turkish companies started specializing in certain project types, such as international airports, railways and urban rail systems. In this respect, in the period of 1972-2016 March, the share of housing projects in the overall international business decreased gradually, whereas the shares of road/bridge/tunnel, commercial center, industrial plant, airport, socio-

cultural facility, petrochemical plant and tourism facility projects increased substantially.

Another important trend in recent years has been the growing interest in partnerships like national and international consortiums for the big projects, direct investments and property management in the neighbouring countries.

Table A-5. Distribution of international works (in detail)

Data related with Turkish contracting in the international market is presented in below, which is taken from Ministry of Economy of Turkey.

1972 - 1979				
Region / Country	Number of Projects	Total Contracting Cost ($)	Average Contracting Cost ($)	Share (%)
Middle East countries	12	339,086,000	28,257,167	34.3%
UAE	0	-	-	0.0%
BAHRAIN	0	-	-	0.0%
PALESTINE	0	-	-	0.0%
IRAQ	1	26,000,000	26,000,000	2.6%
IRANIAN	1	115,000	115,000	0.0%
ISRAEL	0	-	-	0.0%
TRAIN	0	-	-	0.0%
KUWAIT	1	38,350,000	38,350,000	3.9%
LEBANON	0	-	-	0.0%
Saudi Arabia	9	274,621,000	30,513,444	27.7%
SYRIA	0	-	-	0.0%
OMAN	0	-	-	0.0%
JORDAN	0	-	-	0.0%
YEMEN	0	-	-	0.0%
CIS Countries	-	-	-	0.0%
AZERBAIJAN	0	-	-	0.0%
BELARUS	0	-	-	0.0%
ARMENIA	0	-	-	0.0%
GEORGIA	0	-	-	0.0%
KAZAKHISTAN	0	-	-	0.0%
KYRGYZSTAN	0	-	-	0.0%
MOLDOVA	0	-	-	0.0%
UZBEKISTAN	0	-	-	0.0%
RUSSIA FED.	0	-	-	0.0%
TAJIKISTAN	0	-	-	0.0%
TURKMENISTAN	0	-	-	0.0%
UKRAINE	0	-	-	0.0%
African countries	17	650,737,739	38,278,691	65.7%
ANGOLA	0	-	-	0.0%
BURKINA FASO	0	-	-	0.0%
BURUNDI	0	-	-	0.0%
ALGERIA	0	-	-	0.0%
DJIBOUTI	0	-	-	0.0%
CHAD	0	-	-	0.0%
DEMOCRATIC CONGO	0	-	-	0.0%
ERITREA	0	-	-	0.0%
ETHIOPIA	0	-	-	0.0%
EQUATORIAL GUINEA	0	-	-	0.0%
MOROCCO	0	-	-	0.0%
IVORY COAST	0	-	-	0.0%
GABON	0	-	-	0.0%
GAMBIA	0	-	-	0.0%
GHANA	0	-	-	0.0%
GUINEA	0	-	-	0.0%
SOUTH AFRICA	0	-	-	0.0%
SOUTH SUDAN	0	-	-	0.0%
CAMEROON	0	-	-	0.0%
KENYA	0	-	-	0.0%
CONGO	0	-	-	0.0%
LIBERIA	0	-	-	0.0%
LIBYA	17	650,737,739	38,278,691	65.7%
MADAGASCAR	0	-	-	0.0%
MALAWI	0	-	-	0.0%
FINANCIAL	0	-	-	0.0%
EGYPT	0	-	-	0.0%
MAURITANIA	0	-	-	0.0%
MOZAMBIQUE	0	-	-	0.0%
NIGER	0	-	-	0.0%
NIGERIA	0	-	-	0.0%
RUE career	0	-	-	0.0%
SENEGAL	0	-	-	0.0%
SEYCHELLES	0	-	-	0.0%
SİERRA LEONE	0	-	-	0.0%
SOMALIA	0	-	-	0.0%
SUDAN	0	-	-	0.0%
TANZANIA	0	-	-	0.0%
TUNISIAN	0	-	-	0.0%
UGANDA	0	-	-	0.0%
ZAMBIA	0	-	-	0.0%
Asian Countries	-	-	-	0.0%
AFGHANISTAN	0	-	-	0.0%
AUSTRALIA	0	-	-	0.0%
BANGLADESH	0	-	-	0.0%
CHINA	0	-	-	0.0%
PHILIPPINES	0	-	-	0.0%
INDIA	0	-	-	0.0%
MALDIVES	0	-	-	0.0%
MALAYSIA	0	-	-	0.0%
MONGOLIA	0	-	-	0.0%
NEPAL	0	-	-	0.0%
PAKISTAN	0	-	-	0.0%
PAPUA NEW GUINEA	0	-	-	0.0%
SRI LANKA	0	-	-	0.0%
THAILAND	0	-	-	0.0%

Table A-5. Distribution of international works in detail (Continued)

VIETNAMESE	0	-	-	0.0%
NEW ZELAND	0	-	-	0.0%
European countries	-	-	-	0.0%
GERMANY	0	-	-	0.0%
ALBANIA	0	-	-	0.0%
AUSTRIA	0	-	-	0.0%
BELGIUM	0	-	-	0.0%
BOSNIA AND HERZEGOVINA	0	-	-	0.0%
BULGARIA	0	-	-	0.0%
CZECH REPUBLIC	0	-	-	0.0%
DENMARK	0	-	-	0.0%
ESTONIA	0	-	-	0.0%
FINLAND	0	-	-	0.0%
FRANCE	0	-	-	0.0%
CROATIA	0	-	-	0.0%
NETHERLANDS	0	-	-	0.0%
BRITAIN	0	-	-	0.0%
IRELAND	0	-	-	0.0%
SPAIN	0	-	-	0.0%
SWISS	0	-	-	0.0%
ITALY	0	-	-	0.0%
MONTENEGRO	0	-	-	0.0%
KOSOVO	0	-	-	0.0%
LATVIA	0	-	-	0.0%
LITHUANIAN	0	-	-	0.0%
HUNGARY	0	-	-	0.0%
MACEDONIA	0	-	-	0.0%
POLAND	0	-	-	0.0%
ROMANIA	0	-	-	0.0%
SERBIA	0	-	-	0.0%
GREECE	0	-	-	0.0%
TRNC	0	-	-	0.0%
Americas	-	-	-	0.0%
USA	0	-	-	0.0%
ARGENTINA	0	-	-	0.0%
BRAZIL	0	-	-	0.0%
COLOMBIA	0	-	-	0.0%
PERU	0	-	-	0.0%
VENEZUELA on	0	-	-	0.0%
CHILE	0	-	-	0.0%
Grand total	29	989,823,739	34,131,853	100.0%

1980 - 1989				
Region / Country	Number of Projects	Total Contracting Cost ($)	Average Contracting Cost ($)	Share (%)
Middle East countries	112	4,376,826,896	39,078,812	40.4%
UAE	2	15,300,000	7,650,000	0.1%
BAHRAIN	0	-	-	0.0%
PALESTINE	0	-	-	0.0%
IRAQ	45	2,160,667,053	48,014,823	19.9%
IRANIAN	2	83,527,334	41,763,667	0.8%
ISRAEL	0	-	-	0.0%
TRAIN	0	-	-	0.0%
KUWAIT	3	42,045,000	14,015,000	0.4%
LEBANON	0	-	-	0.0%
Saudi Arabia	49	1,734,099,793	35,389,792	16.0%
SYRIA	0	-	-	0.0%
OMAN	0	-	-	0.0%
JORDAN	8	118,240,506	14,780,063	1.1%
YEMEN	3	222,947,210	74,315,737	2.1%
CIS Countries	8	260,547,000	32,568,375	2.4%
AZERBAIJAN	0	-	-	0.0%
BELARUS	0	-	-	0.0%
ARMENIA	0	-	-	0.0%
GEORGIA	1	45,000,000	45,000,000	0.4%
KAZAKHISTAN	0	-	-	0.0%
KYRGYZSTAN	0	-	-	0.0%
MOLDOVA	0	-	-	0.0%
UZBEKISTAN	0	-	-	0.0%
RUSSIA FED.	4	184,541,000	46,135,250	1.7%
TAJIKISTAN	0	-	-	0.0%
TURKMENISTAN	1	3,006,000	3,006,000	0.0%
UKRAINE	2	28,000,000	14,000,000	0.3%
African countries	157	6,156,520,202	39,213,504	56.8%
ANGOLA	0	-	-	0.0%
BURKINA FASO	0	-	-	0.0%
BURUNDI	0	-	-	0.0%
ALGERIA	1	2,513,250	2,513,250	0.0%
DJIBOUTI	0	-	-	0.0%
CHAD	0	-	-	0.0%
DEMOCRATIC CONGO	0	-	-	0.0%
ERITREA	0	-	-	0.0%
ETHIOPIA	0	-	-	0.0%
EQUATORIAL GUINEA	0	-	-	0.0%
MOROCCO	0	-	-	0.0%
IVORY COAST	0	-	-	0.0%
GABON	0	-	-	0.0%

Table A-5. Distribution of international works in detail (Continued)

GAMBIA	0	-	-	0.0%
GHANA	0	-	-	0.0%
GUINEA	0	-	-	0.0%
SOUTH AFRICA	0	-	-	0.0%
SOUTH SUDAN	0	-	-	0.0%
CAMEROON	0	-	-	0.0%
KENYA	0	-	-	0.0%
CONGO	0	-	-	0.0%
LIBERIA	0	-	-	0.0%
LIBYA	154	6,132,726,952	39,822,902	56.6%
MADAGASCAR	0	-	-	0.0%
MALAWI	0	-	-	0.0%
FINANCIAL	0	-	-	0.0%
EGYPT	1	5,280,000	5,280,000	0.0%
MAURITANIA	0	-	-	0.0%
MOZAMBIQUE	0	-	-	0.0%
NIGER	0	-	-	0.0%
NIGERIA	0	-	-	0.0%
RUE career	0	-	-	0.0%
SENEGAL	0	-	-	0.0%
SEYCHELLES	0	-	-	0.0%
SİERRA LEONE	0	-	-	0.0%
SOMALIA	0	-	-	0.0%
SUDAN	0	-	-	0.0%
TANZANIA	0	-	-	0.0%
TUNISIAN	1	16,000,000	16,000,000	0.1%
UGANDA	0	-	-	0.0%
ZAMBIA	0	-	-	0.0%
Asian Countries	-	-	-	0.0%
AFGHANISTAN	0	-	-	0.0%
AUSTRALIA	0	-	-	0.0%
BANGLADESH	0	-	-	0.0%
CHINA	0	-	-	0.0%
PHILIPPINES	0	-	-	0.0%
INDIA	0	-	-	0.0%
MALDIVES	0	-	-	0.0%
MALAYSIA	0	-	-	0.0%
MONGOLIA	0	-	-	0.0%
NEPAL	0	-	-	0.0%
PAKISTAN	0	-	-	0.0%
PAPUA NEW GUINEA	0	-	-	0.0%
SRI LANKA	0	-	-	0.0%
THAILAND	0	-	-	0.0%
VIETNAMESE	0	-	-	0.0%
NEW ZELAND	0	-	-	0.0%

