INTERNATIONAL ENTRY DECISION FOR DESIGN FIRMS

A Dissertation

by

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ABSTRACT

International projects within the Architecture-Engineering-Construction (AEC) sector have increased both in number and in revenue during the past two decades. AEC companies seek projects outside of their home country at much higher rates than the past and the decision to enter into a new market is one of the most critical decisions AEC companies face in often volatile and competitive environments. There are few studies that investigate the important factors influencing international entry into a new market.

This dissertation developed a model investigating the influence of two company specific factors, international experience and embeddedness, and two country institutions, legal system and corruption, on the entry in a new international market using event history analysis. The focus of this study is to analyze the entry decision making for firms that are working in the Architecture and Engineering sector of the construction industry. In this dissertation these companies are classified as Design Firms. The logit regression model was developed to understand the influence of four dependent variables on the entry decision of design firms. The model controls for GDP per capita, market competition, and diversification level of companies.

The analysis was based on the longitudinal data from international design firms entering in the Central Eastern European countries since 1991 when the Soviet Union sphere of influence waned. The results of this study contribute to the body of knowledge by introducing a quantitative model that investigates the influence of company and country factors on the international entry of design firms. Practitioners can use the

results of this study in their entry decision-making. The results may also help practitioners identify and collect important information and knowledge as they pursue international projects.

DEDICATION

This dissertation is dedicated to my parents for their endless love, support, and encouragement throughout my life.

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NOMENCLATURE

CEE	Central Eastern Europe
ENR	Engineering News Record
TOP 200	ENR Top 200 International Design Firms
TOP 225	ENR Top 225 International Contractors
TCE	Transaction Cost Economics

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CHAPTER I

INTRODUCTION

International economic opportunities have expanded steadily over the past few decades, fostering an increase in many forms of international business. A dramatic increase in many forms of international business and in the pursuit of resources from foreign sources resulted in academic study of internationalization over the past few decades (Hitt, Tihanyi, Miller, & Connelly, 2006). In international business and strategic management research, foreign entry decision at the firm level is a critical decision (Terpstra & Sarathy, 1991), and research in this area is an expanding discipline.

Having decided to enter a foreign market, firms must select the most favorable market and then select the appropriate mode of entry. The mode determines the extent that the firm becomes involved in the foreign market, the degree of control over its activities, and the risks it must bear to expand into the foreign market. Thus, entry decision and entry mode identification can determine the degree a firm succeeds in a foreign market (Anderson & Gatignon, 1986; Root, 1987).

International AEC project is defined as projects in architecture, engineering, and construction sector that are performed by an international AEC company in a country outside of its home country. International AEC projects increased both in number and in revenue since 1991. AEC companies are seeking projects outside of their home countries, the location of headquarter of an international AEC company is defined as home country, more than any other time and the decision to enter a new market is one of

the most critical decisions AEC companies face in a volatile and competitive environment.

The strength of the international market over the past decade can be seen in the result of Engineering News Record (ENR)'s Top 225 International Contractors list. As a group, the Top 225 generated $453 billion in 2011, contracting revenue from projects outside their home countries, up more than 350 percent from $116.5 billion in 2002. Also, the Top 200 International Design Firms generated $65.3 billion in 2011 from projects outside of their respective home country. Domestic revenue for these firms was $65.24 billion in 2011. In 2002, the TOP 200 international revenue and domestic revenue were $18.9 billion and $32 billion respectively. While the domestic revenue saw a 204 percent growth over the past decade, international revenue escalated more than 340 percent.

While Global projects may appear as attractive investments, such projects usually involve significant risks and challenges. International projects involve interactions among stakeholders, individuals and agencies from different national backgrounds. Additional risks, misunderstandings, increased transaction costs related to global projects, coupled with the dramatic increase in international projects, makes the study of global projects worth investigating.

Despite previous studies and contributions to the international literature, little is known about AEC company strategies on international entry decision-making, and previous studies are founded on questionnaires and interviews instead of actual industry data. AEC companies are defined as companies that generate revenue in any of the

following fields: architecture, engineering, and construction. This study is a quantitative research intended to study the international entry of firms that generate revenue in architecture and engineering services. In this dissertation, firms that generate revenue in architecture and engineering are defined as design firms. The developed model considers the influence of two company specific factors, international experience and embeddedness on the international entry of design firms. Also, the covers two company institutions, legal system and corruption, applying institutional theory to decision-making. This study contributes an empirical examination that models the influence of company specific factors and country institutional factors on the entry decision of international construction companies.

1.1. Problem Statement

In order to improve international project performance it is critical to understand and investigate some of the most important factors influencing AEC company strategies regarding international entry decisions. A large body of academic research has been focused on internationalization of manufacturing firms. However, few studies have examined globalization of AEC companies. Very limited numbers of these studies focus on international entry decision of AEC companies. Moreover, previous studies have been based on interviews and questionnaires or small size case studies. Attempts at investigating corporate strategies in the area of entry decision making by utilizing actual industry data have not been formalized between owners, contractors and designers.

This study attempts to address the research gap by using industry data to pursue the following questions: what is the influence of two company factors, embeddedness

and international experience, on the international entry decision of design firms. Second, what is the influence of the country institutions, legal system and corruption, on the international entry decision of design firms. An additional research question that will be addressed is how to measure the diversification level of companies when the influence of market size is considered.

1.2. Research Objectives

The primary research objective of this study is to investigate the influence of two company factors, international experience and embeddedness and two country institution, legal system and corruption level on the entry decision of design firms. In addition to the primary objective identified above the following objectives were pursued:

- Development of a diversification measurement technique that considers market size.
- Analysis of international construction projects utilizing industry data
- Investigation of the influence of company diversification and competition levels on the international entry decision.

1.3. Research Scope and Boundaries

For the purpose of this study, international entry is defined as an international company performing a design project in one of the Central East European (CEE) countries for the first time. For this study, the list of applicable countries is:

- ALBANIA
- BELARUS
- BOSNIA
- BULGARIA

- CROATIA
- CZECH REPUBLIC
- ESTONIA
- HUNGARY
- LATVIA
- LITHUANIA
- MACEDONIA
- MOLDOVA
- POLAND
- ROMANIA
- RUSSIA
- SLOVAKIA
- SLOVENIA
- UKRAINE
- YUGOSLAVIA

AEC company is defined as a company that performs any of the following services: Architecture, Engineering, and Construction. AEC Company could have two divisions: Design Division and Construction Division. For this study, design division is defined as a part of the construction company that performs architectural and/or design services. The Construction Division is defined as a part of the construction company that performs procurement and/or construction services. Some AEC companies might focus on design projects while others might only focus on procurement and construction.

Design firm is defined as a company that generates majority or all of its revenue from one of the following categories:

- Architect
- Engineer
- Environmental
- Geotechnical engineer
- Landscape

- Planner

Companies considered in this definition might generate most of their revenue from procurement and construction; however, in this study as long as companies generate some part of their revenue from categories explained above, they are considered as AEC companies with design division or design firms – construction only firms are omitted.

The boundaries of the research include:

- This study investigates only Engineering News Record (ENR) Top 200 international design firms and ENR Top 225 international contractors. The data is based on voluntarily reports of revenue provided by companies from around the world. There might be other international companies that are not investigated in this study because of lack of data.
- Company and country data sets were collected from 1991, when the Soviet Union influenced waned until 2011.
- The effects regarding diversification level of companies, Gross Domestic Product (GDP) of countries, and the respective year on the international entry of design firms are controlled.

1.4. Organization of the Dissertation

This dissertation consists of six chapters followed by 2 appendices of supporting information. Following this introduction, Chapter Two presents background information regarding the international construction projects including, international risk management, decision support systems, and organizational issues regarding international

projects. Chapter Three details the research framework and the research hypotheses. Also, background information related to each hypothesis is explained. Chapter Four details the research methodology including event history analysis, data collection methods, and data sources. Chapter Five discusses the results. Chapter Six reviews the achievement of research objectives, as well as conclusions, recommendations, contributions, and suggestions for additional research. Appendix A presents a sample of utilized data sets. Appendix B lists all of the companies analyzed in this study.

CHAPTER II

BACKGROUND

The cyclical nature of AEC projects is one of the reasons most corporations seek to obtain global contracts. Global contracts might mitigate the impact of a downside economy and ensure the financial stability through increased global activities (Seung H Han, Park, Kim, Kim, & Kang, 2007). Advanced technological companies also view global projects as chances to capitalize on the expertise gained from long involvement with one type of construction or technology (Abdul-Aziz, 1994).

This literature review discusses a host of the topics related to international AEC projects. Over the past two decades, scholars have studied different aspects of international AEC projects. Based on an extensive review of the literature, previous studies have been categorized as

- Transaction Cost Economics Theory (TCE)
- International risk management
- Decision support system for international projects
- Organizational issues in global projects

This research required an extensive literature review on global AEC projects as well as theories that could support concepts behind the developed hypotheses. The following theories, examined at depth in this research, created a sound background for the hypotheses: (1) social embeddedness, (2) liability of foreignness. Also, the following concepts were utilized in this study to develop some of the hypotheses: (1) legal system,

(2) international experience and (3) corruption. Since these theories and concepts were utilized to develop the model, the literature review associated with these theories and concepts is detailed in Chapter 3.

2.1. Transaction Cost Economics

Scholars have tried to explain entry decisions using different theoretical approaches such as the corporate strategy perspective (Caves & Mehra, 1986) and learning perspective (Barkema & Vermeulen, 1998). Transaction cost economics (TCE) is a well-known dominant theory (Williamson, 1979) that has been used by scholars to explain the international entry decisions of companies (Anderson & Gatignon, 1986; Erramilli & Rao, 1993; Teece, 1986). TCE is an effort to better understand economic organization by regarding the transaction as the basic unit of analysis (Williamson, 1981). TCE categorizes each transaction based on three critical characteristics of transaction: (1) uncertainty; (2) frequency that transactions recur; and (3) the degrees to which durable transaction specific investments are incurred. Table1 shows the transaction categories based on investment frequency and investment characteristics. Frequency is categorized into recurrent and occasional. Degree of specificity of investments is categorized as non-specific, mixed, and idiosyncratic. For example, buying eggs from grocery market is a recurrent transaction because this transaction occurs on a regular basis. Also, this transaction is non-specific since this transaction is not specific to either the buyer or the owner. TCE theory proposes the best governance structure for the different types of transactions shown in Table1. The suggested governance structure for each cell could change as the level of uncertainty, the third

characteristic of transactions changes. If the uncertainty level of a transaction increases, the required control for this transaction increases. If the level of uncertainty of the transaction decreases, the required control for the transaction decreases.

Projects, which are unique and timebounded, could be categorized as occasional idiosyncratic transactions. Based on these two characteristics of projects, the shaded cell in Table1 describes projects. TCE suggests a high level of control for this type of transactions. Timebounded refers to the length of time that a project takes. In addition to characteristics of a project, the high level of uncertainty of international projects can make the study of these transactions more complex.

Table 1 – Illustrative Commercial Transactions

		Investment Characteristics		
		Nonspecific	Mixed	Idiosyncratic
Frequency	Occasional	Purchasing Standard Equipment	Purchasing Customized equipment	Constructing a Plant
	Recurrent	Purchasing Standard Material	Purchasing Customized Material	Site-Specific Transfer of Intermediate Product Across Successive Stages

When firms enter a new international market they assume the market has at least enough financial potential to pay off the high overhead that international projects require. Based on the TCE, the success rate of the international entry can significantly be

affected by three constructs: (1) the transaction-specific assets, which are the investments that are specialized to one or few uses; (2) external uncertainty; and (3) internal uncertainty (Anderson & Gatignon, 1986). A detailed investigation of internationalization of project-based entities is needed for the following reasons:

(1) Many projects have considerable amount of transaction-specific assets that are designed for each project.

(2) The level of external and internal uncertainty is high for international projects especially when firms enter new markets.

(3) Previous studies almost exclusively use TCE to explain the internationalization of manufacturing and service firms.

The focus of this research is to study the entry of design firms in international markets. It investigates some of the important factors influencing the international entry decision of AEC companies.

AEC industry research is a major part of the project management research stream. Project management found its roots in construction, defense, and engineering. As project management has been developed, new project types have appeared such as software and computer products. In the 1950's, project management was formally recognized as a distinct discipline arising from the field of management. It has evolved from its basic form to a sophisticated discipline during the past six decades.

Despite significant studies around the topic of international entry, scholars have focused almost exclusively on manufacturing rather than project-based firms. However, project oriented firms differ from manufacturing firms because of project specific

characteristics such as uniqueness and timeboundedness. Research on internationalization of project-based entities is necessary due to the increasing trend of global projects. During the past two decades scholars have tried to study different aspects of global projects. Some of the research streams are: international risk management; decision support systems for international projects; and organizational issues in global projects.

2.2. International Risk Management

Studies on international risk management have been one of the dominant research streams in international global construction literature. Seung H. Han and Diekmann (2001) developed a risk-based bidding decision-making process. The study introduced a formal procedure based on cross impact analysis method for go/no-go decision for the traditional competitive public sector international projects utilizing five risk categories: (1) political risk; (2) economic risk; (3) cultural/legal; (4) technology/construction; and (5) other risk. The method is designed to predict future events by capturing the interactions between elements. This method is most effective when relationships between elements are complex and when required data is hard to collect. As a part of these five categories, Ashley and Bonner (1999) focused on political risk factors and developed a political risk identification model.

Walewski (2005) developed a systematic tool to identify and assess the risks specific to international construction with the ultimate goal of improving international project performance. The tool, International Project Risk Assessment (IPRA), consists of 82 risk elements that are assessed by likelihood of occurrence and relative impact to

identify those elements having the greatest impact on the project. The tool was developed based on surveys and structured interviews.

Kim, Han, and Kim (2008) expanded the international risk assessment literature by quantifying appropriate contingencies required to address risks on international projects. Cost contingency is determined to ensure a favorable level of profit and a good chance of winning the contract. The developed mode characterizes an international project for its cost performance prediction compared to the initial cost estimation. A linear discriminant analysis with the support of a bootstrap method was used to develop the model. Bootstrapping is a method for assigning measures of accuracy to sample estimates (Efron & Tibshirani, 1993). Generally, it falls in the broader class of resampling methods. Discriminant method is a technique designed for analyzing the data when the dependent variable is categorical.