European countries	6	37,729,239	6,288,207	0.3%
GERMANY	0	-	-	0.0%
ALBANIA	0	-	-	0.0%
AUSTRIA	0	-	-	0.0%
BELGIUM	0	-	-	0.0%
BOSNIA AND HERZEGOVINA	0	-	-	0.0%
BULGARIA	0	-	-	0.0%
CZECH REPUBLIC	0	-	-	0.0%
DENMARK	0	-	-	0.0%
ESTONIA	0	-	-	0.0%
FINLAND	0	-	-	0.0%
FRANCE	0	-	-	0.0%
CROATIA	0	-	-	0.0%
NETHERLANDS	0	-	-	0.0%
BRITAIN	0	-	-	0.0%
IRELAND	0	-	-	0.0%
SPAIN	0	-	-	0.0%
SWISS	0	-	-	0.0%
ITALY	0	-	-	0.0%
MONTENEGRO	0	-	-	0.0%
KOSOVO	0	-	-	0.0%
LATVIA	0	-	-	0.0%
LITHUANIAN	0	-	-	0.0%
HUNGARY	0	-	-	0.0%
MACEDONIA	0	-	-	0.0%
POLAND	0	-	-	0.0%
ROMANIA	0	-	-	0.0%
SERBIA	0	-	-	0.0%
GREECE	0	-	-	0.0%
TRNC	6	37,729,239	6,288,207	0.3%
Americas	1	1,624,310	1,624,310	0.0%
USA	1	1,624,310	1,624,310	0.0%
ARGENTINA	0	-	-	0.0%
BRAZIL	0	-	-	0.0%
COLOMBIA	0	-	-	0.0%
PERU	0	-	-	0.0%
VENEZUELA on	0	-	-	0.0%
CHILE	0	-	-	0.0%
Grand total	284	10,833,247,647	38,145,238	100.0%

Table A-5. Distribution of international works in detail (Continued)

1990- 1999				
Region / Country	Number of Projects	Total Contracting Cost ($)	Average Contracting Cost ($)	Share (%)
Middle East countries	146	1,889,276,711	12,940,251	6.4%
UAE	4	50,216,889	12,554,222	0.2%
BAHRAIN	1	50,246,267	50,246,267	0.2%
PALESTINE	0	-	-	0.0%
IRAQ	8	20,026,598	2,503,325	0.1%
IRANIAN	1	14,638,880	14,638,880	0.0%
ISRAEL	55	309,963,439	5,635,699	1.1%
TRAIN	0	-	-	0.0%
KUWAIT	6	146,663,506	24,443,918	0.5%
LEBANON	1	100,000,000	100,000,000	0.3%
Saudi Arabia	57	922,904,067	16,191,299	3.1%
SYRIA	5	86,341,800	17,268,360	0.3%
OMAN	0	-	-	0.0%
JORDAN	7	148,275,265	21,182,181	0.5%
YEMEN	1	40,000,000	40,000,000	0.1%
CIS Countries	1,213	19,894,301,337	16,400,908	67.7%
AZERBAIJAN	116	1,247,554,300	10,754,778	4.2%
BELARUS	10	345,658,792	34,565,879	1.2%
ARMENIA	1	6,530,000	6,530,000	0.0%
GEORGIA	15	182,362,091	12,157,473	0.6%
KAZAKHISTAN	115	2,939,750,540	25,563,048	10.0%
KYRGYZSTAN	14	318,313,000	22,736,643	1.1%
MOLDOVA	11	61,021,572	5,547,416	0.2%
UZBEKISTAN	46	1,075,671,417	23,384,161	3.7%
RUSSIA FED.	654	10,327,308,118	15,790,991	35.1%
TAJIKISTAN	2	52,393,750	26,196,875	0.2%
TURKMENISTAN	194	2,711,523,315	13,976,924	9.2%
UKRAINE	35	626,214,442	17,891,841	2.1%
African countries	101	3,658,379,090	36,221,575	12.4%
ANGOLA	0	-	-	0.0%
BURKINA FASO	0	-	-	0.0%
BURUNDI	0	-	-	0.0%
ALGERIA	2	5,000,000	2,500,000	0.0%
DJIBOUTI	0	-	-	0.0%
CHAD	0	-	-	0.0%
DEMOCRATIC CONGO	0	-	-	0.0%
ERITREA	0	-	-	0.0%
ETHIOPIA	1	44,971,000	44,971,000	0.2%
EQUATORIAL GUINEA	0	-	-	0.0%
MOROCCO	1	8,000,000	8,000,000	0.0%
IVORY COAST	0	-	-	0.0%
GABON	0	-	-	0.0%
GAMBIA	1	739,535	739,535	0.0%
GHANA	2	4,450,000	2,225,000	0.0%
GUINEA	0	-	-	0.0%
SOUTH AFRICA	0	-	-	0.0%
SOUTH SUDAN	0	-	-	0.0%
CAMEROON	0	-	-	0.0%
KENYA	0	-	-	0.0%
CONGO	0	-	-	0.0%
LIBERIA	0	-	-	0.0%
LIBYA	79	3,400,350,580	43,042,412	11.6%
MADAGASCAR	0	-	-	0.0%
MALAWI	0	-	-	0.0%
FINANCIAL	0	-	-	0.0%
EGYPT	13	184,030,975	14,156,229	0.6%
MAURITANIA	0	-	-	0.0%
MOZAMBIQUE	0	-	-	0.0%
NIGER	0	-	-	0.0%
NIGERIA	0	-	-	0.0%
RUE career	0	-	-	0.0%
SENEGAL	0	-	-	0.0%
SEYCHELLES	0	-	-	0.0%
SİERRA LEONE	0	-	-	0.0%
SOMALIA	0	-	-	0.0%
SUDAN	2	10,837,000	5,418,500	0.0%
TANZANIA	0	-	-	0.0%
TUNISIAN	0	-	-	0.0%
UGANDA	0	-	-	0.0%
ZAMBIA	0	-	-	0.0%
Asian Countries	19	1,159,295,159	61,015,535	3.9%
AFGHANISTAN	5	26,145,000	5,229,000	0.1%
AUSTRALIA	0	-	-	0.0%
BANGLADESH	0	-	-	0.0%
CHINA	0	-	-	0.0%
PHILIPPINES	0	-	-	0.0%
INDIA	0	-	-	0.0%
MALDIVES	0	-	-	0.0%
MALAYSIA	0	-	-	0.0%
MONGOLIA	0	-	-	0.0%
NEPAL	0	-	-	0.0%
PAKISTAN	14	1,133,150,159	80,939,297	3.9%
PAPUA NEW GUINEA	0	-	-	0.0%
SRI LANKA	0	-	-	0.0%
THAILAND	0	-	-	0.0%
VIETNAMESE	0	-	-	0.0%
NEW ZELAND	0	-	-	0.0%

Table A-5. Distribution of international works in detail (Continued)

European countries	130	2,250,641,974	17,312,631	7.7%
GERMANY	43	824,942,514	19,184,710	2.8%
ALBANIA	5	35,269,000	7,053,800	0.1%
AUSTRIA	0	-	-	0.0%
BELGIUM	1	2,780,000	2,780,000	0.0%
BOSNIA AND HERZEGOVINA	6	13,636,579	2,272,763	0.0%
BULGARIA	0	-	-	0.0%
CZECH REPUBLIC	0	-	-	0.0%
DENMARK	1	76,000	76,000	0.0%
ESTONIA	0	-	-	0.0%
FINLAND	0	-	-	0.0%
FRANCE	0	-	-	0.0%
CROATIA	2	486,509,465	243,254,733	1.7%
NETHERLANDS	0	-	-	0.0%
BRITAIN	0	-	-	0.0%
IRELAND	0	-	-	0.0%
SPAIN	0	-	-	0.0%
SWISS	0	-	-	0.0%
ITALY	0	-	-	0.0%
MONTENEGRO	0	-	-	0.0%
KOSOVO	1	1,635,708	1,635,708	0.0%
LATVIA	4	43,366,764	10,841,691	0.1%
LITHUANIAN	2	26,796,753	13,398,377	0.1%
HUNGARY	0	-	-	0.0%
MACEDONIA	0	-	-	0.0%
POLAND	2	125,013,614	62,506,807	0.4%
ROMANIA	33	509,572,689	15,441,597	1.7%
SERBIA	0	-	-	0.0%
GREECE	0	-	-	0.0%
TRNC	30	181,042,888	6,034,763	0.6%
Americas	20	536,103,783	26,805,189	1.8%
USA	19	488,103,783	25,689,673	1.7%
ARGENTINA	0	-	-	0.0%
BRAZIL	0	-	-	0.0%
COLOMBIA	0	-	-	0.0%
PERU	0	-	-	0.0%
VENEZUELA on	0	-	-	0.0%
CHILE	1	48,000,000	48,000,000	0.2%
Grand total	1,629	29,387,998,054	18,040,514	100.0%