Seung H Han, Kim, and Kim (2007) identified 64 risk variables into five categories based on interviews with 12 industry practitioners and 30 overseas case studies. The five major categories are: (1) the conditions of the host country and project owner; (2) the bidding process; (3) project characteristics and contractual conditions; (4) characteristics of the organization and participants; and (5) the contractor's ability and capacity. According to this study, the five leading causes of poor profitability of international projects are:

1. Leadership and competence of project manager
2. Project planning and management
3. Owner's funding capacity

4. Adequacy of contract duration
5. Reflection of host country's conditions

2.3. Decision Support System For International Projects

Another research stream attempts to develop decision support systems for international projects. These studies are mostly designed to help practitioners in their decision-making. In the field of international construction projects, some of these frameworks are founded based on international risk management studies.

Seung H Han, Diekmann, Lee, and Ock (2004) introduced a framework of project selection procedure for multinational contractors applying a multi-criteria decision making method to maximize the total value of firms. The model integrates the risk hierarchy of both individual projects and corporate level projects.

Based on studies conducted by Han and his colleagues, and other scholars on decision support systems for international projects, Seung H Han, Park, et al. (2007) developed a profit prediction model for international projects by analyzing the relationship between risks and project profitability. The model utilized 126 actual projects performed by South Korean companies in international construction markets. In 2005, Gunhan and Arditi developed a descriptive international expansion decision model. They used a different method to facilitate the entry-decision in foreign markets and to highlight the importance of the factors involved in this decision. The model is based on Analytic Hierarchy Process (AHP) and using a Delphi Survey, the model enables AEC companies to test if they are ready to expand into international markets. The model has two steps: first the model helps companies to decide whether they need to

expand into an international market; and then, it evaluates positive and negative aspects of conducting business in a specific country.

Similar to the three previous models, a case base reasoning (CBR) decision support system was constructed by (Ozorhon, Dikmen, & Birgonul, 2006). The CBR system was designed to help companies utilize organizational memory related to experiences of other companies for decision-making. Two hundred fifteen cases from the Turkish construction industry were used to develop the model.

Finally, the Construction Industry Institute Research Team 263 developed the Globalization Self-Assessment Tool (G-SAT) through open-ended interviews in order to identify the dimensions and attributes of globalization. The tool is designed to help engineering and construction companies improve their globalization efforts by identifying and evaluating proper globalization tactics and planning the implementation of these globalization tactics.

2.4. Organizational Issues in Global Projects

There is a growing body of knowledge on organizational issues related to international projects. These problems are exacerbated when firms work in different environments with different institutions. Recently, scholars have recognized institutional theory as a framework for identifying and analyzing different aspects of international projects. (Mahalingham & Levitt, 2007; Orr & Scott, 2008). Mahalingham and Levitt (2007) demonstrated how institutional theory could describe the conflicts on global projects. They found the difference between safety standards of participants of a global project as one of the issues that can increase the amount of conflict substantially.

Working in markets with such differing institutional norms will increase work stoppages and delays. A. N. Javernick-Will and Scott (2010) used institutional theory to identify the type of knowledge that is important for managers of international projects. Their study complies data from 15 case studies of international firms engaged in international infrastructure development projects to identify important institutional knowledge required for global organizations. Based on the same data set, another explanatory study was conducted by A. Javernick-Will and Levitt (2010). The study used institutional theory to analyze specific methods that firms used to transfer institutional knowledge internally, across projects, and between divisions. Then, they developed new processes for international firms to mobilize their knowledge and improve the outcomes of international projects.

Institutional theory described three major sources of differences between countries. These sources are called institutions. Institutions include regulative, normative, and cultural-cognitive elements that provide meaning to social life (Scott, 2001). Regulative elements include laws, rules, sanctions, and incentives. This element is stressed mainly by economists and can be observed and is more explicit than normative and cultural-cognitive elements. Normative elements focus on the prescriptive, evaluative, and obligatory dimensions of social life. Some of the most important normative institutions are expectations and local preferences, social norms, logistics, productivity norms, and market knowledge (A. Javernick-Will & Levitt, 2010). Cultural-cognitive elements go into a deeper layer including cultural frames and scripts (Schank & Abelson, 1977). Hofstede (1991) identified a set of four dimensions to assess

work-related values and differences regarding the cultural aspects of different countries. The study was based on 117,000 questionnaires from 66 countries. The dimensions of work-related beliefs are:

1. Power distance: It is socially accepted level of hierarchy. For example, there is a difference between accepted levels of hierarchy in military services compared to engineering services.
2. Uncertainty avoidance: It is defined as cultural level of tolerance for ambiguity. More risk averse cultures receive lower score in this dimension.
3. Individualism which is the social predilection for inter dependence.
4. Masculinity: It is the culture's desire for sex role differentiation. Feminine cultures believe in existence of similar roles for men and women in the society.

Many scholars recognized the benefit of collecting knowledge about the culture and local norms and the central importance of local institutions during the international expansion (Lord & Ranft, 2000).

2.5. Summary of the Literature

In this chapter some of the studies associated with international entry decision of companies have been described. TCE theory suggests that success rate of international entry of companies depends on transaction specific assets and uncertainties. Projects require extensive amount of transaction specific assets and international projects are faced with significant uncertainties. However, majority of previous studies on explaining international entry of firms almost exclusively focus on manufacturing firms. International risk management literature identifies risk factors associated with

international projects. Based on introduced risk factors, scholars developed decision support systems to support international firms. These studies are founded on questionnaires and interviews and not on actual industry data.

Recently, scholars have tried to explain different aspects of internationalization of AEC companies such as conflict resolution and mobilizing institutional knowledge utilizing institutional theory. Despite previous contributions to the international institutions and internationalization of projects, little is known about specific institutions in global. This study is a quantitative research intended to study the international entry of design firms using industry data. The developed model considers the influence of two company specific factors, international experience and embeddedness, on the international entry of design firms. The theory of social embeddedness explains the influence of embeddedness on the international entry. Also, this study covers two country institutions, legal system and corruption, using institutional theory on the entry decision-making.

CHAPTER III

FRAMEWORK AND HYPOTHESES

3.1. Introduction

This study proposes a model and empirical examination regarding the influence of company specific factors and country institutional factors on the entry decision of international construction companies. First, the model is demonstrated. Then the developed hypotheses along with theoretical background are described. Third, the methodology and industry data is explained. Finally, the results are discussed.

This study empirically tested the influence of four major factors on the entry decision of construction companies. These factors, considered as independent variables in this study, are subsets of: (1) company factors and (2) country institutions. The independent variables for this research are embeddedness, international experience, legal system, and corruption. Significant number of factors might influence on the international entry decision of firms, however, it is impossible to incorporate all factors in the model. On the other hand, incorporating more factors in the model could improve the accuracy of the model. Also, it gives the ability to compare the impact of factors on the model. As a result, three other independent variables have been added to the model as control variables: (1) GDP per capita; (2) year; and (3) diversification level.

3.2. The Model

Figure1 shows the model developed for the purpose of this study. Positive and negative signs on the model illustrate the expected correlation between independent variables and the dependent variable.

Different theoretical backgrounds are incorporated and explain in detail below for each hypothesis. Hypothesis 1 (H1) is explained by the theory of social embeddedness. The theory is the degree to which economic transactions are connected to social relations. Liability of foreignness and international experience describes Hypotheses 2 (H2). Both country institution hypotheses are derived from institutional theory. Hypothesis 3 (H3) is explained as part of regulative institutions, and Hypothesis 4 (H4) is explained as part of both regulative and normative institutions. The rest of this chapter discusses the four hypotheses and their associated theories. A final discussion on the relationship between the proposed model (framework) and proposed hypotheses concludes the chapter.

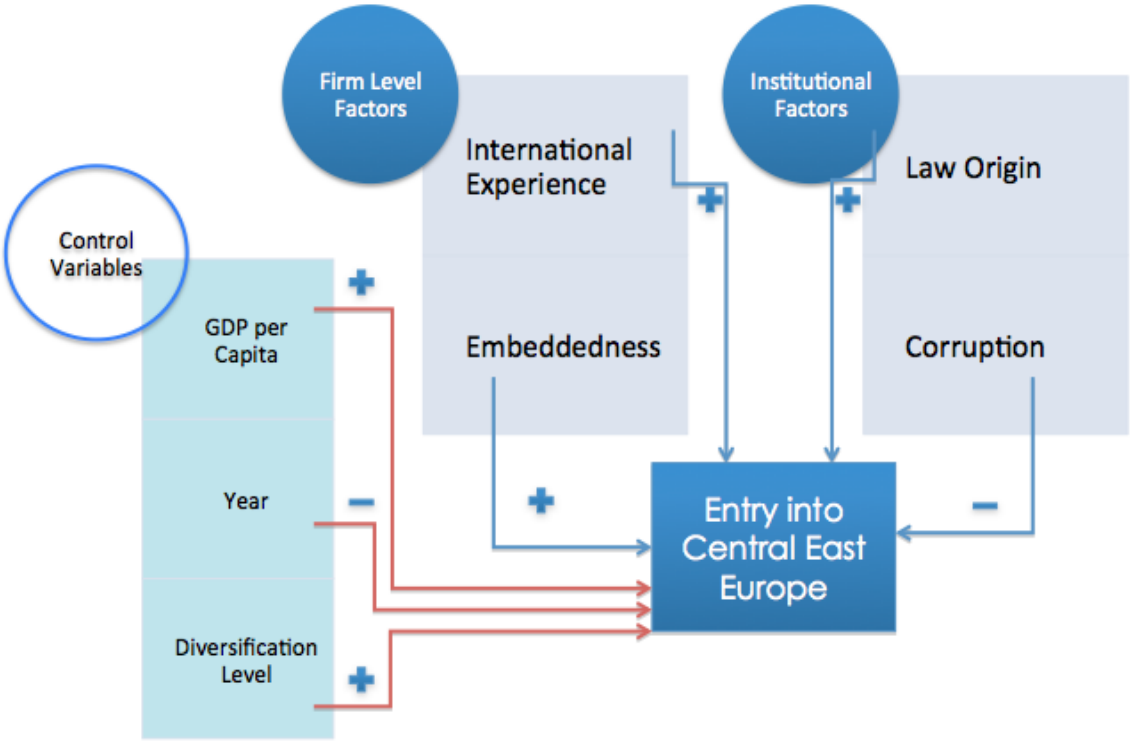

Figure 1 - Framework of the Research

3.3. Hypotheses

3.3.1. Social Embeddedness

How institutions are affected by social relations is one of the classical questions of social theory (Granvetter, 1985). Classical economics assumes that people have rational, self-interested behaviors. As a result, the influence of social relations in economic transactions can be neglected. On the other hand, there is the argument of "embeddedness" that behaviors are so constrained by social relations that the assumption that behaviors are atomistic or independent is irrelevant. Based on these arguments, Granvetter (1985) introduced the concept of social embeddedness. It is defined as the degree to which economic transactions take place through social relations. Powell

(1990) analyzed the sociological and economic literature on exchange and introduced two different types of transactions:

The first type of transactions takes place between individuals who maintain impersonal and constantly shifting exchange ties. In this ideal atomistic market, exchange partners are linked by arm's-length ties. Arm's-length ties are characterized by lean and sporadic transactions and function without any social contact between parties (Hirschman, 1982). An example of this type of transactions is when someone tries to buy a book from the Internet. Buyer and seller maintain impersonal exchange ties and the only factor is the condition of the book and its price. Burt (1992) argued that the use of arm's-length ties offer the highest possible returns to firms.

The second type of transaction happens in stable networks of exchange partners who maintain close social relationships. The key distinction between these two types of transactions is the structure and quality of exchange ties. Research on interfirm network suggests that embedding economic exchanges in social attachments can create unique value for both parties. Embedded ties promote these outcomes through the transfer of private resources (Brian Uzzi, 1997). In fact, since private knowledge can be misappropriated, it is commonly inaccessible through arm's-length ties and is shared only within a set of trustworthy exchange partners (Brian Uzzi, 1999). The transfer of private knowledge between exchange partners is valuable because not having the private knowledge makes it difficult for competitors without private knowledge to compete.

Exchange partners share the belief that access to private information can enlarge the pool of potentially beneficial transactions that are not available through market

means. Romo and Schwartz (1995) findings suggest that embedded actors shift their focus from the narrow economically rational goal of winning immediate gain to cultivating long term corporate ties. Overall, the literature suggests that embeddedness creates economic opportunities that are difficult to replicate via markets or contracts.

Based on the social embeddedness concept, this research study argues that AEC companies that have both design and construction divisions have proprietary knowledge in international projects over the companies that are solely construction companies. The required knowledge to work on international projects can be collected if the design division of the company has been involved in projects in specified country. Once the knowledge is gathered, it will be transferred to the construction division of the company. Achieving this knowledge is so advantageous to the company that it affects the entry decision strategy of the company in the international market. Design firms are not usually limited to a specific location and most of their work can be done from the main office. These firms do not encounter significant risks relative to construction companies, and compensation is almost solely based on the engineering effort, which can be accomplished in the home office.

Despite limited risk factors affecting design firms, various risk factors influence international construction company's performance. Many of these risk factors are related to the political, cultural, economic, and operational environments of the project's location (Walewski, 2005). Gathering dependable data related to project's location can reduce risks and uncertainties in to a significant degree. Knowing about the culture, social norms, and legal system can benefit a company that is about to enter in a foreign

country. This kind of data cannot be fully obtained unless the firm has the experience in that country or it has a trusted relationship with a firm that has been involved in the project's location. While international construction companies are searching for new projects, they are more likely to enter into a market that they are more familiar with.

Companies that have both construction and design divisions can gain proprietary knowledge. This knowledge gives them the edge in international competition compared to the companies that are solely construction companies. Gathering this knowledge is a great motivation for the design division of those companies to aggressively seek international markets. As a result of this strategy, these design firms are more likely to enter international markets than the firms that are solely design firms. Based on the previously mentioned argument, hypothesis 1 is introduced as follows:

H1: AEC companies who have both design and construction divisions are more likely to enter in Central Eastern European countries than the AEC companies who are solely design firms.

3.3.2. International Experience

The influence of experience on the foreign market entry behavior of firms has been extensively investigated in the literature. However, past research focuses almost exclusively on manufacturing and service firms. Whether the results of those research streams can be generalized to project management is not entirely clear. Project oriented firms face some unique challenges expanding internationally.