2000-2009				
Region / Country	Number of Projects	Total Contracting Cost ($)	Average Contracting Cost ($)	Share (%)
Middle East countries	899	32,575,949,035	36,235,761	25.5%
UAE	78	6,432,501,298	82,467,965	5.0%
BAHRAIN	3	281,002,200	93,667,400	0.2%
PALESTINE	0	-	-	0.0%
IRAQ	482	6,328,830,463	13,130,354	4.9%
IRANIAN	23	903,439,018	39,279,957	0.7%
ISRAEL	82	535,369,898	6,528,901	0.4%
TRAIN	70	6,638,677,982	94,838,257	5.2%
KUWAIT	11	458,195,059	41,654,096	0.4%
LEBANON	6	145,208,664	24,201,444	0.1%
Saudi Arabia	71	5,825,171,959	82,044,675	4.6%
SYRIA	15	193,203,264	12,880,218	0.2%
OMAN	29	2,038,875,936	70,306,067	1.6%
JORDAN	18	1,610,133,119	89,451,840	1.3%
YEMEN	11	1,185,340,173	107,758,198	0.9%
CIS Countries	1,956	58,899,137,237	30,112,033	46.0%
AZERBAIJAN	97	3,591,492,062	37,025,691	2.8%
BELARUS	18	183,717,751	10,206,542	0.1%
ARMENIA	0	-	-	0.0%
GEORGIA	68	836,521,757	12,301,791	0.7%
KAZAKHISTAN	253	10,698,786,992	42,287,696	8.4%
KYRGYZSTAN	25	214,794,702	8,591,788	0.2%
MOLDOVA	7	108,516,250	15,502,321	0.1%
UZBEKISTAN	52	414,457,522	7,970,337	0.3%
RUSSIA FED.	868	27,232,382,822	31,373,713	21.3%
TAJIKISTAN	28	344,405,052	12,300,180	0.3%
TURKMENISTAN	446	12,735,346,298	28,554,588	10.0%
UKRAINE	94	2,538,716,029	27,007,617	2.0%
African countries	505	22,508,115,196	44,570,525	17.6%
ANGOLA	1	211,000,000	211,000,000	0.2%
BURKINA FASO	0	-	-	0.0%
BURUNDI	1	52,131,595	52,131,595	0.0%
ALGERIA	129	4,706,553,815	36,484,913	3.7%
DJIBOUTI	6	66,697,195	11,116,199	0.1%
CHAD	0	-	-	0.0%
DEMOCRATIC CONGO	0	-	-	0.0%
ERITREA	0	-	-	0.0%
ETHIOPIA	5	273,608,548	54,721,710	0.2%
EQUATORIAL GUINEA	1	24,850,000	24,850,000	0.0%
MOROCCO	29	1,586,822,538	54,718,019	1.2%
IVORY COAST	0	-	-	0.0%
GABON	0	-	-	0.0%

Table A-5. Distribution of international works in detail (Continued)

GAMBIA	0	-	-	0.0%
GHANA	1	17,749,994	17,749,994	0.0%
GUINEA	3	33,405,436	11,135,145	0.0%
SOUTH AFRICA	0	-	-	0.0%
SOUTH SUDAN	0	-	-	0.0%
CAMEROON	1	26,267,300	26,267,300	0.0%
KENYA	0	-	-	0.0%
CONGO	0	-	-	0.0%
LIBERIA	0	-	-	0.0%
LIBYA	260	13,303,171,202	51,166,043	10.4%
MADAGASCAR	0	-	-	0.0%
MALAWI	0	-	-	0.0%
FINANCIAL	2	42,032,202	21,016,101	0.0%
EGYPT	11	450,958,979	40,996,271	0.4%
MAURITANIA	0	-	-	0.0%
MOZAMBIQUE	1	10,334,000	10,334,000	0.0%
NIGER	0	-	-	0.0%
NIGERIA	3	257,000,000	85,666,667	0.2%
RUE career	0	-	-	0.0%
SENEGAL	0	-	-	0.0%
SEYCHELLES	1	12,300,000	12,300,000	0.0%
SİERRA LEONE	1	24,184,849	24,184,849	0.0%
SOMALIA	0	-	-	0.0%
SUDAN	46	754,179,794	16,395,213	0.6%
TANZANIA	0	-	-	0.0%
TUNISIAN	3	654,867,748	218,289,249	0.5%
UGANDA	0	-	-	0.0%
ZAMBIA	0	-	-	0.0%
Asian Countries	436	4,679,276,943	10,732,287	3.7%
AFGHANISTAN	410	3,586,979,108	8,748,730	2.8%
AUSTRALIA	0	-	-	0.0%
BANGLADESH	0	-	-	0.0%
CHINA	0	-	-	0.0%
PHILIPPINES	0	-	-	0.0%
INDIA	5	156,786,721	31,357,344	0.1%
MALDIVES	0	-	-	0.0%
MALAYSIA	0	-	-	0.0%
MONGOLIA	0	-	-	0.0%
NEPAL	2	38,734,517	19,367,259	0.0%
PAKISTAN	19	896,776,597	47,198,768	0.7%
PAPUA NEW GUINEA	0	-	-	0.0%
SRI LANKA	0	-	-	0.0%
THAILAND	0	-	-	0.0%
VIETNAMESE	0	-	-	0.0%
NEW ZELAND	0	-	-	0.0%
European countries	295	8,886,806,390	30,124,767	6.9%
GERMANY	7	23,723,860	3,389,123	0.0%
ALBANIA	15	711,090,695	47,406,046	0.6%
AUSTRIA	1	31,900,470	31,900,470	0.0%
BELGIUM	0	-	-	0.0%
BOSNIA AND HERZEGOVINA	5	63,239,590	12,647,918	0.0%
BULGARIA	28	1,359,365,802	48,548,779	1.1%
CZECH REPUBLIC	0	-	-	0.0%
DENMARK	0	-	-	0.0%
ESTONIA	0	-	-	0.0%
FINLAND	1	116,000	116,000	0.0%
FRANCE	9	3,023,873	335,986	0.0%
CROATIA	1	76,950,000	76,950,000	0.1%
NETHERLANDS	3	178,848,160	59,616,053	0.1%
BRITAIN	1	890,000	890,000	0.0%
IRELAND	17	1,172,103,267	68,947,251	0.9%
SPAIN	0	-	-	0.0%
SWISS	2	402,010,000	201,005,000	0.3%
ITALY	1	3,390,906	3,390,906	0.0%
MONTENEGRO	2	45,021,377	22,510,689	0.0%
KOSOVO	3	18,231,792	6,077,264	0.0%
LATVIA	1	-	-	0.0%
LITHUANIAN	1	148,000,000	148,000,000	0.1%
HUNGARY	0	-	-	0.0%
MACEDONIA	16	234,410,386	14,650,649	0.2%
POLAND	17	1,168,077,373	68,710,434	0.9%
ROMANIA	127	2,802,262,364	22,065,058	2.2%
SERBIA	1	38,227,620	38,227,620	0.0%
GREECE	8	3,197,680	399,710	0.0%
TRNC	28	402,725,175	14,383,042	0.3%
Americas	13	377,440,502	29,033,885	0.3%
USA	11	366,329,866	33,302,715	0.3%
ARGENTINA	1	1,628,350	1,628,350	0.0%
BRAZIL	1	9,482,286	9,482,286	0.0%
COLOMBIA	0	-	-	0.0%
PERU	0	-	-	0.0%
VENEZUELA on	0	-	-	0.0%
CHILE	0	-	-	0.0%
Grand total	4,104	127,926,725,303	31,171,229	100.0%

Table A-5. Distribution of international works in detail (Continued)

2010-2017				
Region / Country	Number of Projects	Total Contracting Cost ($)	Average Contracting Cost ($)	Share (%)
Middle East countries	768	53,733,064,312	69,964,927	29.0%
UAE	37	4,252,015,422	114,919,336	2.3%
BAHRAIN	3	792,984,166	264,328,055	0.4%
PALESTINE	1	35,000,000	35,000,000	0.0%
IRAQ	423	16,291,861,670	38,515,039	8.8%
IRANIAN	24	3,127,244,658	130,301,861	1.7%
ISRAEL	21	434,839,501	20,706,643	0.2%
TRAIN	61	7,673,385,823	125,793,210	4.1%
KUWAIT	13	5,887,336,507	452,872,039	3.2%
LEBANON	4	188,655,990	47,163,997	0.1%
Saudi Arabia	138	11,427,221,720	82,805,954	6.2%
SYRIA	6	120,302,709	20,050,452	0.1%
OMAN	20	3,171,882,386	158,594,119	1.7%
JORDAN	15	273,070,641	18,204,709	0.1%
YEMEN	2	57,263,120	28,631,560	0.0%
CIS Countries	1,329	86,700,386,628	65,237,311	46.7%
AZERBAIJAN	170	7,190,112,951	42,294,782	3.9%
BELARUS	17	397,789,548	23,399,385	0.2%
ARMENIA	0	-	-	0.0%
GEORGIA	124	3,384,866,177	27,297,308	1.8%
KAZAKHISTAN	122	9,175,049,536	75,205,324	4.9%
KYRGYZSTAN	31	186,901,909	6,029,094	0.1%
MOLDOVA	12	128,086,195	10,673,850	0.1%
UZBEKISTAN	25	1,229,154,110	49,166,164	0.7%
RUSSIA FED.	419	31,044,055,565	74,090,825	16.7%
TAJIKISTAN	20	245,855,733	12,292,787	0.1%
TURKMENISTAN	351	31,394,247,600	89,442,301	16.9%
UKRAINE	38	2,324,267,303	61,164,929	1.3%
African countries	540	31,259,630,854	57,888,205	16.9%
ANGOLA	4	597,932,575	149,483,144	0.3%
BURKINA FASO	1	399,751	399,751	0.0%
BURUNDI	0	-	-	0.0%
ALGERIA	196	9,931,989,371	50,673,415	5.4%
DJIBOUTI	9	80,190,999	8,910,111	0.0%
CHAD	1	24,500,000	24,500,000	0.0%
DEMOCRATIC CONGO	2	1,143,614	571,807	0.0%
ERITREA	1	31,640,724	31,640,724	0.0%
ETHIOPIA	6	1,976,900,000	329,483,333	1.1%
EQUATORIAL GUINEA	7	418,215,547	59,745,078	0.2%
MOROCCO	30	2,522,768,818	84,092,294	1.4%
IVORY COAST	12	154,817,104	12,901,425	0.1%
GABON	10	316,475,988	31,647,599	0.2%
GAMBIA	0	-	-	0.0%
GHANA	10	753,832,992	75,383,299	0.4%
GUINEA	7	119,111,555	17,015,936	0.1%
SOUTH AFRICA	3	18,975,871	6,325,290	0.0%
SOUTH SUDAN	2	11,405,896	5,702,948	0.0%
CAMEROON	13	880,523,744	67,732,596	0.5%
KENYA	10	254,644,476	25,464,448	0.1%
CONGO	4	594,132,040	148,533,010	0.3%
LIBERIA	1	251,500	251,500	0.0%
LIBYA	92	5,388,388,221	58,569,437	2.9%
MADAGASCAR	1	30,000,000	30,000,000	0.0%
MALAWI	1	43,000,000	43,000,000	0.0%
FINANCIAL	2	155,000,000	77,500,000	0.1%
EGYPT	2	516,288,409	258,144,205	0.3%
MAURITANIA	2	108,653,018	54,326,509	0.1%
MOZAMBIQUE	5	699,500,000	139,900,000	0.4%
NIGER	2	6,381,789	3,190,895	0.0%
NIGERIA	25	1,191,405,507	47,656,220	0.6%
RUE career	1	181,837,112	181,837,112	0.1%
SENEGAL	29	775,274,196	26,733,593	0.4%
SEYCHELLES	0	-	-	0.0%
SIERRA LEONE	2	9,262,346	4,631,173	0.0%
SOMALIA	4	75,929,586	18,982,397	0.0%
SUDAN	21	255,474,339	12,165,445	0.1%
TANZANIA	6	2,553,810,244	425,635,041	1.4%
TUNISIAN	13	289,951,222	22,303,940	0.2%
UGANDA	1	139,540,000	139,540,000	0.1%
ZAMBIA	2	150,082,300	75,041,150	0.1%
Asian Countries	341	5,945,609,941	17,435,806	3.2%
AFGHANISTAN	273	2,942,231,389	10,777,404	1.6%
AUSTRALIA	2	860,000	430,000	0.0%
BANGLADESH	3	83,819,558	27,939,853	0.0%
CHINA	2	13,777,199	6,888,600	0.0%
PHILIPPINES	1	67,295,612	67,295,612	0.0%
INDIA	13	924,771,393	71,136,261	0.5%
MALDIVES	6	86,548,239	14,424,706	0.0%
MALAYSIA	5	35,982,739	7,196,548	0.0%
MONGOLIA	6	192,624,470	32,104,078	0.1%
NEPAL	0	-	-	0.0%
PAKISTAN	23	1,386,110,416	60,265,670	0.7%
PAPUA NEW GUINEA	2	63,090,169	31,545,085	0.0%
SRI LANKA	2	98,815,717	49,407,859	0.1%
THAILAND	1	16,747,483	16,747,483	0.0%
VIETNAMESE	1	1,541,000	1,541,000	0.0%
NEW ZELAND	1	31,394,558	31,394,558	0.0%

Table A-5. Distribution of international works in detail (Continued)

European countries	207	7,061,332,656	34,112,718	3.8%
GERMANY	13	375,141,962	28,857,074	0.2%
ALBANIA	4	788,906,577	197,226,644	0.4%
AUSTRIA	0	-	-	0.0%
BELGIUM	13	82,569,489	6,351,499	0.0%
BOSNIA AND HERZEGOVINA	28	525,046,911	18,751,675	0.3%
BULGARIA	6	159,975,375	26,662,563	0.1%
CZECH REPUBLIC	1	12,000,000	12,000,000	0.0%
DENMARK	0	-	-	0.0%
ESTONIA	2	963,381	481,691	0.0%
FINLAND	4	4,796,691	1,199,173	0.0%
FRANCE	6	105,540,945	17,590,158	0.1%
CROATIA	4	104,258,900	26,064,725	0.1%
NETHERLANDS	1	62,517,515	62,517,515	0.0%
BRITAIN	24	191,825,310	7,992,721	0.1%
IRELAND	0	-	-	0.0%
SPAIN	4	14,681,646	3,670,412	0.0%
SWISS	1	796,270,000	796,270,000	0.4%
ITALY	1	2,903,494	2,903,494	0.0%
MONTENEGRO	9	57,331,934	6,370,215	0.0%
KOSOVO	18	1,322,360,168	73,464,454	0.7%
LATVIA	2	460,881,200	230,440,600	0.2%
LITHUANIAN	2	4,598,635	2,299,318	0.0%
HUNGARY	3	42,200,000	14,066,667	0.0%
MACEDONIA	13	780,381,610	60,029,355	0.4%
POLAND	9	329,536,238	36,615,138	0.2%
ROMANIA	8	257,067,593	32,133,449	0.1%
SERBIA	1	420,000	420,000	0.0%
GREECE	1	1,300,000	1,300,000	0.0%
TRNC	29	577,857,083	19,926,106	0.3%
Americas	21	810,662,941	38,602,997	0.4%
USA	1	98,500,000	98,500,000	0.1%
ARGENTINA	0	-	-	0.0%
BRAZIL	7	136,159,151	19,451,307	0.1%
COLOMBIA	1	2,350,000	2,350,000	0.0%
PERU	3	18,470,000	6,156,667	0.0%
VENEZUELA on	9	555,183,790	61,687,088	0.3%
CHILE	0	-	-	0.0%
Grand total	3,206	185,510,687,331	57,863,596	100.0%

1972 - 2017				
Region / Country	Number of Projects	Total Contracting Cost ($)	Average Contracting Cost ($)	Share (%)
Middle East countries	1,937	92,914,202,953	47,968,097	26.2%
UAE	121	10,750,033,609	88,843,253	3.0%
BAHRAIN	7	1,124,232,633	160,604,662	0.3%
PALESTINE	1	35,000,000	35,000,000	0.0%
IRAQ	959	24,827,385,784	25,888,828	7.0%
IRANIAN	51	4,128,964,890	80,960,096	1.2%
ISRAEL	158	1,280,172,838	8,102,360	0.4%
TRAIN	131	14,312,063,805	109,252,395	4.0%
KUWAIT	34	6,572,590,072	193,311,473	1.9%
LEBANON	11	433,864,654	39,442,241	0.1%
Saudi Arabia	324	20,184,018,539	62,296,354	5.7%
SYRIA	26	399,847,773	15,378,761	0.1%
OMAN	49	5,210,758,322	106,342,007	1.5%
JORDAN	48	2,149,719,531	44,785,824	0.6%
YEMEN	17	1,505,550,503	88,561,794	0.4%
CIS Countries	4,506	165,754,372,202	36,785,258	46.7%
AZERBAIJAN	383	12,029,159,313	31,407,727	3.4%
BELARUS	45	927,166,091	20,603,691	0.3%
ARMENIA	1	6,530,000	6,530,000	0.0%
GEORGIA	208	4,448,750,025	21,388,221	1.3%
KAZAKHISTAN	490	22,813,587,067	46,558,341	6.4%
KYRGYZSTAN	70	720,009,611	10,285,852	0.2%
MOLDOVA	30	297,624,017	9,920,801	0.1%
UZBEKISTAN	123	2,719,283,049	22,107,992	0.8%
RUSSIA FED.	1945	68,788,287,505	35,366,729	19.4%
TAJIKISTAN	50	642,654,535	12,853,091	0.2%
TURKMENISTAN	992	46,844,123,213	47,221,898	13.2%
UKRAINE	169	5,517,197,774	32,646,141	1.6%
African countries	1,320	64,233,383,081	48,661,654	18.1%
ANGOLA	5	808,932,575	161,786,515	0.2%
BURKINA FASO	1	399,751	399,751	0.0%
BURUNDI	1	52,131,595	52,131,595	0.0%
ALGERIA	328	14,646,056,437	44,652,611	4.1%
DJIBOUTI	15	146,888,194	9,792,546	0.0%
CHAD	1	24,500,000	24,500,000	0.0%
DEMOCRATIC CONGO	2	1,143,614	571,807	0.0%
ERITREA	1	31,640,724	31,640,724	0.0%
ETHIOPIA	12	2,295,479,548	191,289,962	0.6%
EQUATORIAL GUINEA	8	443,065,547	55,383,193	0.1%
MOROCCO	60	4,117,591,357	68,626,523	1.2%
IVORY COAST	12	154,817,104	12,901,425	0.0%
GABON	10	316,475,988	31,647,599	0.1%

Table A-5. Distribution of international works in detail (Continued)

GAMBIA	1	739,535	739,535	0.0%
GHANA	13	776,032,986	59,694,845	0.2%
GUINEA	10	152,516,991	15,251,699	0.0%
SOUTH AFRICA	3	18,975,871	6,325,290	0.0%
SOUTH SUDAN	2	11,405,896	5,702,948	0.0%
CAMEROON	14	906,791,044	64,770,789	0.3%
KENYA	10	254,644,476	25,464,448	0.1%
CONGO	4	594,132,040	148,533,010	0.2%
LIBERIA	1	251,500	251,500	0.0%
LIBYA	602	28,875,374,694	47,965,739	8.1%
MADAGASCAR	1	30,000,000	30,000,000	0.0%
MALAWI	1	43,000,000	43,000,000	0.0%
FINANCIAL	4	197,032,202	49,258,051	0.1%
EGYPT	27	1,156,558,363	42,835,495	0.3%
MAURITANIA	2	108,653,018	54,326,509	0.0%
MOZAMBIQUE	6	709,834,000	118,305,667	0.2%
NIGER	2	6,381,789	3,190,895	0.0%
NIGERIA	28	1,448,405,507	51,728,768	0.4%
RUE career	1	181,837,112	181,837,112	0.1%
SENEGAL	29	775,274,196	26,733,593	0.2%
SEYCHELLES	1	12,300,000	12,300,000	0.0%
SİERRA LEONE	3	33,447,195	11,149,065	0.0%
SOMALIA	4	75,929,586	18,982,397	0.0%
SUDAN	69	1,020,491,133	14,789,727	0.3%
TANZANIA	6	2,553,810,244	425,635,041	0.7%
TUNISIAN	17	960,818,970	56,518,763	0.3%
UGANDA	1	139,540,000	139,540,000	0.0%
ZAMBIA	2	150,082,300	75,041,150	0.0%
Asian Countries	796	11,784,182,043	14,804,249	3.3%
AFGHANISTAN	688	6,555,355,497	9,528,133	1.8%
AUSTRALIA	2	860,000	430,000	0.0%
BANGLADESH	3	83,819,558	27,939,853	0.0%
CHINA	2	13,777,199	6,888,600	0.0%
PHILIPPINES	1	67,295,612	67,295,612	0.0%
INDIA	18	1,081,558,114	60,086,562	0.3%
MALDIVES	6	86,548,239	14,424,706	0.0%
MALAYSIA	5	35,982,739	7,196,548	0.0%
MONGOLIA	6	192,624,470	32,104,078	0.1%
NEPAL	2	38,734,517	19,367,259	0.0%
PAKISTAN	56	3,416,037,172	61,000,664	1.0%
PAPUA NEW GUINEA	2	63,090,169	31,545,085	0.0%
SRI LANKA	2	98,815,717	49,407,859	0.0%
THAILAND	1	16,747,483	16,747,483	0.0%
VIETNAMESE	1	1,541,000	1,541,000	0.0%
NEW ZELAND	1	31,394,558	31,394,558	0.0%