According to the TCE perspective, international experience is relevant to market entry behavior of firms because experience has the potential to reduce the cost and

increase the effectiveness of transactions. Firms that enter countries face uncertainty and they will try to gain knowledge about new markets to minimize this uncertainty (Carlsson, Nordegren, & Sjoholm, 2005). International experience is considered as an indicator of low levels of internal uncertainty (Dow & Larimo, 2009).

Acquiring market knowledge decreases the level of uncertainty. The market knowledge can be defined as knowledge about how the network works such as how relations to different actors on the market are developed, and how coordination of activities takes place (Johanson & Vahlne, 1990). Having international experience in general and experience in the specific region influence the entry decision of design firms.

International experience can be divided into two categories: (1) general international experience; and (2) international experience specific to the region. The focus of this study is the general international experience. In this type of experience, firms acquire knowledge about how to handle international operations such as market methods, and formalities connected with procurement and payments. This type of knowledge is not market specific and can be transferred from one country to another (Johanson & Vahlne, 1990). Thus, firms with more international experience have more confidence in their ability to enter a new market.

When companies have higher level of international experience in the region, they acquire market specific knowledge such as business climate, culture, and structure of market system. This type of knowledge is difficult to acquire and the best way to acquire this knowledge is by operating in the market. Once the firm is established in a foreign

market, learning benefits and scale economics reduces uncertainty that firms face when they enter a new market. They acquire knowledge about opportunities and business alternatives in the new market and the degree of foreignness decreases (Carlsson et al., 2005). For the purpose of this study, the influence of general international experience on international entry decision of design firms has been investigated:

H2: Design firms with more international experience are more likely to enter in the AEC industry of the CEE region.

3.3.3. Legal Origin

Home institutions are important factors influencing the entry decisions of international companies. International management scholars apply institutional theory to study the internationalization and multinational enterprises (Dacin, Goodstein, & Scott, 2002). The application of institutional theory in the international management literature includes:

(1) Conceptualization of national environment, introducing country institutional profile that consists of regulatory, cognitive, and normative institutions (Eden & Miller, 2004; Kostova & Zaheer, 1999); and

(2) Explanation of comparative national business systems based on the different types of institutions (Casper & R., 2004; Hill, 1995).

Institutional theory considers the processes by which structures become established as authoritative guidelines for social behavior (Scott, 2005). Regulative institutions that consist of laws, rules, and sanctions are one of three elements of country institutions. Economists have stressed that good economic institutions are instrumental

to economic growth (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1999) and a legal system is the most important element of economic institutions. Law and the quality of its enforcement are potentially important determinants of entry decision of international firms. However, it is not clear from the literature what is the effect of different legal institutions on the entry decision of international firms.

This research evaluates the influence of the regulative institutions of home countries on the international entry of firms. The legal origin of countries is an indicator of regulations of home countries in this study.

Legal scholars argue that some legal systems are sufficiently similar since their legal system originated from major families of law (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998). Watson (1974) argued that laws in different countries are typically not written from scratch, but rather transplanted from few legal families. In general, commercial laws come from two families: common law, which is English in nature; and civil law, which derives from Roman law. La Porta et al. (1998) show that laws vary across countries because of differences in legal origins. Civil laws give investors weaker legal rights than common laws do. On the other hand, the quality of law enforcement is the highest in most forms of civil law countries. Although the laws have been revised from their origin based on each country environment, this study argues that the country's law origin could be used as an indicator of regulative institutions. Firms develop some characteristics based on the home legal system that will influence the entry decision of those firms in international market.

H3: Design firms coming from home countries that have a common law based regulation system are more likely to enter in the AEC industry of the CEE region.

3.3.4. Corruption

Corruption has gained a lot of attention recently as the economic transaction between less corrupt and more corrupt countries has increased in the past two decades. Corruption is defined as the abuse of public power for private benefits (Teisman, 2000). It is common in situations where there are few institutional restrictions or when the quality of administrative officials is poor (Keefer and Knack 1997). Corruption is more common in transition economics and less developed economies (Hellman, Jones, Kaufmann, & Schankerman, 2000). Corruption does not seem to deter Foreign Direct Investment (FDI) in absolute time in countries such as China, Brazil, and Thailand (Habib & Zurawicki, 2002).

The focus of this study is to introduce corruption as an important and independent country level factor influencing entry decision and to test the perception that the difference in the exposure to corruption between host and home countries has a negative effect on international entry decision of firms.

Research on corruption identifies bribes and queuing cost (Fisman, 2001) as part of the firms operating costs in countries where government corruption is significant. However, Shleifer and Vishny (1993) argue that the cost of bribery and its frequency of occurrence can be neglected compared to the uncertainty surrounding corruption transactions. If the level of uncertainty is low, payments to corrupt officials are like an explicit tax (Wei, 1997) which should not affect entry decision making.

Institutional theory predicts that firms learn how to work in corrupted environment and adopt broadly diffused business to achieve access to resources (Oliver, 1991). If the situation in the host country is corrupted and bribery could help international companies to win new projects, receive higher compensation for their work, or achieve access to resources, firms adapt to the corrupted environment. In order to reduce the level of uncertainty related to corruption, firms tend to conform to pressures from the institutional environment (Uhlenbruck, Rodriguez, Doh, & Eden, 2006). Uncertainty reduces the discretion of the firms (Xu & Shenkar, 2001). The more uncertain the corrupted country, it is more likely that companies engage in corruption to encounter such pressures.

Trying to adapt to the local institutions, however, may bring up two issues. The first issue is the inability of the home firms to handle corruption in host countries. The greater the difference of the level of corruption between home and host country, the lower the likelihood that firms know how to cope with corrupted situations. Alternatively, exposure to corruption at home provides a learning experience for firms entering in a corrupted country (Habib & Zurawicki, 2002). The second issue is the reduction of the internal legitimacy of the company. The engagement in corruption may collide with internal values and norms of the firm given that it may have to submit to home country or international anticorruption rules (Uhlenbruck et al., 2006). The difference of institutional conditions of the firm's internal and external environment may create conflicting institutional pressures that reduce the stability of the organization of firms (Allison, 1984; Kostova & Roth, 2002). Hence, these two issues might reduce the

likelihood of the international entry by the firms coming from a host country with different institutional environments.

H4: The greater the absolute difference in the corruption level between home and host countries, the lesser the likelihood of international entry for the design firms in CEE region.

3.4. Summary

In this chapter, the proposed model was introduced. Then, each hypothesis along with associated theory and background was explained. The model shows the expected correlation between factors and the international entry of design firms. It is expected that international experience, law origin and embeddedness have positive correlation with international entry of design firms while it is expected that corruption has a negative correlation with the international entry.

In the next chapter, the methodology to test the model will be explained. Also, the industry data collected along with data analysis techniques that have been utilized in this study are demonstrated.

CHAPTER IV

METHODOLOGY

Chapter Two of this study showed that there was a lack of quantitative studies based on actual industry data on the international entry decision of design firms. Chapter Three described the proposed model framework that was introduced along with all four hypotheses. These hypotheses are founded on social embeddedness, international experience, legal system, and corruption respectively. The proposed model as well as the theories and concepts associated with the hypotheses were described in detail Chapter Three.

This chapter outlines the specific research methodology employed in demonstrating the model and hypotheses, including the data collection procedures, data sources, and data analysis techniques. Event history analysis was used to demonstrate the model. In this chapter, the event history analysis technique utilized in this study is explained. Then, the independent, independent, and control variables are discussed. Next the data collecting procedures and sources of data are described. The chapter concludes with the development of two variables of model and a follow-on discussion.

4.1. Event History Analysis

Statistical techniques known as event history analysis were developed to enable researchers to analyze time-series data sets and dichotomous dependent variables. This analysis has been used to study the occurrence of events such as deaths or marriages within observed periods of time. The occurrence of an event is treated as a dependent

variable, which is observed over contiguous time periods of varying length for each subject that is considered as an independent variable (Allison, 1984).

The sample for this study consists of 663 design firms. These design firms have appeared in the ENR Top 200 International Design Firms ranking at some point in time since 1991. They were observed for the maximum of 21 years, beginning with the first year of their position in the ranking. The event of interest was the first entry of the company in the CEE region. Thus, even though the analysis deals with what is, in principle, a repetitive event, it is defined to be non-repetitive by considering the first entry. For example, if company x entered the region in 1995 and continued to work in the region for several years, the event of interest is the year they entered the region which in this case is 1995. After 1995, this study did not monitor the entry of company x in other countries in the region nor did it monitor the years of existence in the region. This is an appropriate strategy if the process of the first entry is different from the second entry or expansion strategies.

Explanatory variables served as independent variables thought to affect the likelihood of the first entry event. When observations are measured in discrete time such as year or month, logit regression can be used to measure the coefficients, standard errors, and covariances of the model. Event history analysis can be described as the study of the distribution of time until an event occurs. In this study the event in question is whether the international design firm enters in the CEE market or not. Entry is a non-repeated, single event that can be modeled as a nonparametric model. A nonparametric model does not specify the exact form of the distribution of event times. Also, the entry

event is recorded in discrete time since the data shows only the year in which the entry occurred, not the exact month and day. The data shows that company x entered the region in 1991, but it does not mention the specific month. Several event history analysis techniques could be utilized to test the model. Figure 2 shows the algorithm suggested to select the most appropriate event history analysis technique for testing the model. Based on explained characteristics and as it is shown in Figure 2, a binary logit regression model was used for the analysis. As in regression analysis, t-tests indicate whether each explanatory variable significantly affects the dependent variable.

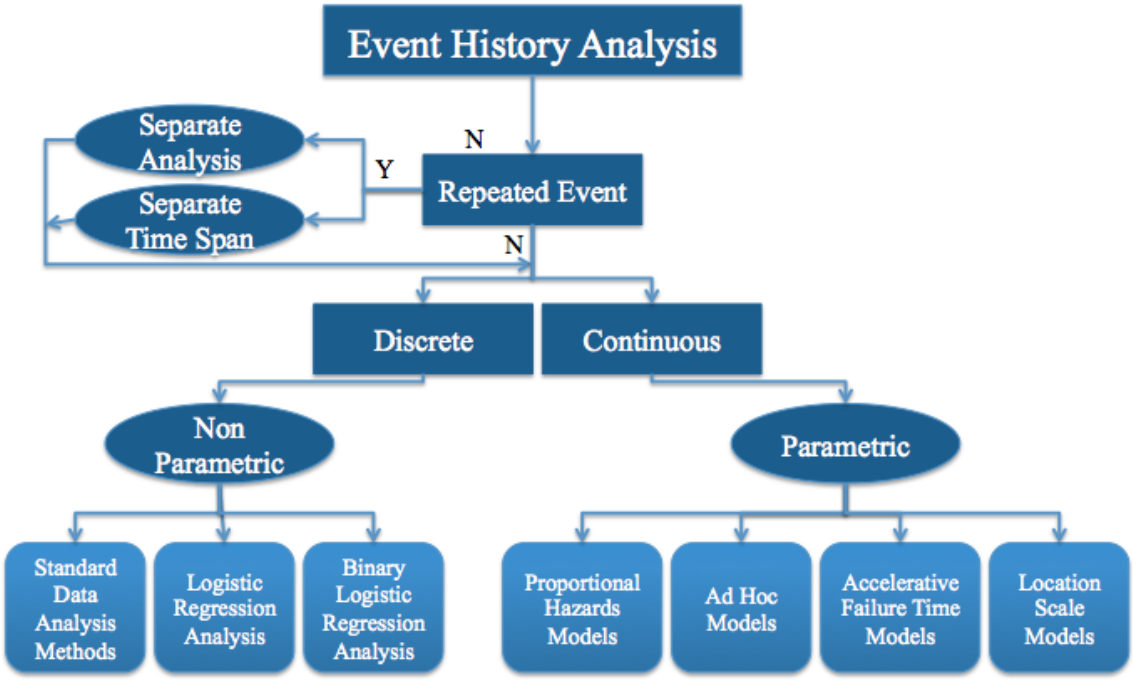

Figure 2 - Algorithm to Select Appropriate Event History Analysis Technique

Table 2 shows the number of companies who entered the region since 1991. During the observation period, 193 out of 663 companies never entered the region and therefore they are considered censored data points.

Table 2 – Distribution of Year of Entry

Year	Number At Risk	Number Entry in CEE	Estimated Hazard Rate
1992	200	96	0.48
1993	123	54	0.44
1994	85	26	0.31
1995	76	28	0.37
1996	52	10	0.19
1997	69	16	0.23
1998	72	16	0.22
1999	62	19	0.31
2000	68	20	0.29
2001	69	9	0.13
2002	68	22	0.32
2003	70	15	0.21
2004	77	16	0.21
2005	77	18	0.23
2006	62	8	0.13
2007	64	12	0.19
2008	69	6	0.09
2009	76	23	0.30
2010	66	20	0.30
2011	62	18	0.29
2012	66	16	0.24
Total	1633	468	

A goal of this study was to estimate a regression model where the probability of entry in the CEE region in a one-year period depends on seven explanatory variables including control variables. Two of these variables are legal origin and embeddedness and are assumed to be constant over time. Two explanatory variables, international experience and corruption, were measured annually. As a result, this analysis has both constant and time varying variables. Other than these four variables, three other time varying variables are analyzed as control variables. These variables are GDP per capita, year, and diversification score.

4.1.1. The Discrete-Time Hazard Rate

A central concept in event history analysis is the risk set. In this study, this is the set of companies who were at risk of entry in the region at each point in time. In 1991, all 200 companies in the ranking were at risk of entry in the region. Out of those 200, 96 actually entered in the region in that year, and 96 firms were no longer at risk during the second year. At the end of each year, the risk set diminished by the number of firms that experienced entry in that year. The next year the risk set might change due to two other events. Some of the companies that were part of the risk set might diminish due to not being ranked in that year. Also, other companies might be added to the risk set since they were added to the ranking. In Table 2 number of the risk set for each year is shown.

The second key concept is the hazard rate, sometimes referred to the hazard or the rate. In this study, the hazard rate is the probability that entry will occur at a particular time to a particular company given that the firm was at risk at that time. It is important to realize that the hazard is an unobserved variable, yet it controls both the

occurrence and timing of events. Consequently, it is the fundamental dependent variable in an event history model.

Based on the assumption that the hazard rate varies by year, but is the same for all companies in each year, the hazard rate can be estimated by dividing the number of entries by the number of companies at risk. The hazard rate is shown in the last column of Table 2.

The next step was to specify how the hazard rate depends on explanatory variables. The hazard was denoted by P(t). Four explanatory variables used to explain the model are: x_1 is the law origin of the home country, $x_2(t)$ is the corruption, x_3 is the embeddedness variable, $x_4(t)$ is the international experience variable. Also, the three control variables were: $y_1(t)$ is the year in which data is analyzed, $y_2(t)$ is the diversification score of companies, and $y_3(t)$ is the GDP per capita of home countries. The law origin and embeddedness remain constant over time and the other five explanatory variables had different values at each time t. As a first approximation, P(t) was described as a linear function of the explanatory variables:

$$P(t) = a + b_1x_1 + b_2x_2(t) + b_3x_3 + b_4x_4(t) + b_5y_1(t) + b_6y_2(t) + b_7y_3(t) \quad (1)$$

For t = 1,…, 21.

A problem with this specification was that P(t), because it was a probability, could not be greater than one or less than zero, while the right side of the equation could be any number. Such a model can yield impossible predictions that can create significant

problems in both computation and interpretation. In order to avoid this difficulty the logit transformation of P(t) was used for this analysis:

$$\log\left(\frac{P(t)}{(1-P(t))}\right) = a + b_1x_1 + b_2x_2(t) + b_3x_3 + b_4x_4(t) + b_5y_1(t) + b_6y_2(t) + b_7y_3(t) \quad (2)$$

The left side of the equation could vary between minus and plus infinity as a result of this transformation. The model was still somewhat restrictive because it implied that the only changes that occur in the hazard over time were those, which resulted directly from changes in time-varying explanatory variables. With entry in the region, so many other problems might cause the fluctuation of hazard. Problems such as political environment, global recession, and change in market conditions could change the hazard. So, for the purpose of this study, any variation in the hazard was allowed by letting the intercept a be different at each point in discrete time. Thus, the following equation was used:

$$\log\left(\frac{P(t)}{(1-P(t))}\right) = a(t) + b_1x_1 + b_2x_2(t) + b_3x_3 + b_4x_4(t) + b_5y_1(t) + b_6y_2(t) + b_7y_3(t) \quad (3)$$

where $a(t)$ refers to 21 different constants, one for each year that was observed.

Estimation of the model was performed by the maximum likelihood procedure. The principle of maximum likelihood is to choose values for coefficients, which maximize the probability of observing what has been observed (Allison, 1984). For each year that each firm is known to beat risk and did not enter the region, a separate

observational record was created and it was referred as company-year. Thus, firms that entered the region in the first year contributed one company-year to the model. Those who entered the region in year four contribute four company-years. Censored firms are those that were still not entering the region. These firms contributed up to 21 company-years to the model. For the 663 companies, the dependent variable was coded 1 if a company entered the region in that year and it was coded 0 otherwise. The explanatory variables were assigned the values they took in each company-year. The final step was to pool the 1633 company-years into a single sample, and then estimate logit models for a dichotomous dependent variable using the method of maximum likelihood. IBM SPSS software was used to estimate the model.

Censoring and time varying explanatory variables are solved by this statistical analysis procedure. Censured data in this study referred to companies who have not entered the CEE region in any of the observed years. These companies contribute as many company-years to the model as they have been observed. For example, if the company were ranked between 1995 and 1998 and never entered the region, it contributed four company-years to the model. The second common issue that needed to be addressed in this statistical model was time varying explanatory variables. This issue has been addressed by treating each year at risk as a distinct observation.

The explained formula utilized all observed companies during the past 21 years. The formula was used to analyze two sets of data. The first data set included all 663 companies that create 1633 company-years. The second data set included a total of 345 companies that create 1176 company-years. The results of the analysis from both data

sets were compared. In the following sections the dependent variable and all explanatory variables are explained in more detail.

4.1.2. Dependent Variable

4.1.2.1. Entry in the International Market

In this research the influence of two firm factors and two country factors on the international entry of the design firms in the CEE region was analyzed. This analysis was based on the performance of the largest design firms in the world. Engineering News Record (ENR) publishes a list of top 200 international design firms and the data set for this analysis has been gathered from this list between 1991 and 2011. The success of design firms is based on the international gross revenue of these firms. Therefore, their current position and international expansion is useful information for other design firms.

4.1.3. Independent Variables

The following independent variables are linked with hypotheses explained in chapter 3. Embeddedness is associated with Hypothesis 1, international experience is associated with hypothesis 2, legal system is associated with hypothesis 3, and corruption is associated with hypothesis4. The following sections explain independent variables in more detail.

4.1.3.1. Embeddedness

Design firms decide whether to enter in a new market based on many factors. According to the social embeddedness theory, this research argued that the design divisions of AEC companies with a construction division are more likely to enter a new

market compared to the companies that are solely design firms. Construction companies seek new projects around the world and they need priority information to reduce the international risk related to those projects. The theory of embeddedness explains that motivations behind economic activities are not necessarily confined to that specific transaction. Companies seek long term goals of creating a bond with the owners and collecting priority knowledge about the new market. Design firms with a strong construction division enter the region, analyze the market, and create relationships with owners to create future opportunities for the construction sector. If the company has a small construction division or it does not have a construction division at all, embeddedness could not affect the entry decision-making. There are many companies that have both a design division and a construction division; however, in this analysis the size of the construction division was as important as the size of the design division. Therefore, this analysis only considered the companies that have been in the ENR top 225 international contractors at least once.

The embeddedness variable is a binary variable that was coded 1 if the company was in the ranking of ENR Top 225 International Contractors as well as in the ranking of ENR Top 200 Design firms and was coded 0 if the company was solely design firm. In the preliminary analysis no correlation was found between embeddedness and entry in the CEE region. As a result, this variable was changed to the variable called "type of the company". Type of the company refers to the company's perception about its identity. This analysis focused on AEC companies that at least have a design division. If AEC Company has a construction division, type of the company variable was coded 1

regardless of the size of its construction division and was coded 0 if the company is solely design firm.

4.1.3.2. International Experience

This research models international experience by using the total international revenue of firms as an explanatory variable. Companies with higher international revenue are involved in either more international projects or larger projects or both. Higher international revenue leads to more experience resulting from the exposure to international projects.

The international market is volatile and the international experience that companies have had a decade ago would not necessarily help for entering in a new market today. At the same time transferring international knowledge from projects to the company and using lessons learned from previous projects are time-consuming processes. Based on the volatility of the international market on one hand and the time consuming process for transferring international knowledge within the company on the other, international experience is defined as the total international revenue that the company has generated each year. The explanatory variable in this study is defined as the percentage of company's revenue divided by the total international revenue generated from all companies. Selection of this ratio as an explanatory variable makes this variable consistent and comparable between years. This explanatory variable accounts for the inflation and market environment. The total international revenue may not be a good indicator of international experience. If the international market is slow in one specific year such as it was in 2008 due to the global recession, the revenue of most

companies decrease. International experience is a relative term and actual dollar amount would not reflect the entire story. For example, assume company x generated 20 million dollars in revenue in 2007 compared to 40 billion dollars revenue generated by all companies in the ranking. In 2008, this company generated the same revenue as in 2007 while all ranked companies generated 35 billion dollars due to global recession. Even though company x did not generate higher revenue, it was more successful in global market compared to its competitors. Accordingly, the percentage of total annual revenue is considered as an explanatory variable.

4.1.3.3. Legal System

The legal system of home and host countries can significantly affect the entry decision-making of companies. The legal systems of home and host countries affect the international entry decision-making for design firms. As host country legal systems change, they affect the levels of protection for investors and creditors. The levels of protection for investors and creditors affect entry decision-making. Similarly, home country legal systems affect the entry decision-making in two ways. First, legal systems become part of the company's identity that wants to enter in a foreign market. For example, if a company is familiar the corrupted environment, it finds bribery as a tool that could be used to solve work challenges. This company might encounter difficulties to work in a less corrupted environment. Second, legal systems give companies different legal rights. As a result, companies entering a host country might assume that they have legal rights similar to their home country.

This research focused on the influence of the legal system of the home country on the entry decision. Legal origin is being used as an indicator of legal system. While each country has modified their regulations based on the unique environment of the country, the legal origin could be a good indicator of the fundamental characteristics of the legal system. This variable is constant over time and was assigned zero if the legal origin is Roman law and one if the legal origin is common law.

4.1.3.4. Corruption

Corruption is one of most important factors influencing the international entry. It is determined by country's institutional environment, both regulative and normative, which has been found to be important for market attractiveness (Egger & Winner, 2005). Companies try to enter in markets that they are familiar first and then enter in unknown markets. For example, US companies are more likely to enter into the markets such as Canada or England where people speak the same language. This research contends (H1) that firms are more likely to enter in the markets that have similar corruption level to their home country. They could use the local experiences in corruption situations to become successful in managing the project. Hypothesis 4 was designed to test if the difference between corruption level of home and host country influence the entry decision of design firms. Data regarding the Corruption Perceptions Index (CPI) was applied for the analysis. CPI measures the perceived levels of public sector corruption in countries worldwide. CPI The variable was defined as the absolute value of the CPI of the home country minus the CPI of the host country. A detailed description of CPI can be found in Section 4.2.3.4.

4.1.4. Control Variables

This study analyzed the influence of four explanatory variables on the entry decision-making. Many factors influence the entry decision and the influence of these factors cannot be controlled in this analysis. If all influencing factors were incorporated in the model, the significant level of variables could help distinguishing strongly correlated variables from weak correlations. Even though not all influencing explanatory variables could be tested, the following well-known influencing variables are incorporated into the model: GDP per capita, year of entry, and diversification score. While previous research could explain the most probable effect of these factors on the entry decision overall, this analysis evaluated the influence of these factors for this specific data set. All these factors were considered as independent variables on the right side of the Equation. Results of the analysis related to these control variables are explained in Chapter 5.

4.1.4.1. GDP per Capita

The research design called for limiting the influence of country prosperity in the entry decision. It could be argued that firms coming from more developed countries are more likely to enter a new market despite the differences between home and host countries and also company factors. Another argument is that wealthier countries attract international firms simply because they have more AEC projects. GDP is a good proxy for analyzing the influence of country prosperity in this study.

GDP, which stands for Gross Domestic Product, is a measure describing the value of a country as economic stability and growth. While researchers are rarely in

complete agreement in this indicator, GDP is still the most popular method to indicate a country's economic state. GDP per capita is a measure that results from GDP divided by the size of the nation's overall population. A country with high GDP but with an overwhelmingly large population will result in a low GDP per capita; thus indicating a not so favorable economy. So, GDP per capita was selected as one of the explanatory variables in the model.

4.1.4.2. Year of Entry

Central East Europe became a new market in 1991 and available for all companies to invest. International companies from all around the world began to compete to on AEC projects in the CEE region. In 1991 no international companies were involved in projects in the region and competition level to win a project was not as high as in 2011 might have been. As competition increases in one market, individual company mark ups might go down and fewer opportunities would be left. As a result, companies might be less interested in the market as time passed. In order to control for this effect, year has been considered as one of the control variables and has been added to the model as an independent explanatory variable.

4.1.4.3. The Diversification Level

There is a significant research on influence of diversification level of companies on their performance. The diversification decision itself is one of the important strategic decisions that could influence the international entry of companies. During the design of this research, a new measuring technique was developed to identify the diversification level of the companies. Previous measurement techniques do not consider the influence

of the total revenue generated from each sector. For example, if the general building sector generates one billion dollars in revenue each year and oil and gas industry sector generates ten billion dollars a year a company that solely works in oil and gas industry sector is more diversified than the company works in general building. In order to consider the market attractiveness the Diversification Score (DS) method has been developed.

ENR publishes the total international revenue in each sector such as general building, water supply, and transportation. This new measurement technique of diversification level considers the total market in each sector. First, it identifies the international revenue generated in each sector. Then, in order to calculate maximum DS companies can collect from each category, it divides 100 by the number of sector. Third, the DS for each sector will be calculated. If the international revenue of the company in each sector is greater or equal to the average percentage of total international revenue generated by all companies in that sector, company will collect the highest score possible from that sector. Otherwise, the score is the percentage of company's international revenue multiplies by maximum score divided by the percent of international revenue generated by all companies in that sector.

For example, in 2010 Technical Spa, an Italian engineering company, has generated 88 percent of its revenue in transportation, 10 percent in general buildings, and 2 percent in water supply. In the same year, the markets in these categories are 17.1, 16.2, and 5.3 percent of the total design market respectively. Since 10 sectors are categorized in ENR list in 2010, the maximum score for each sector is 100 divided by

10. For transportation sector, the firm's percent revenue, 88 percent, is greater than 17.1 percent. So, the DS for this sector is 10. General building and water supply DS are 10 divided by 16.2 and 2 divided by 5.3 respectively. Total DS for this company in 2010 is 10 plus 6.17 plus 3.77 equals to 19.94.

4.1.5. Interdependence Between Explanatory Variables

After identifying all explanatory variables, it is required to test the interdependence between explanatory variables. Interdependence is a relationship in which each variable is mutually dependent on the other variable. It is assumed that all explanatory variables are mutually interdependent. If a linear regression analysis or a correlation model shows that variables are not independent from each other, only one of those two variables should be considered in the model. Table 3 shows the correlation coefficient for one-on-one correlation models between nominal explanatory variables for both models. Legal system and embeddedness variables are binary variables and cannot be tested for correlation. As it is shown in Table 3 no correlation can be found between explanatory variables in both model 1 and model 2. The highest correlation coefficient was associated with GDP per capita and CPI in model 1. This correlation coefficient was 0.45 that shows a weak correlation between these two variables.

4.2. Models and Data Sources

In this study two models were developed based on the same data sources. In the following, each model is described and data sources are introduced.