European countries	638	18,236,510,259	28,583,872	5.1%
GERMANY	63	1,223,808,336	19,425,529	0.3%
ALBANIA	24	1,535,266,272	63,969,428	0.4%
AUSTRIA	1	31,900,470	31,900,470	0.0%
BELGIUM	14	85,349,489	6,096,392	0.0%
BOSNIA AND HERZEGOVINA	39	601,923,080	15,433,925	0.2%
BULGARIA	34	1,519,341,177	44,686,505	0.4%
CZECH REPUBLIC	1	12,000,000	12,000,000	0.0%
DENMARK	1	76,000	76,000	0.0%
ESTONIA	2	963,381	481,691	0.0%
FINLAND	5	4,912,691	982,538	0.0%
FRANCE	15	108,564,818	7,237,655	0.0%
CROATIA	7	667,718,365	95,388,338	0.2%
NETHERLANDS	4	241,365,675	60,341,419	0.1%
BRITAIN	25	192,715,310	7,708,612	0.1%
IRELAND	17	1,172,103,267	68,947,251	0.3%
SPAIN	4	14,681,646	3,670,412	0.0%
SWISS	3	1,198,280,000	399,426,667	0.3%
ITALY	2	6,294,400	3,147,200	0.0%
MONTENEGRO	11	102,353,311	9,304,846	0.0%
KOSOVO	22	1,342,227,668	61,010,349	0.4%
LATVIA	7	504,247,964	72,035,423	0.1%
LITHUANIAN	5	179,395,388	35,879,078	0.1%
HUNGARY	3	42,200,000	14,066,667	0.0%
MACEDONIA	29	1,014,791,996	34,992,827	0.3%
POLAND	28	1,622,627,225	57,950,972	0.5%
ROMANIA	168	3,568,902,646	21,243,468	1.0%
SERBIA	2	38,647,620	19,323,810	0.0%
GREECE	9	4,497,680	499,742	0.0%
TRNC	93	1,199,354,385	12,896,284	0.3%
Americas	55	1,725,831,536	31,378,755	0.5%
USA	32	954,557,959	29,829,936	0.3%
ARGENTINA	1	1,628,350	1,628,350	0.0%
BRAZIL	8	145,641,437	18,205,180	0.0%
COLOMBIA	1	2,350,000	2,350,000	0.0%
PERU	3	18,470,000	6,156,667	0.0%
VENEZUELA on	9	555,183,790	61,687,088	0.2%
CHILE	1	48,000,000	48,000,000	0.0%
Grand total	9,252	354,648,482,074	38,332,088	100.0%

Table A-5. Distribution of international works in detail (Continued)

DISTRIBUTION OF CONTRACTING SERVICES (1972 – 1979)						
	SECTOR	ORDER	ACTIVITY AREA	PROJECT COSTS (USD)	SHARE	NUMBER OF PROJECT
SUPERSTRUCTURE	BUILDING	7	MILITARY FACILITIES	55,000,000	0.056	1
		11	HEALTH FACILITY	0	0.000	0
		11	SCHOOLS	0	0.000	0
		11	ADMINISTRATIVE BUILDING	0	0.000	0
		11	HOUSING	0	0.000	0
		11	SOCIAL / CULTURAL FACILITIES	0	0.000	0
		11	TRADE CENTER	0	0.000	0
		11	SPORT FACILITIES	0	0.000	0
		11	TOURIST FACILITIES	0	0.000	0
		11	OTHER	0	0.000	0
			TOTAL	55,000,000	0.056	1
	INDUSTRIAL FACILITIES	10	PETROCHEMICAL PLANT	115,000	0.000	1
		11	POWER PLANT	0	0.000	0
		11	ENERGY TRANSPORT LINES	0	0.000	0
		11	GAS / OIL PIPE LINES	0	0.000	0
		2	PLANT	234,800,000	0.237	9
		11	COMMUNICATION SYSTEMS	0	0.000	0
		11	STORAGE FACILITIES	0	0.000	0
		5	OTHER	63,000,000	0.064	1
			TOTAL	297,915,000	0.301	11
SUPERSTRUCTURE TOTAL				352,915,000	0.357	12
INFRASTRUCTURE	WATER WORKS	11	SEWERAGE SYSTEM	0	0.000	0
		8	DRINKING WATER / TREATMENT PLANTS	43,750,000	0.044	2
		11	DAM	0	0.000	0
		6	IRRIGATION	58,128,000	0.059	1
		4	OTHER	83,000,000	0.084	1
			TOTAL	184,878,000	0.187	4
	TRANSPORTATION	3	ROAD / TUNNELS / BRIDGES	176,521,000	0.178	6
		11	RAILWAY	0	0.000	0
		11	AIRPORT	0	0.000	0
		1	PORT	267,900,000	0.271	6
		11	OTHER	0	0.000	0
			TOTAL	444,421,000	0.449	12
	OTHER	9	OTHER (INFRASTRUCTURE)	7,609,739	0.008	1
INFRASTRUCTURE TOTAL				636,908,739	0.643	17
OTHER		11	CONSULTANCY	0	0.000	0
		11	OTHERS	0	0.000	0
TOTAL (OTHER)				0	0.000	0
TOTAL (GRAND)				989,823,739	1.000	29

DISTRIBUTION OF CONTRACTING SERVICES (1980 – 1989)						
	SECTOR	ORDER	ACTIVITY AREA	PROJECT COSTS (USD)	SHARE	NUMBER OF PROJECT
SUPERSTRUCTURE	BUILDING	14	MILITARY FACILITIES	187,973,033	0.017	6
		13	HEALTH FACILITY	202,849,126	0.019	13
		11	SCHOOLS	235,301,276	0.022	22
		12	ADMINISTRATIVE BUILDING	221,254,771	0.020	14
		1	HOUSING	4,354,350,076	0.402	66
		24	SOCIAL / CULTURAL FACILITIES	22,548,217	0.002	5
		23	TRADE CENTER	23,051,705	0.002	7
		27	SPORT FACILITIES	0	0.000	0
		15	TOURIST FACILITIES	127,280,000	0.012	4
		20	OTHER	66,509,850	0.006	4
			TOTAL	5,441,118,054	0.502	141
	INDUSTRIAL FACILITIES	22	PETROCHEMICAL PLANT	28,209,000	0.003	2
		18	POWER PLANT	78,138,158	0.007	7
		21	ENERGY TRANSPORT LINES	30,934,932	0.003	4
		17	GAS / OIL PIPE LINES	85,306,899	0.008	9
		9	PLANT	265,410,305	0.024	24
		27	COMMUNICATION SYSTEMS	0	0.000	0
		16	STORAGE FACILITIES	122,560,084	0.011	6
		10	OTHER	249,721,187	0.023	6
			TOTAL	860,280,565	0.079	58
SUPERSTRUCTURE TOTAL				6,301,398,619	0.582	199
INFRASTRUCTURE	WATER WORKS	27	SEWERAGE SYSTEM	0	0.000	0
		8	DRINKING WATER / TREATMENT PLANTS	299,762,993	0.028	20
		2	DAM	1,638,500,000	0.151	3
		7	IRRIGATION	445,785,731	0.041	14
		6	OTHER	452,695,093	0.042	9
			TOTAL	2,836,743,817	0.262	46
	TRANSPORTATION	3	ROAD / TUNNELS / BRIDGES	690,663,035	0.064	18
		26	RAILWAY	2,513,250	0.000	1
		25	AIRPORT	10,173,000	0.001	1
		5	PORT	458,845,648	0.042	5
		27	OTHER	0	0.000	0
			TOTAL	1,162,194,933	0.107	25
	OTHER	4	OTHER (INFRASTRUCTURE)	461,902,188	0.043	9
INFRASTRUCTURE TOTAL				4,460,840,938	0.412	80
OTHER		27	CONSULTANCY	0	0.000	0
		19	OTHERS	71,008,090	0.007	5
TOTAL (OTHER)				71,008,090	0.007	5
TOTAL (GRAND)				10,833,247,647	1.000	284

Table A-5. Distribution of international works in detail (Continued)

DISTRIBUTION OF CONTRACTING SERVICES (1990 – 1999)

	SECTOR	ORDER	ACTIVITY AREA	PROJECT COSTS (USD)	SHARE	NUMBER OF PROJECTS
SUPERSTRUCTURE	BUILDING	10	MILITARY FACILITIES	889,946,972	0.030	22
		8	HEALTH FACILITY	1,373,306,595	0.047	70
		17	SCHOOLS	356,627,167	0.012	40
		5	ADMINISTRATIVE BUILDING	1,943,215,078	0.066	263
		1	HOUSING	5,970,225,811	0.203	224
		12	SOCIAL / CULTURAL FACILITIES	675,758,494	0.023	76
		7	TRADE CENTER	1,468,834,505	0.050	99
		19	SPORT FACILITIES	285,549,251	0.010	17
		3	TOURIST FACILITIES	2,513,714,645	0.086	133
		11	OTHER	793,196,902	0.027	138
			TOTAL	16,270,375,419	0.554	1082
	INDUSTRIAL FACILITIES	6	PETROCHEMICAL PLANT	1,672,068,298	0.057	50
		16	POWER PLANT	377,918,219	0.013	14
		21	ENERGY TRANSPORT LINES	217,052,536	0.007	20
		25	GAS / OIL PIPE LINES	141,958,422	0.005	12
		2	PLANT	4,279,016,024	0.146	183
		26	COMMUNICATION SYSTEMS	94,359,868	0.003	28
		24	STORAGE FACILITIES	164,163,582	0.006	23
		22	OTHER	216,197,030	0.007	30
			TOTAL	7,162,733,979	0.244	360
SUPERSTRUCTURE TOTAL				23,433,109,399	0.797	1442
INFRASTRUCTURE	WATER WORKS	28	SEWERAGE SYSTEM	31,119,652	0.001	2
		15	DRINKING WATER / TREATMENT PLANTS	444,532,162	0.015	15
		29	DAM	30,910,145	0.001	1
		20	IRRIGATION	271,654,908	0.009	8
		18	OTHER	350,386,414	0.012	12
			TOTAL	1,128,603,281	0.038	38
	TRANSPORTATION	4	ROAD / TUNNELS / BRIDGES	2,299,562,942	0.078	54
		30	RAILWAY	23,298,120	0.001	4
		9	AIRPORT	1,230,678,462	0.042	33
		14	PORT	466,151,613	0.016	18
		27	OTHER	31,951,889	0.001	1
			TOTAL	4,051,643,026	0.138	110
	OTHER	13	OTHER (INFRASTRUCTURE)	607,863,467	0.021	19
INFRASTRUCTURE TOTAL				5,788,109,774	0.197	167
OTHER		31	CONSULTANCY	0	0.000	0
		23	OTHERS	166,778,881	0.006	20
TOTAL (OTHER)				166,778,881	0.006	20
TOTAL (GRAND)				29,387,998,054	1.000	1629