Table 3 – Correlation Coefficient for Testing Interdependency

Diversification Level	Year	-0.15	-0.12
Diversification Level	GDP per Capita	-0.11	-0.02
Diversification Level	CPI	0.11	0.11
Diversification Level	International Revenue	0.17	0.19
Year	GDP per Capita	0.23	-0.11
Year	CPI	-0.24	-0.23
Year	International Revenue	0.08	0.12
GDP Per Capita	CPI	0.45	0.15
GDP Per Capita	International Revenue	0.06	0.01
CPI	International Revenue	0.05	0.05

4.2.1. Model 1

Collected data created an Excel sheet to analyze using IBM SPSS software. The same analysis was conducted for two sets of data. Model 1 is based on data points from all companies that have been ranked in ENR Top 200 international design firms as low as one time. Three general issues are associated with this model:

- Data censuring: As it was explained before, in logit regression analysis each year is treated as a distinct observation and data censuring would not be an issue in this type of analysis.
- Size of the company: Design firms are ranked anywhere between 1 to 21 times in ENR Top 200 International Design Firms. Companies that have appeared

consistently in the ranking, were larger companies compared to companies that have been ranked once or twice. Consistently ranked companies generated more than 200 percent in revenue than companies that appear in the ranking once to twice. The focus of this research is to study large design firms and occasionally ranked firms might not be considered "large firms" compared to the others.

- Entrance prior or after the observed time: If the company appeared once to twice in the ranking, there is a possibility that they have entered the region before observed time. Also, another possibility is that they did not enter the region in the observed time and they entered the region after that. Assume that a company entered the region in 1993 when they were not ranked and stayed in the region for two years. In 1994, when the company was ranked, the dependent variable would be 1 for this company-year. However, it should have been zero since the company was already in the region. Eliminating companies that have been ranking few times could decrease the effect of this issue.

This study investigated the influence of four country and company factors and the name of the company was not as important as the characteristics of those companies. In order to address the issues explained above, Model 2 were developed. The results from both models are compared in Chapter 5.

4.2.2. Model 2

Model 2 eliminated the companies that were not ranked more than three times. Minimum of four times in the ranking has been selected in order not to loose so many data points and at the same time eliminate the effect of many companies that

occasionally have shown up in the ranking. By eliminating these companies, the number of analyzed companies was cut in almost half and 13 home country data points have been eliminated. The results of the analysis of both data sets have been compared.

4.2.3. Data Sources

A significant data collection effort has been conducted to analyze the international entry of design firms. The data regarding to both independent and dependent variables have been collected from several actual industry and country data sets as follows: ENR TOP 200 International Design Firms, ENR TOP 225 International Contractors, World Bank Data, Transparency International, and Law and finance (La Porta et al., 1998). A sample of collected data is shown in Appendix A. Data sources and the information collected from each source is explained next.

4.2.3.1. ENR Top 200 Design Firms

ENR publishes summary data about the top 200 international design firms every year. The data provides firm's ranking by total international gross revenue, the total gross revenue, firm type, and country of origin. The data also classified the AEC industry into different sectors and provide the ranked firm's percent of total revenue in each sector. It also publishes the list of the countries that each one of the ranked firms has worked in each year. The focus of this research is the entry into the Central Eastern European (CEE) countries. The region has attracted international companies since 1991 when the influence of the Soviet Union waned. Design company information has been gathered since 1992 (which is the report for 1991) to 2012. The total number of 663 companies from 45 countries from all continents has been ranked as TOP 200

international design firms. These firms are ranked anywhere between one to twenty one times in the list. Total number of data points collected from the list is 4172. For the purpose of this study the following data sets has been collected from the ranking:

1. Company Name
2. Home Country: Home country is the country or origin of the firm. International design firms might have several branches all around the world, however, the home country is where headquarter of the firm is located.
3. Type of the company: Design firms generate the revenue from one of these services: Architect (A), Engineer (E), Environmental (ENV), Geotechnical (G), Landscape (L), and Planner (P). Also, some of the firms have both design division as well as construction division which are identified in the list.
4. International Revenue: Companies are ranked based on the generated international revenue each year. The actual international revenue in million dollars is the basis for analysis of the influence of international revenue on the entry decision-making. The data set had two issues in regard with the international revenue. First issue was that the data set from 1992 to 1994 was based on range of international revenues and not the actual number. For example, companies ranked from 1 to 24 had generated more than 100 million dollars in international revenue in 1992. In the ranking they were categorized as companies with higher than 100 million dollars in revenue. Also, companies ranked from 42 to 68 have generated 50 down to 30 million dollars in revenue in the same year. International revenue for these companies is assumed to be in the middle of the range. For example the assumption is that all companies

ranked from 42 to 68 in the list have generated $40 million dollars in international revenue in 1992. The second issue was that in 1996, the ranking was based on total revenue and not the international revenue. As a result, a global company with significant number of domestic projects and fewer international projects ranked high and a firm that generated most of its revenue internationally was not even ranked. In order to create consistent data points, first, companies that have generated less than $2.9 million dollars in international revenue had been eliminated from the ranking. The 2.9 million dollars threshold was selected based on the lowest generated revenue in 1994, 1995, 1997, and 1998. As a result, 47 companies were deleted from the ranking. Second, by analyzing the data 17 companies were added to the ranking. These companies have generated solid international revenue in 1994, 1995, 1997, and 1998 and they are not ranked in 1996. These companies were mostly international companies that generated more than 50 percent of their work internationally. Since, these companies did not generate millions of dollars in domestic projects, they were not ranked in 1996.

5. Type of work: Before 2001, ENR classified all types of AEC projects into nine major categories: General Building, Manufacturing, Power, Water Supply, Sewer and Waste, Industrial, Petroleum, Hazardous waste, and transportation. Then, they added Telecommunication as the tenth category. Each year, it is identified what percent of the international revenue has been generated from each one of the sectors. Data set has some missing points were some firms did not report the revenue generated from each sector. Also, in some cases the number does not add to 100,

which are because of the fact, that some of the revenue might come from other sources. That is why for this study another category called “Other” has been added to the list. This data set was collected to calculate the diversity level of firms in each year they were ranked in TOP 200 International Design firms. The diversity level of the firm is one of the explanatory factors in the analysis.

6. Where to find the TOP 200: ENR publishes all countries that TOP 200 international firms are performing a project. This data is the basis for developing the dependent variable and figure out if the country has worked in the CEE region in a specific year.

4.2.3.2. ENR Top 225 International Contractors

ENR publishes the summary data about the top 225 international contractors. The format of the data is similar to the list of the top 200 international design firms. One of the explanatory variables in this analysis is the embeddedness. It measures whether the company has a construction division or it is just a design firm. The ranking of each company that has both construction and design division has been collected.

4.2.3.3. World Bank Data (WBD)

The World Bank's Open Data initiative is intended to provide all users with access to World Bank data. The data catalog is a listing of available World Bank datasets, including databases, pre-formatted tables, reports, and other resources. Some of the most popular World Bank data sets are World Development Indicators, GDP ranking, Global Economic Monitor, and Worldwide Governance Indicators. This analysis uses the data set regarding to GDP per capita for the countries in the list were

collected to use as a control variable. GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars. World bank convert domestic currencies to dollar using single year official exchange rate.

4.2.3.4. Transparency International

For the past 18 years, Transparency International (TI) has established a strong reputation for measuring and combating corruption. They have raised awareness of the devastating effects of corruption and worked with government, business leaders, and local communities to fight against it. TI consists of more than 100 chapters – locally established, independent organizations – and is based in Berlin, Germany. The mission is to stop corruption and promote transparency, accountability, and integrity. The core values are transparency, accountability, integrity, solidarity, courage, and democracy. The organization publishes several data sets to support their mission and the Corruption Perceptions Index (CPI) is one of these data sets. CPI measures the perceived levels of public sector corruption in countries worldwide. There is no meaningful way to assess absolute levels of corruption in countries on the basis of hard empirical data. Attempts to do so such as by comparing bribes reported cannot be taken as definitive indicators of corruption levels. Rather they show how effective prosecutors are in investigating and exposing corruption. TI's insight is that capturing perceptions of corruption is the most

reliable method of comparing relative corruption levels across countries. For a country to be included in the ranking, it must be incorporated in a minimum of three of the CPI's data sources. The CPI includes only sources that provide a score for a set of countries and that measure perceptions of corruption in the public sector. TI reviews the methodology of each data source in detail to ensure that the sources used meet TI's quality standards.

CPI is a composite index, drawing on corruption-related data from expert and business surveys carried out by a variety of independent institutions. TI collected data related to corruption perception index in 1995 ranking 41 countries such as Denmark, USA, and Spain. In 2012, 176 countries have been ranked. The score ranges from 0 (highly corrupt) to 100 (very clean). CPI's mission and practice is to induce governments around the world to take notice of corruption.

For this study, CPI is required for all missing data point especially from 1992 to 1994. Also, most of the countries of the region started to receive a CPI assessment in 1998. For example Serbia and Bosnia started to get ranked in 2003. Two methods could be used to predict the missing data points. First method is to use different statistical methods to figure out the trend and formula. This method might not be accurate for some of the countries that have almost 10 missing data points. The second method that was utilized in this study was to assign the last existing data point to the years before that data does not exist. Statisticians believe that using the starting point data instead of extrapolation of the trend will result in a more accurate data set.

4.2.3.5. Law Origin

A growing body of scholarly work on the influence of legal rules on issues such as creditor rights and protection of stakeholder rights (La Porta, Lopez-de-Silanes et al. 1998) and the data set regarding to the legal origin of 49 countries is available for public. This research is based on that data set for testing the hypothesis three. All countries needed for the purpose of this study are not included in this study. Some of the countries such as Cuba do not have either Civil law origin or Roman law origin. Cuba has a communist legal system. Also, others such as some of the countries in Middle East or Africa have combination of Civil Law and Islamic Law. Data regarding to the law origin can be found in Schleifer's studies and different online sources and all of this data sets has been gathered and used in this analysis.

4.3. Data Collection

The goal of this study was to analyze the first entry of design firms in CEE region. Once a company entered the region no matter if it continued the business, leaved the region the next year, or expanded its projects within the region, this analysis did not continue to observe it. Companies might fluctuate in the ranking for two reasons:

1. As total international revenue generated each year changes, the ranking of the company changes.
2. Mergers and acquisitions might cause fluctuation in the ranking. Merger of two or more companies increases the total international revenue and the probability of entering the CEE region. Merger and acquisition in this study is considered and it will be explained later.

Changes in company location, or changes in company types such as adding construction sector to the company are the results of change in company strategies. In this study these changes were considered as influential changes on international entry decision of design firms. As a result, if the company changed in a major way such as change of home country, change of the type of company, or merger and acquisition, the company was analyzed as a new company in this analysis. For example, in 1998 Brown and Root Co. and M.W. Kellog Co. became KBR. Brown and Root Co., M.W. Kellog, and KBR were considered separate design firms for this analysis.

Each one of the data points in this analysis includes the following:

1. Company
2. Country of origin (home country)
3. Type of the company
4. Year: Each year that company is in the ranking is one data point. Each company can create one to twenty one data points in this analysis. Also, year is one of the explanatory variables in this analysis.
5. Enter: A binary variable that is coded 1 if company has a project in any of the CEE countries and coded 0 if it does not perform any project in the region.
6. Company ranking in the ENR Top 200 International Design Firms list.
7. Company ranking in the ENR Top 225 International Contractors.
8. T225: A binary variable that is coded 1 if the company is in the Top 225 international contractor list and is coded 0 if it is not ranked.

9. CBIN: A binary variable that is coded 1 if company has a construction sector and 0 if it is solely a design firm.
10. Corruption Perception Index (CPI) for each year
11. Average CPI for CEE countries
12. International revenue in million dollars
13. Total revenue in million dollars
14. Law origin: It is a binary variable that is coded 1 of the country law origin is common law and is coded zero if the law origin is not common law. Civil law is the most common law origin in the world. Some of the countries in Middle East and Africa combine Civil Law with Islamic Law.
15. Revenue in each sector: It contains the percentage of revenue generated from each sector. From 1991 to 2000, ENR published eight different sectors that most design and construction companies have worked on as follows:
    - General Building: Includes commercial buildings, offices, stores, hospitals, governmental offices, hotels, housing, etc.
    - Manufacturing: Includes auto, electronic assembly, etc.
    - Power: Includes thermal and hydroelectric power plants, transmission lines, substations, cogeneration plants, etc.
    - Water Supply: Includes dams, reservoirs, irrigation canals, pumping stations, water treatment plants, etc.
    - Sewer/Waste: Includes sanitary and storm sewers, pumping plants, industrial waste facilities, etc.

- Industrial and Petroleum: Industrial projects include pulp and paper mills, steel mills, steel mills, chemical plants, etc. Petroleum projects include refineries, petrochemical plants, offshore facilities, pipelines, etc.
- Transportation: Includes airports bridges, roads, canals, piers, tunnels, etc.
- Hazardous Waste: Includes chemical nuclear waste treatment, asbestos, etc.

After 2001 ENR added Telecommunication as the ninth industry sector. Telecommunication includes transmission lines, cabling, data centers, etc. Also, the category of "Other" has been added since all numbers do not necessarily add up to 100 percent.

16. Diversification Score (DS): It is one of the explanatory variables in this analysis. A new method has been developed for measuring diversification level considering market attractiveness. Detailed explanation of the new method is explained later.
17. GDP per capita: It is a control variable for this study and it has been collected from World Bank data sets.

CHAPTER V

RESULTS AND DISCUSSION

In this chapter the empirical results obtained from two models described in Chapter 4 are explained. First, the results related to each hypothesis and discussion around the results of both model 1 and model 2 are presented. Then, results related to control variables for both models are discussed. Third, a summary of findings and comparison of two models is also provided.

5.1. Hypotheses Evaluation

The empirical results of this study are documented in Table 4. The table presents event history logit models of the likelihood of entry in CEE region together with their standard errors based on the explained model in Section 4.1. The first column is the list all the explanatory variables in the model. Columns 2 and 5 are the coefficients of explanatory variables for model 1 and model 2. Positive signs on the coefficients imply that the corresponding variables increase the likelihood of entry; negative imply that they reduce it. Column 3 and 6 are standard error for the coefficients. Column 4 and 7 show the significance level for each one of the coefficients. The following sections discuss the results of each hypothesis. For example, third row is explaining the Type of the Company variable. This variable shows a coefficient of 0.422 for Model 1 and 0.37 for model 2. Standard Error for Model 1 and Model 2 are 0.133 and 0.161 respectively. Significance levels of this explanatory variable for both models are 0.002 and 0.022 respectively.