DISTRIBUTION OF CONTRACTING SERVICES (2000-2009)

	SECTOR	ORDER	ACTIVITY AREA	PROJECT COSTS (USD)	SHARE	NUMBER OF PROJECT
SUPERSTRUCTURE	BUILDING	19	MILITARY FACILITIES	2,479,152,992	0.019	273
		13	HEALTH FACILITY	3,340,469,937	0.026	132
		10	SCHOOLS	4,888,057,401	0.038	245
		9	ADMINISTRATIVE BUILDING	5,522,402,012	0.043	346
		2	HOUSING	13,696,780,209	0.107	618
		12	SOCIAL / CULTURAL FACILITIES	3,861,217,959	0.030	122
		1	TRADE CENTER	13,698,830,340	0.107	351
		20	SPORT FACILITIES	2,323,850,189	0.018	42
		8	TOURIST FACILITIES	5,662,179,392	0.044	174
		14	OTHER	3,222,492,672	0.025	221
			TOTAL	58,695,433,102	0.459	2524
	INDUSTRIAL FACILITIES	7	PETROCHEMICAL PLANT	6,007,709,885	0.047	83
		4	POWER PLANT	8,783,106,729	0.069	86
		26	ENERGY TRANSPORT LINES	985,890,452	0.008	58
		25	GAS / OIL PIPE LINES	1,117,633,512	0.009	29
		5	PLANT	7,241,783,218	0.057	216
		30	COMMUNICATION SYSTEMS	153,405,720	0.001	39
		23	STORAGE FACILITIES	1,254,205,506	0.010	70
		24	OTHER	1,174,012,350	0.009	61
			TOTAL	26,717,747,372	0.209	642
SUPERSTRUCTURE TOTAL				85,413,180,474	0.668	3166
INFRASTRUCTURE	WATER WORKS	22	SEWERAGE SYSTEM	1,800,140,773	0.014	49
		18	DRINKING WATER / TREATMENT PLANTS	2,997,383,683	0.023	86
		21	DAM	1,910,088,675	0.015	32
		28	IRRIGATION	856,913,775	0.007	20
		17	OTHER	3,062,341,996	0.024	48
			TOTAL	10,626,868,902	0.083	235
	TRANSPORTATION	3	ROAD / TUNNELS / BRIDGES	13,585,118,354	0.106	345
		11	RAILWAY	3,962,284,733	0.031	28
		6	AIRPORT	6,875,943,621	0.054	126
		16	PORT	3,165,087,385	0.025	53
		29	OTHER	155,007,616	0.001	6
			TOTAL	27,743,441,709	0.217	558
	OTHER	15	OTHER (INFRASTRUCTURE)	3,177,130,359	0.025	64
INFRASTRUCTURE TOTAL				41,547,440,969	0.325	857
OTHER		31	CONSULTANCY	0	0.000	0
		27	OTHERS	966,103,859	0.008	81
TOTAL (OTHER)				966,103,859	0.008	81
TOTAL (GRAND)				127,926,725,303	1.000	4104

Table A-5. Distribution of international works in detail (Continued)

DISTRIBUTION OF CONTRACTING SERVICES (2010-2017)						
	SECTOR	ORDER	ACTIVITY AREA	PROJECT COSTS (USD)	SHARE	NUMBER OF PROJECT
SUPERSTRUCTURE	BUILDING	18	MILITARY FACILITIES	2,698,371,077	0.015	206
		12	HEALTH FACILITY	4,747,318,194	0.026	118
		13	SCHOOLS	4,269,051,195	0.023	147
		11	ADMINISTRATIVE BUILDING	5,537,463,312	0.030	193
		2	HOUSING	22,843,841,932	0.123	429
		17	SOCIAL / CULTURAL FACILITIES	2,970,770,120	0.016	96
		5	TRADE CENTER	14,205,487,817	0.077	192
		9	SPORT FACILITIES	7,506,594,793	0.040	48
		10	TOURIST FACILITIES	7,345,671,790	0.040	216
		14	OTHER	3,995,046,653	0.022	254
			TOTAL	76,119,616,886	0.410	1899
	INDUSTRIAL FACILITIES	8	PETROCHEMICAL PLANT	7,646,841,286	0.041	75
		4	POWER PLANT	14,608,854,143	0.079	126
		23	ENERGY TRANSPORT LINES	1,650,006,094	0.009	36
		25	GAS / OIL PIPE LINES	1,356,401,410	0.007	17
		7	PLANT	8,708,046,832	0.047	162
		29	COMMUNICATION SYSTEMS	22,342,857	0.000	11
		26	STORAGE FACILITIES	1,142,400,910	0.006	58
		20	OTHER	1,792,179,317	0.010	42
			TOTAL	36,927,072,848	0.199	527
SUPERSTRUCTURE TOTAL				113,046,689,734	0.609	2426
INFRASTRUCTURE	WATER WORKS	27	SEWERAGE SYSTEM	936,942,367	0.005	26
		15	DRINKING WATER / TREATMENT PLANTS	3,005,063,572	0.016	80
		24	DAM	1,376,531,852	0.007	22
		28	IRRIGATION	296,663,856	0.002	6
		21	OTHER	1,786,127,849	0.010	41
			TOTAL	7,401,329,495	0.040	175
	TRANSPORTATION	1	ROAD / TUNNELS / BRIDGES	28,992,015,272	0.156	245
		6	RAILWAY	12,746,278,471	0.069	50
		3	AIRPORT	16,240,217,599	0.088	89
		16	PORT	2,985,926,422	0.016	24
		30	OTHER	1,095,072	0.000	2
			TOTAL	60,965,532,835	0.329	410
	OTHER	22	OTHER (INFRASTRUCTURE)	1,713,514,332	0.009	54
INFRASTRUCTURE TOTAL				70,080,376,663	0.378	639
OTHER		31	CONSULTANCY	0	0.000	0
		19	OTHERS	2,383,620,934	0.013	141
TOTAL (OTHER)				2,383,620,934	0.013	141
TOTAL (GRAND)				185,510,687,331	1.000	3206

DISTRIBUTION OF CONTRACTING SERVICES (1972 – 2017)						
	SECTOR	ORDER	ACTIVITY AREA	PROJECT COSTS (USD)	SHARE	NUMBER OF PROJECT
SUPERSTRUCTURE	BUILDING	18	MILITARY FACILITIES	6,310,444,075	0.018	508
		13	HEALTH FACILITY	9,663,943,852	0.027	333
		12	SCHOOLS	9,749,037,039	0.027	454
		10	ADMINISTRATIVE BUILDING	13,224,335,174	0.037	816
		1	HOUSING	46,865,198,028	0.132	1337
		15	SOCIAL / CULTURAL FACILITIES	7,530,294,790	0.021	299
		3	TRADE CENTER	29,396,204,367	0.083	649
		11	SPORT FACILITIES	10,115,994,233	0.029	107
		8	TOURIST FACILITIES	15,648,845,827	0.044	527
		14	OTHER	8,077,246,077	0.023	617
			TOTAL	156,581,543,461	0.442	5647
	INDUSTRIAL FACILITIES	9	PETROCHEMICAL PLANT	15,354,943,468	0.043	211
		5	POWER PLANT	23,848,017,249	0.067	233
		24	ENERGY TRANSPORT LINES	2,883,884,014	0.008	118
		26	GAS / OIL PIPE LINES	2,701,300,243	0.008	67
		6	PLANT	20,729,056,380	0.058	594
		29	COMMUNICATION SYSTEMS	270,108,445	0.001	78
		27	STORAGE FACILITIES	2,683,330,082	0.008	157
		23	OTHER	3,495,109,884	0.010	140
			TOTAL	71,965,749,765	0.203	1598
SUPERSTRUCTURE TOTAL				228,547,293,226	0.644	7245
INFRASTRUCTURE	WATER WORKS	25	SEWERAGE SYSTEM	2,768,202,792	0.008	77
		17	DRINKING WATER / TREATMENT PLANTS	6,790,492,410	0.019	203
		21	DAM	4,956,030,671	0.014	58
		28	IRRIGATION	1,929,146,270	0.005	49
		20	OTHER	5,734,551,352	0.016	111
			TOTAL	22,178,423,495	0.063	498
	TRANSPORTATION	2	ROAD / TUNNELS / BRIDGES	45,743,880,604	0.129	668
		7	RAILWAY	16,734,374,574	0.047	83
		4	AIRPORT	24,357,012,682	0.069	249
		16	PORT	7,343,911,068	0.021	106
		30	OTHER	188,054,577	0.001	9
			TOTAL	94,367,233,504	0.266	1115
	OTHER	19	OTHER (INFRASTRUCTURE)	5,968,020,085	0.017	147
INFRASTRUCTURE TOTAL				122,513,677,084	0.345	1760
OTHER		31	CONSULTANCY	0	0.000	0
		22	OTHERS	3,587,511,764	0.010	247
TOTAL (OTHER)				3,587,511,764	0.010	247
TOTAL (GRAND)				354,648,482,074	1.000	9252

APPENDIX B

QUESTIONNAIRE FOR OBTAINING IMPORTANCE WEIGHTS OF COUNTRY FACTORS

PERSONAL INFORMATION

Education Level : Graduate M.Sc. PhD

Position : _____

Professional Experience : 0-5 years 6-10 years 10-15 years 16-20 years over 21

GENERAL INFORMATION ABOUT THE COMPANY

The age of the company you are working in:

- ☐ 0-10 years
- ☐ 10-20 years
- ☐ 20-30 years
- ☐ 30-40 years
- ☐ 40 years and over

The type of company you are working in

- ☐ Contractor
- ☐ Owner
- ☐ Deigner
- ☐ Consultancy
- ☐ Other

Annual turnover of the company which you are working:

- ☐ 0-100 Billion TL
- ☐ 100-500 Billion TL
- ☐ 500 Billion TL and over

Fields of activity of the company

- ☐ Residential
- ☐ Commercial buildings
- ☐ Transport
- ☐ Energy structures
- ☐ Water Construction
- ☐ Industrial plant
- ☐ Other

THE PURPOSE OF THE QUESTIONNAIRE

Purpose of the questionnaire is to determine importance weights of country factors to be used in grouping countries to facilitate learning from international construction projects. Within the scope of this study, similar countries are identified accordance with the obtained country groups.

Please mark the importance level of each factor to be used in grouping countries.

COUNTRY FACTORS	IMPORTANCE				
	Very Low				Very High
Financial conditions of the country *(e.g. Value of national currency against specific key currency , Availability of project financing for construction projects financed by government , Foreign exchange regime , Level of difficulty in money transfer etc.)*	○ 1	○ 2	○ 3	○ 4	○ 5

COUNTRY FACTORS	IMPORTANCE Very Low				Very High
Economic conditions of the country *(e.g. Gross domestic product per capita (PPP) , Distribution of income , Current account balance, Level of interest rate and fluctuations , Level of inflation and fluctuations, Unemployment rate, Level of economic development and justice of taxation system, Level of local tax rates and requirements etc.)*	○ 1	○ 2	○ 3	○ 4	○ 5
Political conditions of the country *(e.g. Level of stability of government and political condition , The status of international relations including neighbouring countries , The impact of the government on business etc.)*	○ 1	○ 2	○ 3	○ 4	○ 5
Social conditions of the country *(e.g. Existence of internal conflicts and social unrest , Occurrence of civil wars , Level of class differences/distinction among the local people , Fractionalization by language, ethic and regional groups , Level of crime rate etc.)*	○ 1	○ 2	○ 3	○ 4	○ 5

COUNTRY FACTORS	IMPORTANCE Very Low — Very High
Legal conditions of the country *(e.g. Maturity and reliability of the legal system , Level of applicability of the legal system, Level of clarity of the laws and regulations, legislations, and policies etc.)*	○ 1 ○ 2 ○ 3 ○ 4 ○ 5
Development level of construction industry and working culture *(e.g. The size of the construction market and related trend of the growth rate , Level of attractiveness (construction demand, forthcoming projects etc.) of the local construction market , Level of competition in the local construction market , Level of construction control and inspection mechanism in the market , Level of corruption in the local construction market etc.)*	○ 1 ○ 2 ○ 3 ○ 4 ○ 5
Regulations and requirements associated with construction to be applied *(e.g. Level of social and environmental policies, requirements and enforcements , Level of occupational health and safety system and requirement and enforcements , Level of quality requirements and standards to be applied during the construction process etc.)*	○ 1 ○ 2 ○ 3 ○ 4 ○ 5

COUNTRY FACTORS	IMPORTANCE Very Low — Very High
Difficulties/constraints issued to foreign construction companies *(e.g. Level of requirements and constraints for partner and partnerships , Level of requirements to hire local labour and staff , Level of requirement of travelling and visa status , Level of requirement for special residency permit , Level of requirements to obtain work permits and licences etc.)*	○ 1 ○ 2 ○ 3 ○ 4 ○ 5
Level of bureaucracy *(e.g. Bureaucratic procedures and stages , Bureaucratic procedure durations/delays , Level of variations of applied bureaucracy etc.)*	○ 1 ○ 2 ○ 3 ○ 4 ○ 5
Quality and availability of local resources *(e.g. Availability and quality level of materials, equipment and spare parts, Availability and efficiency level of workers, labours and subcontractors, Availability and quality level of infrastructure system etc.s)*	○ 1 ○ 2 ○ 3 ○ 4 ○ 5

COUNTRY FACTORS	IMPORTANCE				
	Very Low				Very High
Religious, linguistic and cultural structure *(e.g. Perspective attitudes of local people foreign companies and workers, Problems/obstacles or conveniences/supports related to the religious, cultural and linguistic features of the country etc.)*	○ 1	○ 2	○ 3	○ 4	○ 5
Geographical/physical/climatic conditions of the country *(e.g. The advantages or disadvantages of geographical location of the country , Conveniences/supports and suitability of the climate and weather conditions of the country , Conveniences/supports and suitability of the geological structure and physical conditions of the country etc.)*	○ 1	○ 2	○ 3	○ 4	○ 5
Other					
	○ 1	○ 2	○ 3	○ 4	○ 5
	○ 1	○ 2	○ 3	○ 4	○ 5
	○ 1	○ 2	○ 3	○ 4	○ 5

APPENDIX C

COUNTRY EVALUATION FORM

Please mark the countries in which you execute your project or which you have information about. Evaluate these countries by using the following evaluation form for each country you mark.

□ Afghanistan	□ Malaysia
□ Albania	□ Moldova
□ Algeria	□ Morocco
□ Azerbaijan	□ Mozambique
□ Belarus	□ Nigeria
□ Bosnia and Herzegovina	□ Northern Cyprus
□ Bulgaria	□ Oman
□ Croatia	□ Pakistan
□ Djibouti	□ Poland
□ Egypt	□ Qatar
□ Ethiopia	□ Romania
□ Georgia	□ Russia
□ Germany	□ Saudi Arabia
□ Holland	□ South Africa
□ India	□ Sudan
□ Iran	□ Syria
□ Iraq	□ Tajikistan
□ Jordan	□ Tanzania
□ Kazakhstan	□ Tunisian
□ Kosovo	□ Turkmenistan
□ Kuwait	□ UAE
□ Kyrgyzstan	□ UK
□ Lebanon	□ Ukraine
□ Libya	□ Uzbekistan
□ Macedonia	□ Yemen

Followings are the country factors that affect project performance (time, cost, quality etc.) in the international construction environment. You are kindly requested to evaluate these factors considering your experiences in any project type in the host country in question.

1. Please evaluate the general financial conditions of the country. Choose one of the following answers considering the conditions of the host country in the recent years (last 5 years).

Value of national currency against specific defined/key currency (USD, EUR etc.)	□ Appreciation against key currency □ Stabile/ no fluctuation □ Depreciation against key currency
Availability of project financing for construction projects financed by government	□ Easily available □ Moderately available □ Limited availability (limited, scarce sources) □ Not available
Foreign exchange regime	□ Highly strict □ Strict □ Flexible □ Highly flexible
Level of difficulty in money transfer	□ High, difficult □ Medium, moderate □ Low, easy
Membership of the international financial institutions, trade organizations, chambers and insurance associations (ICISA, EBRD, GFIA, IIS, ILO, WB, WTO, IMF, etc.) and relations	□ Applicable, strong relations □ Applicable, poor relations □ No membership
Credit rating grade according to credit rating agencies (Moody's, Standard & Poor's, Fitch etc.)	□ Very high (prime) □ High (high grade) □ Medium (medium grade) □ Low (speculative) □ Very low (-,in default)
Level of vulnerability of contractors to financial risks	□ Very high vulnerability □ High vulnerability □ Medium vulnerability □ Low vulnerability □ Very low vulnerability

2. Please evaluate the general economic conditions of the country. Choose one of the following answers considering the conditions of the host country in the recent years (last 5 years).

Gross domestic product per capita (PPP)	□ Very high (more than 35000$) □ High (25000$-35000$) □ Medium (15000$-25000$) □ Low (5000$-15000$) □ Very low (less than 5000$)
Distribution of income	□ Highly unequal □ Unequal □ Balance/equilibrium of income distribution
Current account balance (Including goods, services and incomes)	□ Undesirable surplus, inflow □ Desirable surplus, inflow □ At balance □ Undesirable deficit, outflow □ Desirable deficit, outflow
Balance of payments (Including reserve asset etc.)	□ Surplus (Inflow) □ At balance □ Deficit (Outflow)
Level and trend of economic growth rate	□ Positive and high rate □ Positive and low rate □ At balance □ Negative and low rate □ Negative and high rate
Level of interest rate and fluctuations	□ High level and upward tendency □ High level and downward tendency □ High level and stabile □ Low level and upward tendency □ Low level and downward tendency □ Low level and stabile
Level of inflation and fluctuations	□ High level and upward tendency □ High level and downward tendency □ High level and stabile □ Low level and upward tendency □ Low level and downward tendency □ Low level and stabile
Unemployment rate	□ High □ Medium □ Low
Level of economic development and justice of taxation system	□ Developed and fair system □ Developed and unfair system □ Undeveloped and fair system □ Undeveloped and unfair system

Level of local tax rates and requirements (Income and corporate tax)	□ High rate and high requirements □ High rate and low requirements □ Low rate and high requirements □ Low rate and low requirements
Government incentives and supports specific to construction industry (Tax incentives etc.)	□ High level □ Medium level □ Low level □ No incentive
Economic crisis	□ There has not been any economic crisis for more than five years □ No crisis in the recent year but overcame in the previous years □ On the verge of economic crisis □ There has been economic crisis
Level of vulnerability of contractors to economic risk	□ Very high vulnerability □ High vulnerability □ Medium vulnerability □ Low vulnerability □ Very low vulnerability

3. Please evaluate the general political conditions of the country. Choose one of the following answers considering the conditions of the host country in the recent years (last 5 years).

Level of stability of government and political condition	□ High level of stability □ Medium level of stability □ Low level (unstable)
The status of international relations including neighbouring countries (Diplomatic relations, hostiles, embargos etc.)	□ Good and sustainable relationships, stabile □ Good but vulnerable relationships, unstable □ Poor but improving relationships □ Poor and remain the same
The impact of the government on business	□ Highly frequent and highly influential □ Frequent and influential □ Almost never, n/a
State of war	□ There has not been any state of war for more than five years □ No war in the recent year but overcame in the previous years □ On the verge of war □ At war

Existence of terrorism	□ There has not been any terrorist activity for more than five years □ No terrorist activities in the recent year but overcame in the previous years □ There has been terrorism or threat of terrorism
Level of vulnerability of contractors to political risk	□ Very high vulnerability □ High vulnerability □ Medium vulnerability □ Low vulnerability □ Very low vulnerability

4. Please evaluate <u>the general social conditions of the country</u>. Choose one of the following answers considering the conditions of the host country in the recent years (last 5 years).