5.1.1. Hypothesis 1 Embeddedness

This hypothesis stated companies that have both construction and design sector are more likely to enter CEE region. The empirical analysis for model 1 and model 2 provides strong support this hypothesis showing a significant positive effect. The significance level for model 1 ($p < 0.001$) is greater than significance level for model 2 ($p < 0.05$).

Table 4 – Logit Regression Model Results

1	2	3	4	5	6	7
Explanatory Variables	Model 1	Standard Error	Significance	Model 2	Standard Error	Significance
Intercept	127.3	22.678	0.000	143.63	25.096	0.000
Type of the company	0.422	0.133	0.002	0.37	0.161	0.022
CPI	0.202	0.052	0.000	0.295	0.055	0.000
International experience	0.066	0.021	0.002	0.086	0.025	0.001
Law origin	-0.817	0.149	0.000	-0.555	0.185	0.003
Year	-0.065	0.011	0.000	-0.074	0.013	0.000
Diversification level	0.018	0.003	0.000	0.015	0.004	0.000
GDP per capita	0.024	0.007	0.001	0.01	0.025	0.079

The primary dependent variable in this study was whether the company has a construction sector large enough that it has been ranked at least once in ENR 225

international contractors. This dependent variable was selected to justify the embeddedness concept that it has been explained. The construction division should be large enough that could affect the entry decision of design division of the company. Comparing the revenue that ENR Top 225 international contractors generate to the revenue that ENR Top 22 international design firms generate, construction companies generate more revenue than design firms. A construction company that is ranked between 160 and 200 in the ranking could generate more revenue than a design firm ranked in top 40. If a company identifies itself as a company that has both design and construction division, it means that their construction division is as important as the design division of the company and the entry decisions of design division could be affected by the construction division. The result of preliminary analysis showed no correlation between the previous variable and the dependent variable ($p < 0.2$). However, the existing explanatory variable was correlated with the dependent variable. As a result, it was decided to change the previous variable to the current variable. Significant correlation between the existing explanatory variable and the dependent variable is because of the followings:

- Size boundary of companies in this dissertation was the reason that ENR TOP 225 ranked companies was selected as the basis of this study. Since the ranking was based on international revenue of construction companies, only large construction companies can be ranked among the TOP 225 international contractors. ENR Top 225 international contractors generate more revenue than ENR Top 200 design firms do. For example, in 2011, TOP 225 contractors

generated over 450 billion dollars in revenue while TOP 200 design firms generated 65 billion dollars. So, a construction company that did not appear in the TOP 225 ranking could generate same revenue as a design firm that appeared in TOP 200 ranking. If the construction division of a company is not ranked in the TOP 225 international contractor list it does not necessarily indicate that the construction division of the company is small and cannot affect the entry decision of the design division.

- As it was stated in Chapter 3, creating new market opportunities and risk avoidance are two reasons that the entry decision of the design firm could be influenced by its construction division. Companies use diversification techniques as a risk mitigation strategy. Companies with higher generated revenue are more diversified than companies with lower revenue in terms of number of projects and the variety of these ongoing projects. When it comes to international entry decisions, large companies can tolerate more risk compared to smaller projects. As a result, risk avoidance strategies are important strategies for small firms. As the international revenue increases, the likelihood of the entry increases. Accordingly, smaller construction divisions could affect decisions of company's design division with the same or higher degree than large construction divisions.

5.1.2. Hypothesis 2 International Experience

The hypothesis stated that as international experience increases, the chance of international entry in CEE region increases. As shown in Table 4, the analysis

demonstrates strong support for model 1 ($p < 0.01$) and model 2 ($p < 0.001$). International experience variable was the international revenue generated by the company a year before the analyzed year. A significantly positive correlation between this variable and dependent variable shows that as the absolute value of international experience variable increases, the likelihood of entry increases. As a result, companies with higher generated revenue in year x are more likely to enter the CEE region in year $x + 1$. The long term ramifications of entry decision-making would be of extreme value. Further research is needed to investigate initial entry decision making and its impact on out-year performance.

5.1.3. Hypothesis 3 Legal System

Hypothesis 3 contends that common law countries give higher rights to creditors and that companies have a stronger support from the legal system, companies become stronger and they are more likely to enter the region. As it is shown in Table 4, a negative correlation exists between the law origin variable and the dependent variable. This finding implies that the empirical study did not support the hypothesis 3. However it shows a significant negative correlation between the law origin and entry decision for model 1 ($p < 0.001$) and model 2 ($p < 0.01$). According to the analysis, companies from home countries with civil law origin are more likely to enter the region. The reasons behind this may include:

1. Similarity between legal systems: Rules, regulations, incentives, and taxation are the important institutions for AEC companies. Collecting data associated with legal system in a new market could be a challenge for design firms. Companies

with similar legal system to host countries have priority knowledge about the host country legal institutions. CEE region includes 20 countries that have a civil law legal system. Companies from civil law countries have worked in a similar environment before and the data collection process is easier for these companies. This argument could not be the only reason behind the findings. Most of the companies in the ranking have experienced working in countries with civil law system before. It brings the second reason as follows:

2. Location: The physical distance between home and host country might be an important factor influencing an entry decision of firms. As it was explained in hypothesis 1, the construction sector of the company could influence the entry decision of design firms. Design firms mostly provide engineering services, and location is not as important as it is for construction companies. On the other hand, construction companies face significant location risks such as political, environmental, and cultural risks. However, long term strategies of the company could dictate the location as an important factor especially when construction sector of the firm decides to enter the region. In 1992 alone, 63 out of 96 entrances in CEE region came from European countries that are closer to the region in terms of geography and environment. All European countries except UK have civil law origin. So, location might be an important factor that influenced the analysis of this study.

5.1.4. Hypothesis 4 Corruption

This hypothesis argued that inability of the firm to adapt to corrupted environment of host countries and reduction of company's internal legitimacy are two reasons that corruption could affect entry decision of firms. It stated that as the difference between home country and host country corruption level increases, the likelihood of international entry decreases. As it has been shown in Table 4, empirical findings show a strong support for the influence of the corruption level on dependent variable for model 1 ($p < 0.001$) and model 2 ($p < 0.001$). However, the effect is positive and it rejects the hypothesis. Companies originated from countries with higher CPI are more likely to enter the region. Empirical studies presented strong evidence that corruption lowers economic growth directly and indirectly through investment (Mauro 1995, Keefer and Knack 1995). Where corruption exists companies are aware that payment of bribes is often required, given the uncertainty comes with it. Bribery reduces incentives to invest and it will decrease the economic growth. Companies from less corrupted environment come from stronger and more competitive economy, which gives them the edge in international market. Working in a competitive environment creates a character for firms. These firms focus on creating an organization that could deliver complicated projects. These firms are more successful in international market than companies who are trying to take advantage of a corrupted system with bribery and other corrupted activities.

5.2. Control Variables

Three explanatory variables have been added to the model as control variables. These control variables are year, diversification level, and GDP per capita. These explanatory variables were added to the model to compare the significance level of four variables with three control variables. If only four independent variables were developed in the model, significance level of all variables was higher than when all seven variables were considered. The results related to control variables are as follows:

- Year: The empirical findings show a strong negative effect on the influence of year on the international entry of design firms for model 1 ($p < 0.001$) and model 2 ($p < 0.001$). After the Soviet Union collapsed CEE region market became available for all international companies. In first few years, significant number of opportunities became available for design firms while risk of unknown environment has high. The analysis shows that despite the high level of risk, number of international entrances in the region decreased from 1991 to 2011. As it is shown in Table 2, in 1991 96 companies entered the region while in 2011 only 16 companies entered the region. As competition in the region increases, number of entrances decreases. Competition increases due to existence of international companies in the region as well as local companies.
- Diversification Level: Another control variable in this study was the diversification level of the company. It was defined as a number between 0 and 100 based on the generated revenue of the company in each year, 100 the highest diversification level and 0 the lowest diversification level. This study found significant positive effect on

dependent variable for model 1 ($p < 0.001$) and model 2 ($p < 0.001$). As the diversification level of the company increases, the probability of international entry in the CEE region increases. As an example, lets assume company x generated the same total revenue as company y generated in a given year. Company x is specialized in designing petroleum and power sector projects while company y generates revenue in petroleum, power, general building, and transportation. Company x generates 50 percent of its revenue in designing petroleum projects and company y generates only 20 percent of its revenue in the same sector. Empirical findings in this analysis suggest that everything else being constant, the probability of international entry in CEE region to design petroleum projects for company y is more than company x even though company x generates more revenue in this sector than its competitor.

- GDP per capita: As it was stated, GDP per capita has been selected as an explanatory variable to control for home country prosperity and economic condition. The results showed strong positive effect of the GDP on dependent variable for model 1 ($p < 0.001$). However, the significance of its effect for model 1 is moderate at $p < 0.1$. Data set in model 1 covers companies from 46 countries from around the world including Iran, Venezuela, and Jordan. In model 2, 13 countries out of these 46 countries have been eliminated. Most of the remaining countries have a higher GDP per capita value. As a result, the influence of GDP per capita on the dependent variable is less significant in model 2 compared to model 1.

5.3. Summary of Results

This research has studied 663 international design firms from 46 countries. Two models have been developed to investigate influence of four explanatory variables on international entry decision of firms in CEE countries. Table 5 shows the summary of data sets. Model 1 includes 1634 company-years compared to 1176 company-years in model 2. Model 2 includes 345 companies from 33 countries. The rates of entrance, which is the number of entrances divided by number of company-years, for model 1 and model 2 were 0.26 and 0.27 respectively. Almost 90 percent of all companies in model 2 have entered the region in the past 21 years. This rate drops to 67 percent for model 1. List of all companies and home countries are presented in Appendix B.

Table 5 – Summary of Data Sets

	Model1	Model2
Countries	46	33
Companies	663	345
Company-Year	1634	1176
Number of entries	446	302

Both models showed very similar results regarding to all four hypotheses. Model 1 showed a higher overall level of significance for all seven explanatory variables. The significant level below 0.05 shows a significant correlation between explanatory variables and the dependent variable. Significance levels for all coefficients of model one were below 0.005. The second model showed strong support for all hypotheses and two control variables. GDP was the only variable with higher than acceptable

significance level. Model 2 showed a moderate significant level for GDP per capita. In overall, both models showed a relatively similar results and correlations related to all four hypotheses were strongly significant.

CHAPTER VI

CONCLUSION AND SUGGESTIONS

This chapter completes the study of international entry of design firms by presenting research conclusions and recommendations. The initial research objectives are reviewed and specific conclusions relating to the research hypotheses are discussed. Finally, based on the study results, recommendations to industry, contributions to body of knowledge, and potential areas for further study are identified.

6.1. Review of Research Objectives

As identified in Chapter 1, the primary objective of this research effort was to investigate the influence of two company factors, international experience and embeddedness and two country institution, legal system and corruption level on entry decision of design firms.

This primary objective of this research has been met by developing a logit regression model to study the entry decision of design firms. Embeddedness, international experience, legal system, and corruption were modeled as explanatory variables of the model. International entry was the only dependent variable in the logit regression model. Two models were developed based on the same sources of data. Model 1 utilized company data related to all companies that have been ranked in ENR top 200 design firms between 1991 and 2011. Model 2 utilized the data related to companies that have been ranked at least four times in ENR top 200 international design

firms in the same time frame as model 1. The results of these two models were compared.

In addition to the primary objective identified above the following additional objectives were pursued:

- Introducing a new diversification measurement technique that considers the market capacity: This objective has been met by developing diversification score that ranges from 10 to 100 and it assigns higher DS to companies that work in sectors that generate higher than average sectors revenue.
- Analysis of the international AEC projects utilizing actual industry data: This objective has been met by developing a statistical model using industry data sets such as international revenue, revenue generated from each sector, and CPI.
- Investigating the influence of company diversification level and competition level on international entry decision: This objective has been met by assigning two explanatory variables to diversification level and competition level in the logit regression model.

6.2. Findings Related to the Research Hypotheses

The research investigation began with four hypotheses. These hypotheses and the associated findings are as given below:

H1: AEC companies who have both design and construction divisions are more likely to enter in Central Eastern European countries than the AEC companies who are solely design firms.

The findings suggested strong support for this hypothesis. This study showed that companies with construction sector are more likely to enter the region. The limitation of this study regarding to this hypothesis was a lack of threshold in selecting the size of construction sector. The size of the construction sector was not considered in this analysis.

H2: Design firms with more international experience are more likely to enter in the AEC industry of the CEE region.

The empirical results showed strong support for this hypothesis. International experience was modeled based on the international revenue of the company in a year prior to the year of the analysis. Another research study is required to model the influence of long-term international experience on the entry decision of companies.

H3: Design firms coming from home countries that have a common law based regulation system are more likely to enter in the AEC industry of the CEE region.

The results did not support this hypothesis, however, it showed that legal system influences the entry decision of companies. According to the analysis, companies from home countries with civil law origin are more likely to enter the region. This finding can be explained by the influence of similarity of legal system between home and host country and influence of location on the entry decision of design firms.

H4: The greater the absolute difference in the corruption level between home and host countries, the lesser the likelihood of international entry for the design firms in CEE region.

The empirical findings show a strong support for the influence of the corruption level on entry decision of design firms, however, the effect is positive and it rejects the hypothesis. Companies from less corrupted environment come from stronger and more competitive economy, which gives them the edge in international market. As a result, they are more likely to enter new markets.

6.3. Conclusions

This study is one of the few studies in the area of international construction projects that is based on actual industry data. It investigates the influence of two company factors and two country factors on the entry decision of design firms in Central Eastern European Countries. This study analyzes data from 663 companies from 46 countries since 1991 when the Soviet Union crashed. The fundamental conclusions of this dissertation:

1. Two company factors embeddedness and international experience influence entry in CEE countries. Companies that have both design and construction sector are more likely to enter the region than companies that are solely design firms. Also, more international experience the company has, the chances of entry in new countries increases.
2. Corruption and legal system are two important country institutions that influence entry decision-making. Countries that originate from less corrupted environment work in economically developed and competitive markets. These companies are more likely to enter new markets. Also, design companies originated from countries with Civil law system are more likely to enter the region.

6.4. Knowledge Contributions

This dissertation research was an explanatory effort and it expands the body of knowledge and research regarding international entry decision-making. Two major contributions of this study are as follows:

1. While previous studies regarding international construction projects try to develop a decision support system, the focus of this study is to explain the international entry phenomena by finding some of the most important criteria that influences the entry decision-making.
2. Previous research on the topic is mostly based on questionnaires and surveys. This study is one of very few quantitative studies in the field of international construction management that utilizes extensive industry data sets.

This study also contributes to the international risk management body of knowledge by considering the influence of sector diversification on entry of design firms.

6.5. Recommendations to Industry

Recommendations to industry can be made based on the results and conclusions of this study. For organizations undertaking international construction projects, international entry decisions need significant considerations. The following recommendations and findings can help companies in strategic entry decision-making.

1. A combination of company specific factors and country specific factors need to be considered before entering a new country.

2. Acquiring knowledge from previous international projects conducted by the company is crucial in entry decision-making. Companies with fewer international projects can collect required knowledge from consulting companies.
3. Companies that have both contracting and design sector can enter new countries by engineering projects. Once enough knowledge has been collected about the host country and relationship with future clients has been established, the construction sector could enter the region. This decision will result in reduction of risk exposure for the company.
4. Legal system including rules, regulations, incentives, and taxation are important component of entry decision-making. Companies from home countries with similar legal system to the host countries are more likely to enter that country. Acquiring deep knowledge about before entering new countries is required.
5. Diversification in different sectors of design such as transportation, general building, and industrial projects reduces risks and influences the entry decision-making. Diversified companies could search variety of opportunities in new countries compared to companies that generate revenue from one or two sectors.
6. When a new country starts to attract international companies, competition is limited and more opportunities to invest exist. As competition increases companies are less likely to enter the country. If a company is interested to expand their business internationally, they should try to be the first companies that invest in new markets.

7. This study shows that contrary to the first assumption, companies that come from competitive and less corrupted countries are more likely to enter a new country compared to companies from a corrupted environment. For companies that try to expand their business, acquiring proprietary knowledge and technology is more important than familiarity to the local institutions. Technologically advance companies who are capable of working in competitive markets could be successful in new international markets.

6.6. Recommendations for Future Studies

Through the course of this research effort, several areas have been identified for future study. While this study analyzed the influence of two company factors and two country factors on international entry decision of design firms, future studies are required to better understand the dynamics of international entry of companies. First, future studies are required to find other influencing factors on international entry of firms such as financial interdependency between home and host country, political stability of host country, and company organizational structure.

Also, similar studies are required to introduce influencing factors on international entry of construction companies and identify the differences between entry decision of construction companies and design firms.

Also, investigation of expansion strategies in the region and the long-term investment of companies in international market are needed. Tracking the long-term strategies of companies could allow companies to understand factors that influence the long-term international strategies.

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APPENDIX A

SAMPLE OF DATA SETS

This appendix shows a sample of data sets regarding to ENR Top 200 International Design firms in 2012 and CPI in 2012. ENR data set shows complete list of TOP 200 international design firm. It also shows first two pages regarding to where these companies worked in 2011. Similar data set exists for ENR TOP 225 international contractors. The second data set shows the Corruption Perception Index for 176 countries in 2011. Survey methodology and more details on how they collected the data set can be found at Transparency International (2012).

Rank	FIRM	Home	FIRM TYPE	2011 REVENUE TOTAL $ .MIL	2011 REVENUE INT'L $ MIL.	GENERAL BUILDING	MANUFACTURING	POWER	WATER SUPPLY	SEWER/WASTE	INDUS./PETROLEUM	TRANSPORTATION	HAZARDOUS WASTE	TELECOM
1	FLUOR CORP.	USA	EC	3,462.7	86	0	0	2	0	0	98	0	0	0
2	FUGRO NV	Netherlands	GE	3,429.0	94	10	0	3	1	0	76	4	0	1
3	WORLEYPARSONS	Australia	EC	3,413.8	77	1	0	13	0	0	75	4	1	0
4	AECOM TECHNOLOGY CORP.	USA	EA	3,027.0	44	31	0	7	9	10	0	33	10	0
5	JACOBS	USA	AEC	2,434.2	47	9	1	12	2	1	66	9	0	1
6	ARCADIS NV	Netherlands	E	2,347.0	84	17	2	3	16	0	8	10	43	0
7	AMEC	UK	EC	2,291.1	58	4	0	11	2	2	51	4	2	0
8	KBR	USA	EC	1,884.7	86	0	0	1	3	0	85	7	0	0
9	SNC-LAVALIN INTERNATIONAL INC.	Canada	EC	1,828.7	54	10	0	22	3	0	56	8	0	0
10	DAR AL-HANDASAH CONSULTANTS (SHAIR & PARTNERS)	Egypt	EA	1,650.4	100	50	0	2	3	4	11	30	0	1
11	BECHTEL	USA	EC	1,599.0	62	0	0	2	0	0	91	7	0	0
12	CH2M HILL	USA	EAC	1,563.6	40	9	4	11	11	16	18	24	7	0
13	URS CORP.	USA	EAC	1,353.9	25	9	3	5	5	7	15	29	18	1
14	MOTT MACDONALD GROUP LTD.	UK	E	1,219.6	70	9	0	8	8	6	24	36	1	1
15	TECNICAS REUNIDAS	Spain	EC	1,182.1	95	0	0	6	3	0	91	0	0	0
16	ATKINS	UK	EA	1,154.8	48	25	1	2	7	4	9	48	2	1
17	ARUP GROUP LTD.	UK	E	1,109.0	74	42	2	1	1	2	6	39	1	2
18	AURECON	Singapore	E	1,048.2	100	12	5	6	6	3	24	24	0	5
19	HATCH GROUP	Canada	E	998.5	58	0	0	3	2	2	70	13	0	0
20	TECHNIP	France	EC	972.0	99	0	0	0	0	0	100	0	0	0
21	PARSONS BRINCKERHOFF INC.	USA	EA	931.2	55	21	0	25	8	0	0	46	0	0
22	GRONTMIJ NV	Netherlands	E	929.0	72	35	0	0	25	0	0	23	0	0
23	POYRY	Finland	CE	885.0	80	1	0	33	3	7	38	18	0	0
24	RAMBOLL, HANNEMANN & HOJLUND A/S	Denmark	E	868.5	67	39	0	7	4	2	11	29	1	4
25	WSP GROUP PLC	UK	E	815.2	71	47	0	5	0	3	15	23	1	1
26	CB&I	USA	EC	788.6	86	0	0	0	0	0	100	0	0	0
27	GOLDER ASSOCIATES CORP.	Canada	E	736.4	58	0	9	8	5	14	15	6	1	0
28	STANTEC INC.	Canada	E	730.3	44	27	0	7	10	7	5	22	18	1
29	JGC CORP.	Japan	EC	643.0	80	0	0	0	0	0	100	0	0	0
30	TETRA TECH INC.	USA	E	600.0	24	4	0	22	25	9	12	11	18	0
31	PETROFAC LTD.	UK	EC	592.1	100	0	0	0	0	0	100	0	0	0
32	MWH GLOBAL	USA	EC	567.0	56	2	0	8	39	45	0	7	0	0
33	CARDNO LTD.	Australia	E	563.4	66	4	1	4	4	3	49	14	1	0
34	SAIPEM	Italy	EC	512.8	47	0	0	0	0	0	85	14	0	0
35	SWECO	Sweden	E	511.0	49	53	0	12	5	8	11	10	0	0
36	EGIS	France	E	507.4	46	4	3	3	4	0	0	87	0	0
37	COWI A/S	Denmark	E	506.2	69	25	0	0	3	11	0	60	2	0
38	MAIRE TECNIMONT SPA	Italy	EC	472.8	95	0	0	10	0	0	88	2	0	0
39	THE SHAW GROUP INC.	USA	EC	468.3	35	0	0	34	0	0	65	1	1	0
40	BLACK & VEATCH	USA	EC	369.4	32	1	0	57	20	16	6	0	0	0
41	HYDROCHINA CORP.	China	EC	346.0	17	51	0	47	2	0	0	0	0	0
42	AUSENCO	Australia	E	338.6	82	0	1	1	1	2	83	0	0	0
43	SINCLAIR KNIGHT MERZ	Australia	E	332.5	25	8	0	21	1	2	8	8	2	0
44	HYDER CONSULTING	UK	E	332.3	75	32	0	0	6	12	0	49	0	0
45	LOUIS BERGER GROUP	USA	EAP	327.6	53	13	0	16	5	6	0	61	0	0
46	MCDERMOTT INTERNATIONAL INC.	USA	EC	311.8	91	0	0	0	0	0	100	0	0	0
47	HYUNDAI ENGINEERING CO., LTD.	South Korea	EC	289.3	73	0	0	22	1	8	69	0	0	0
48	AFAB	Sweden	E	283.5	35	7	7	78	0	0	3	4	0	0
49	SYSTRA	France	E	276.2	48	0	0	0	0	0	0	100	0	0
50	DHV GROUP	Netherlands	E	273.3	49	9	0	8	18	8	1	48	0	0
51	SINOPEC ENGIENEERING INC.	China	EC	261.5	34	0	0	0	0	0	100	0	0	0
52	CHINA CHENGDA ENGINEERING CO. LTD.	China	EC	252.4	27	0	0	84	0	0	16	0	0	0
53	GHD PTY LTD.	Australia	E	246.0	25	23	2	1	17	26	2	17	8	0
54	KHATIB & ALAMI CONSOLIDATED ENGINEERING CO.	Lebanon	EA	238.6	95	45	0	3	12	8	8	18	0	0
55	SK ENGINERRING & CONSTRUCTION	South Korea	EC	237.8	100	0	0	37	0	0	63	0	0	0
56	CHINA COMMUNICATIONS CONSTRUCTION GROUP LTD.	China	EC	225.4	9	1	0	3	0	0	17	79	0	0
57	CHINA PETROLEUM PIPELINE ENG'G CORP.	China	EC	224.8	67	0	0	0	0	0	100	0	0	0
58	SMEC (SNOWY MOUNTAINS NEG'G CORP.)	Australia	E	224.0	50	4	0	20	34	0	0	39	0	0
59	NIPPON KOEI GROUP	Japan	E	215.0	35	0	0	14	22	13	2	33	0	0
60	WOOD GROUP MUSTANG	USA	EC	214.6	23	0	0	0	0	0	100	0	0	0
61	ILF CONSULTING ENGINEERS	Austria	E	214.2	82	3	0	7	15	5	50	20	0	1
62	EXP	Canada	EA	209.0	40	53	0	0	2	0	14	12	0	16
63	MEINHARDT INTL. PTY. LTD.	Australia	E	208.8	81	47	5	2	9	10	1	23	0	3
64	GENSLER	USA	A	200.9	26	92	1	0	0	0	0	4	0	2
65	HOK	USA	AE	199.2	45	77	0	0	0	0	0	23	0	0
66	FICHTNER GMBH & CO. KG	Germany	E	198.0	66	1	0	76	6	16	1	1	0	0
67	KEPCO ENGINEERING & CONSTRUCTION CO. LTD.	South Korea	AEC	190.8	35	0	0	100	0	0	0	0	0	0