Existence of internal conflicts and social unrest (Rebellion, protest and demonstration etc.)	□ There has not been any social unrest for more than five years □ No social unrest in the recent year but overcame in the previous years □ There has been social unrest or threat of social unrest
Occurrence of civil wars	□ There has not been any civil war for more than five years □ No civil war in the recent year but overcame in the previous years □ There has been civil war
Level of class differences/distinction among the local people (Racial, gender, education and health discrimination etc.)	□ High level, excessive gap between classes □ Low level, narrow gap between classes □ Almost never, n/a
Fractionalization by language, ethic and regional groups	□ Divided and there are tensions among existing diverse groups □ Undivided but there are tensions among the local people □ Divided but no considerable tension and effect □ Undivided and no tension
Level of crime rate (Including smuggling, forgery, theft etc.)	□ High □ Medium □ Low
Existence of nationwide strike	□ There has not been any nationwide strike for more than five years □ No nationwide strike in the recent year but overcame in the previous years □ There has been nationwide strike

Education level of the local people	□ High □ Medium □ Low
Level of social awareness and environmental sensitivity of the local people	□ High □ Medium □ Low
Development level of the institutions for protection of human right and labour practices	□ High □ Medium to High, considerable efforts to improve □ Medium, not improved, no effort to improve □ Low to Medium, considerable efforts to improve □ Low, not improved, no effort to improve
Level of vulnerability of contractors to social risk	□ Very high vulnerability □ High vulnerability □ Medium vulnerability □ Low vulnerability □ Very low vulnerability

5. Please evaluate the legal conditions of the country. Choose one of the following answers considering the conditions of the host country in the recent years (last 5 years).

Maturity and reliability of the legal system	□ High level maturity and high level reliability □ High level maturity and low level reliability □ Low level maturity and high level reliability □ Low level maturity and low level reliability
Level of applicability of the legal system (Among people, places and states)	□ High □ Medium □ Low
Level of clarity of the laws and regulations, legislations, specifications and policies	□ High □ Medium □ Low
Level of predictability of the change of laws and regulations, legislations, specifications and policies (Due to changes made frequently etc.)	□ High □ Medium □ Low

Compliance with internationally-accepted/ universal rules and laws	□ High compliance □ Low / partial compliance but considerable efforts to improve □ Low / partial compliance and no effort to improve □ No compliance but considerable efforts to improve □ No compliance and no effort to improve
Efficiency of legal process and bureaucratic decisions	□ Not efficient, with delays □ Moderate efficiency, some delays are expected □ Efficient, without delay

6. Please evaluate the development level of the construction industry and working culture. Choose one of the following answers considering the conditions of the host country in the recent years (last 5 years).

The size of the construction market and related trend of the growth rate	□ Large size and positive growth rate □ Large size and remain same or negative growth rate □ Medium size and positive growth rate □ Medium size and remain same or negative growth rate □ Small size and positive growth rate □ Small size and remain same or negative growth rate
Level of attractiveness (construction demand, forthcoming projects etc.) of the local construction market	□ High □ Medium □ Low or none
Level of competition in the local construction market	□ High □ Medium □ Low or none
Level of construction control and inspection mechanism in the market	□ High □ Medium □ Low or none
Level of corruption in the local construction market (Bribery, nepotism etc.)	□ High □ Medium □ Low or none
Level of development of business ethics and local working culture	□ High □ Medium □ Low □ None
The effect of illegal organizations on the construction sector	□ High □ Medium □ Low □ None

Development level of industrial relations, trade unions and employers associations	□ High □ Medium □ Low or undeveloped
Development level of technology used in the industry and openness of the industry to innovation	□ Highly developed, contemporary and open to innovation □ Outdated but there are efforts to develop, open to innovation □ Outdated but there is no effort to develop
Collaboration level with academic institutions (Exchange level of information etc.)	□ High □ Medium □ Low □ No collaboration
Existence of internationally famous executed construction projects	□ High number of projects, remarkable projects □ Low number of projects □ No executed project
Level of vulnerability of contractors to domestic construction market risks	□ Very high vulnerability □ High vulnerability □ Medium vulnerability □ Low vulnerability □ Very low vulnerability

7. Please evaluate the construction related regulations and requirements to be applied. Choose one of the following answers considering the conditions of the host country in the recent years (last 5 years).

Level of social and environmental policies, requirements and enforcements ***(Prevention of dust emissions , ISO 14000 series certificate, prevention of harmful gases, noise, odours, light disturbance, wastes, requirements for threatened or endangered species)***	□ Strict and complex requirements □ Reasonable/moderate requirements □ Not current policy
Level of occupational health and safety system and requirement and enforcements ***(Inspecting hazardous/dangerous conditions, well-defined safety organization., safety monitoring and reporting, issues related with plant and equipment)***	□ Strict and complex requirements □ Reasonable/moderate requirements □ Not current policy

Level of specifications and standards to be applied during construction process ***(Design, material, technical, sustainability etc.)***	□ Strict and complex requirements □ Reasonable/moderate requirements □ Not current policy
Level of quality requirements and standards to be applied during the construction process ***(Quality assurance and quality control system, registration with ISO standards, quality training etc.)***	□ Strict and complex requirements □ Reasonable/moderate requirements □ Not current policy
Level of construction project management requirements during the construction process ***(Risk, human resources management etc.)***	□ Strict and complex requirements □ Reasonable/moderate requirements □ Not current policy

8. Please evaluate the requirements/difficulties/constraints issued specific to foreign construction companies Choose one of the following answers considering the conditions specific to your home country in the recent years (last 5 years).

Level of requirements and constraints for partner and partnerships	□ Strict requirements □ Reasonable requirements □ No requirement
Level of requirements to hire local labour and staff	□ Strict requirements □ Reasonable requirements □ No requirement
Level of requirement of travelling and visa status	□ Strict, difficult requirements □ Moderate, reasonable, easy requirements □ No requirement
Level of requirement for special residency permit	□ Strict, difficult requirements □ Moderate, reasonable, easy requirements □ No requirement
Level of requirement to use local contracts	□ Strict requirements □ Reasonable requirements □ No requirement

Level of requirements to obtain work permits and licences	□ Strict requirements □ Reasonable requirements □ No requirement
Level of requirements regarding local tax	□ Strict requirements □ Reasonable requirements □ No requirement
Level of requirements to obtain construction license	□ Strict requirements □ Reasonable requirements □ Almost never or no requirement
Level of restrictions of import and export, customs procedures	□ Strict requirements □ Reasonable requirements □ Almost never or no requirement
Level of strict bureaucracy special to foreign contractors ***(Acceptance of the approval procedure and government policies, decision making mechanism etc.)***	□ Red tape and time consuming, barriers and obstacles □ Medium level of bureaucracy □ No bureaucratic barrier special to foreign contractors

9. Please evaluate the level of bureaucracy. Choose one of the following answers considering the conditions of the host country in the recent years (last 5 years).

Bureaucratic procedures and stages	□ Complex and difficult procedure stages □ Reasonable procedure stages □ Simple and easy procedure stages
Bureaucratic procedure durations/delays	□ Long and excessive durations, with delays □ Reasonable durations □ Short durations, without delay
Level of variations of applied bureaucracy	□ High □ Medium □ Low

10. Please evaluate the quality and availability of local resources. Choose one of the following answers considering the conditions of the host country in the recent years (last 5 years).

Availability and quality level of materials, equipment and spare parts	□ Easily available and high level quality □ Easily available but low level quality □ Difficulties in availability but high level quality □ Difficulties in availability and low level quality
Availability and efficiency level of workers, labours and subcontractors	□ Easily availability of highly efficient people □ Not so easily availability of efficient people □ Difficulties in availability of efficient people □ High difficulties in availability of efficient people
Availability and quality level of infrastructure systems ***(Energy, power, water supply, sewage, transport, technology, communication systems)***	□ Easily available and high level quality, □ Difficulties in availability but high level quality □ Easily available but low level quality □ Difficulties in availability and low level quality

11. Please evaluate potential problems or conveniences to foreign companies due to the religious, linguistic and cultural structure of the country. Choose one of the following answers considering the conditions of the host country in the recent years (last 5 years).

Problems/obstacles or conveniences/supports related to the religious and cultural features of the country	□ Problems, obstacles and cultural clashes are frequently observed □ Moderately observed, at balance □ Conveniences are frequently observed
Problems/obstacles or conveniences/supports related to the linguistic features of the country ***(Communication issues, language barrier etc.)***	□ Problems and obstacles frequently observed □ Moderately observed □ Conveniences frequently observed
Perspective attitudes of local people foreign companies and workers	□ Positive (Warm hospitality, sympathetically etc.) □ Neutral / medium □ Negative (Xenophobia etc.)

12. Please evaluate <u>potential problems or conveniences to construction companies due to the geographical, physical, climatic conditions of the country.</u> Choose one of the following answers considering the conditions of the host country in the recent years (last 5 years).

Geological, hydrological, meteorological, natural disaster risk ***(Earthquakes, landslides, volcanic eruptions, floods, tsunamis, blizzards, droughts, hurricanes, tornadoes etc.)***	□ Very high □ High □ Medium □ Low □ Very low
The advantages or disadvantages of geographical location of the country ***(Transportation difficulties in the country, the variety of access roads, day and night hours, etc.)***	□ Highly advantageous, suitable environment □ Moderately advantageous, reasonable □ Disadvantageous, not suitable
Conveniences/supports and suitability of the climate and weather conditions of the country	□ Highly adequate climate and weather conditions □ Adequate/suitable climate and weather conditions □ Inadequate/severe climate and weather conditions
Conveniences/supports and suitability of the geological structure and physical conditions of the country ***(Ground and physical conditions, geological formations: islands, volcanoes etc.,)***	□ Highly advantageous, suitable environment □ Moderately advantageous, reasonable □ Disadvantageous, not suitable, hard conditions