Rank	FIRM	Home	FIRM TYPE	2011 REVENUE TOTAL $ .MIL	2011 REVENUE INT'L $ MIL.	GENERAL BUILDING	MANUFACTURING	POWER	WATER SUPPLY	SEWER/WASTE	INDUS./PETROLEUM	TRANSPORTATION	HAZARDOUS WASTE	TELECOM
68	TEBODIN CONSULTANTS & ENGINEERS	Netherlands	E	182.0	59	7	13	5	8	1	52	7	1	2
69	LAHMEYER INTERNATIONAL GMBH	Germany	E	179.6	87	0	0	95	3	1	1	0	0	0
70	PARSONS	USA	EC	171.5	16	11	0	0	10	12	2	54	9	2
71	CONESTOGA-ROVERS & ASSOC.	USA	E	164.0	45	34	0	3	2	12	2	6	40	0
72	SEPCO ELECTRIC POWER CONSTRUCTION CORP.	China	EAC	156.9	85	0	0	100	0	0	0	0	0	0
73	IDOM	Spain	EA	153.3	65	13	4	41	2	4	15	17	0	5
74	IBI GROUP	Canada	AE	152.4	46	62	7	0	0	0	1	28	0	0
75	BECA GROUP LTD.	New Zealand	EA	152.1	45	18	9	9	19	0	30	12	0	0
76	SKIDMORE OWINGS & MERRILL LLP	USA	AE	139.1	55	100	0	0	0	0	0	0	0	0
77	CHINA NATIONAL MACHINERY INDUSTRY CORP.	China	EC	137.1	41	2	0	64	15	0	8	10	0	0
78	ASSOCIATED CONSULTING ENGINEERS	Greece	AE	130.0	95	32	0	2	10	30	4	20	1	1
79	KOHN PEDERSEN FOX ASSOCIATES PC	USA	A	123.6	86	85	0	0	0	0	0	15	0	0
80	DESSAU INC.	Canada	E	122.0	16	10	0	20	11	5	0	28	0	2
81	CHINA RAILWAY GROUP LTD.	China	EC	121.1	9	3	0	0	0	0	0	97	0	0
82	CDM	USA	EC	120.9	16	6	0	0	25	37	0	28	4	0
83	ARTELIA (SOGREAH & COTEBA)	France	E	120.6	30	23	0	4	14	7	28	22	1	1
84	ORIENTAL CONSULTANTS (ACKG LTD.)	Japan	E	117.9	31	9	0	4	8	4	0	73	0	1
85	CDI ENGINEERING SOLUTIONS	USA	EA	107.6	21	25	0	1	1	0	45	27	0	0
86	KEO INTERNATIONAL CONSULTANTS WLL	Kuwait	AEP	103.8	91	63	0	0	7	13	0	17	0	0
87	PM GROUP	Ireland	EA	102.4	63	10	9	8	8	0	64	1	0	0
88	ADPI	France	AE	101.9	96	4	0	0	0	0	0	96	0	0
89	EPTISA	Spain	E	99.3	53	7	2	8	43	11	0	23	6	0
90	INGENIUM INTERNATIONAL INC.	USA	AE	98.8	89	93	0	0	0	0	0	7	0	0
91	MORRISON KNUDSEN CORP.	USA	E	98.2	84	40	0	1	3	5	0	33	0	15
92	TYPSA	Spain	EA	98.2	49	18	0	3	18	16	0	45	0	1
93	HDR	USA	EA	95.7	6	60	0	11	1	3	4	13	8	0
94	CHINA METALLURGICAL CONSTRUCTION GROUP	China	EA	90.1	9	0	0	5	0	0	13	0	0	0
95	ENVIRON HOLDINGS INC.	USA	ENV	89.3	32	0	0	0	0	0	0	0	0	0
96	CTCI CORP.	Taiwan	EC	88.2	39	0	0	7	0	0	83	10	0	0
97	CHIYODA CORP.	Japan	EC	88.0	83	0	1	0	0	0	99	0	0	0
98	ACCIONA INFRAESTRUCTURAS	Spain	EC	87.9	50	12	0	21	2	4	0	61	0	0
99	CHINA PETROLEUM ENG. & CONSTRUCTION CORP.	China	EC	86.0	53	0	0	0	0	0	100	0	0	0
100	OPUS INTERNATIONAL CONSULTANTS LTD	New Zealand	EAP	84.1	30	30	0	0	13	4	0	53	0	0
101	DORSCH CONSULT	Germany	E	83.7	79	3	1	2	44	27	2	9	0	1
102	HOCHTIEF AG	Germany	EC	80.9	49	55	1	5	1	3	3	30	0	0
103	CANNON DESIGN	USA	AE	79.1	34	100	0	0	0	0	0	0	0	0
104	CHINA HUANQIU CONTRACTING & ENG'G CORP.	China	EC	76.3	22	0	0	0	0	0	100	0	0	0
105	COFFEY INTERNATIONAL	Australia	GE	72.3	19	20	0	8	2	5	0	5	2	0
106	THE BABCOCK & WILCOX CO.	USA	EC	67.7	47	0	0	100	0	0	0	0	0	0
107	SENER INGENIERIA Y SISTEMAS SA	Spain	EC	66.8	66	1	8	27	0	0	24	40	0	0
108	CHINA POWER ENGINEERING CONSULTING GROUP CO.	China	EC	64.5	8	0	0	100	0	0	0	0	0	0
109	CALLISON	USA	A	62.7	49	100	0	0	0	0	0	0	0	0
110	H.P. GAUFF INGENIEURE GMBH & CO. KG - JBG	Germany	E	62.6	77	1	0	4	29	12	0	46	0	7
111	RAFAEL VINOLY ARCHITECTS P.C.	USA	A	62.5	55	100	0	0	0	0	0	0	0	0
112	TECHINT GROUP	Italy	EC	61.3	100	0	0	13	0	0	54	0	0	0
113	SINOHYDRO CORP.	China	EC	59.6	89	4	0	87	4	0	0	3	0	0
114	WATG	USA	A	58.2	96	100	0	0	0	0	0	0	0	0
115	NIPPON JOGESUIDO SEKKEI CO. LTD.	Japan	E	58.0	32	0	0	0	53	47	0	0	0	0
116	BURNS AND ROE GROUP INC.	USA	EC	57.2	47	5	0	91	5	0	0	0	0	0
117	EMPRESARIOS AGRUPADOS	Spain	EA	57.2	52	0	0	80	0	0	0	0	6	3
118	ECOLOGY & ENVIRONMENT INC.	USA	ENV	56.7	34	0	4	18	5	0	42	0	1	6
119	SAFEGE	France	E	56.0	39	0	0	0	39	32	0	18	0	0
120	SARGENT & LUNDY LLC	USA	E	55.2	11	0	0	100	0	0	0	0	0	0
121	BELT COLLINS	USA	L	53.4	86	100	0	0	0	0	0	0	0	0
122	LEND LEASE PROPERTY SERVICES	Australia	EAC	53.2	19	100	0	0	0	0	0	0	0	0
123	SETEC	France	E	52.6	17	3	33	2	3	1	0	57	0	0
124	ENERGOPROJEKT HOLDING PLC	Serbia	E	52.2	69	0	0	90	9	0	0	0	0	0
125	CHINA INT'L WATER & ELECTRIC CORP. (CWE)	China	EC	49.8	94	1	0	67	32	0	0	0	0	0
126	CONSOLIDATED CONSTRACTORS INTERNATIONAL CO.	Greece	EC	48.5	100	28	0	0	0	0	72	0	0	0
127	KAJIMA CORP.	Japan	EC	48.1	12	46	34	3	0	0	11	0	0	1
128	THE MOUCHEL GROUP	UK	E	44.7	5	0	0	0	0	0	3	47	0	0
129	STANLEY CONSULTANTS INC.	USA	E	42.1	23	17	0	22	3	20	0	38	0	0
130	ENPPI (ENG. FOR THE PETRU. & PROCESS INDUSTRIES	Egypt	EC	42.0	25	0	0	0	0	0	100	0	0	0
131	GEODATA	Italy	E	41.7	88	0	0	11	10	0	0	79	0	0
132	POPULOUS	USA	A	40.0	47	100	0	0	0	0	0	0	0	0
133	STUDI INTERNATIONAL	Tunisia	E	39.4	90	8	0	0	16	6	0	51	0	0
134	EHAF CONSULTING ENGINEERS	Egypt	AE	39.1	86	93	0	0	0	0	5	0	0	0

Rank	FIRM	Home	FIRM TYPE	2011 REVENUE TOTAL $ .MIL	2011 REVENUE INT'L $ MIL.	GENERAL BUILDING	MANUFACTURING	POWER	WATER SUPPLY	SEWER/WASTE	INDUS./PETROLEUM	TRANSPORTATION	HAZARDOUS WASTE	TELECOM
135	PCG PROFABRIL CONSULPLANO GROUP	Portugal	E	38.5	62	9	0	3	3	1	71	13	0	0
136	CHINA RAILWAY CONSTRUCTION CORP. LTD.	China	EC	38.0	3	0	0	0	0	0	0	100	0	0
137	DELCAN CORP.	Canada	E	38.0	32	0	0	0	0	0	0	100	0	0
138	ABB LUMMUS GLOBAL	Italy	EC	37.9	100	0	0	0	0	0	100	0	0	0
139	KIEWIT CORP.	USA	EC	37.0	14	0	0	100	0	0	0	0	0	0
140	NBBJ	USA	A	36.7	20	100	0	0	0	0	0	0	0	0
141	HKS INC.	USA	AE	35.3	17	100	0	0	0	0	0	0	0	0
142	AYESA	Spain	E	34.7	26	4	0	2	21	0	14	54	0	6
143	D'APPOLONIA SPA	Italy	E	34.5	50	3	4	7	0	0	43	20	5	15
144	MONENCO	Iran	E	33.7	43	0	0	60	0	0	37	0	0	0
145	CHINA TIANCHEN ENGINEERING CORP.	China	EC	33.6	16	0	0	8	0	0	92	0	0	0
146	NET ENGINEERING INTERNATIONAL SPA	Italy	E	33.0	53	1	0	35	0	1	0	63	0	0
147	PAGESOUTHERLANDPAGE	USA	AE	32.8	36	100	0	0	0	0	0	0	0	0
148	PERKINS EASTMAN	USA	A	32.5	25	100	0	0	0	0	0	0	0	0
149	CTI ENGINEERING CO. LTD.	Japan	E	32.4	8	0	0	0	43	17	0	37	0	0
150	GEOSYNTEC CONSULTANTS	USA	E	30.4	17	0	0	4	0	0	25	0	71	0
151	INGEROP	France	E	30.4	13	33	12	0	3	0	0	52	0	0
152	BURNS & MCDONNELL	USA	EAC	29.7	4	83	0	2	0	0	0	15	0	0
153	PUNJ LLOYD LTD.	India	EC	29.0	85	0	0	0	0	0	100	0	0	0
154	DEWAN ARCHITECTS & ENGINEERS	UAE	AE	28.5	70	100	0	0	0	0	0	0	0	0
155	DIA HOLDING FZCO	UAE	EA	28.4	100	60	0	12	1	3	0	24	0	0
156	ADRIAN SMITH + GORDON GILL ARCHITECTURE	USA	A	27.5	96	100	0	0	0	0	0	0	0	0
157	POSCO ENGINEERING CO.	South Korea	EC	27.3	25	0	0	57	7	0	34	2	0	0
158	NIHON SEKKEI INC.	Japan	AE	25.0	15	100	0	0	0	0	0	0	0	0
159	TECHNITAL SPA	Italy	E	25.0	36	0	0	5	40	10	0	40	0	0
160	CES CONSULTING ENGINEERS SALZGITTER GMBH	Germany	E	24.8	100	4	0	2	44	48	0	3	0	0
161	SHENYANG YUANDA ALUMINUM IND. ENG. CO. LTD.	China	EC	24.5	9	100	0	0	0	0	0	0	0	0
162	ARABTECH JARDANEH	Jordan	EA	24.1	72	69	0	0	8	3	2	11	0	0
164	INECO	Spain	E	24.0	7	0	0	0	0	0	0	100	0	0
163	PAUL C. RIZZO ASSOCIATES INC.	USA	E	24.0	69	0	0	0	100	0	0	0	0	0
165	SUMITOMO MITSUI CONSTRUCTION CO. LTD.	Japan	A	23.7	89	35	0	0	0	0	65	0	0	0
166	GULF INTERSTATE CORP.	USA	EA	23.5	15	0	0	0	0	0	100	0	0	0
167	THORNTON TOMASETTI INC.	USA	EA	23.4	24	96	0	0	0	0	0	2	0	1
168	ENGINEERING CONSULTANTS GROUP SA	Egypt	A	22.8	35	58	0	3	14	1	16	3	0	4
169	RCM TECHNOLOGIES INC.	USA	E	21.3	34	0	0	100	0	0	0	0	0	0
170	POWER ENGINEERS INC.	USA	E	20.7	9	14	0	83	0	0	3	0	0	0
171	H&A ARCHITECTS AND ENGINEERS	USA	AE	20.6	52	100	0	0	0	0	0	0	0	0
172	GHAFARI ASSOCIATES LLC	USA	EA	20.5	17	41	27	0	0	0	0	32	0	0
173	WALDEMAR S. NELSON AND CO. INC.	USA	EA	20.4	37	0	0	0	0	0	64	0	0	0
174	THE JERDE PARTNERSHIP INC.	USA	A	20.1	95	100	0	0	0	0	0	0	0	0
175	WONG TUNG & PARTNERS LTD.	China	A	19.9	64	93	7	0	0	0	0	0	0	0
176	SHELADIA ASSOCIATES INC.	USA	EA	19.7	79	0	0	1	20	0	0	80	0	0
177	MICHAEL BAKER CORP.	USA	EA	19.2	4	34	0	0	0	0	4	49	12	0
178	MOFFATT & NICHOL	USA	E	18.5	16	0	0	0	3	0	0	97	0	0
179	SINOPEC SHANGHAI ENGIENEERING INC.	China	EC	18.3	22	0	0	0	0	0	36	64	0	0
180	PROGEN PROJETOS GERENCIAN	Brazil	E	18.0	13	0	0	0	0	0	0	100	0	0
181	TEMELSU INTERNATIONAL ENGINEERING SERVICES INC.	Turkey	E	17.6	52	0	0	1	13	18	0	50	0	0
182	ECC	USA	E	16.7	49	72	0	1	3	7	0	17	0	0
183	GOETTSCH PARTNERS	USA	A	16.7	72	100	0	0	0	0	0	0	0	0
184	STEELMAN PARTNERS	USA	A	16.5	77	100	0	0	0	0	0	0	0	0
185	ATLAS GROUP	Turkey	EC	16.0	100	100	0	0	0	0	0	0	0	0
186	TOYO-THAI CORP. PUBLIC CO. LTD.	Thailand	EC	15.9	44	0	0	0	10	0	90	0	0	0
187	CRB CONSULTING ENGINEERS INC.	USA	EA	15.2	19	0	4	0	0	0	95	0	0	0
189	SAMOO ARCHITECTS & ENGINEERS	South Korea	AE	15.2	7	64	36	0	0	0	0	0	0	0
188	SSOE INC	USA	EAC	15.2	11	0	82	2	0	0	17	0	0	0
190	MULVANNYG2 ARCHITECTURE	USA	A	15.0	30	100	0	0	0	0	0	0	0	0
191	PEG SA	Switzerland	E	15.0	100	0	0	0	0	0	100	0	0	0
192	POSCO ENGINEERING & CONSTRUCTION	South Korea	EC	14.8	67	61	0	0	0	0	39	0	0	0
193	DOHWA ENGINEERING CO.	South Korea	EC	14.7	6	0	0	42	6	4	0	39	0	0
194	BESIX SA	Belgium	EC	14.5	79	31	0	0	0	7	0	62	0	0
195	SWANKE HAYDEN CONNELL ARCHITECTS	USA	A	14.1	43	100	0	0	0	0	0	0	0	0
196	AAW CONSULTING ENGINEERS	Egypt	E	13.7	70	0	0	0	41	45	0	14	0	0
197	CAMBRIDGE SEVEN ASSOCIATES	USA	A	13.5	61	100	0	0	0	0	0	0	0	0
198	SMALLWOOD, REYNOLDS, STEWART	USA	A	13.5	62	100	0	0	0	0	0	0	0	0
199	STELLAR	USA	EA	13.0	43	0	0	0	0	0	100	0	0	0
200	CHINA GEZHOUBA GROUP CO. LTD.	China	E	12.7	84	9	0	55	9	0	0	11	0	0

A. NORTH AMERICA

CANADA

Acciona Infraestructuras
AECOM Technology Corp.
AF AB
AMEC plc
ARCADIS NV
Artelia (Sogreah & Coteba)
ARUP Group Ltd.
Atkins
Ausenco
The Babcock & Wilcox Co.
Michael Baker Corp.
Bechtel
Louis Berger
Black & Veatch
Burns & McDonnell
Burns and Roe Group Inc.
Callison
Cambridge Seven Associates Inc.
Cannon Design
Cardno Ltd.
CB&I
CDI Corp.
CDM Smith
CH2M HILL
China Chengda Engineering Co. Ltd.
Chiyoda Corp.
Coffey International
Conestoga-Rovers & Assoc.
COWI
CRB
Dar Al-Handasah Consultants (Shair and Partners)
DHV Group
Ecology & Environment Inc.
Egis
Empresarios Agrupados
ENVIRON Holdings Inc.
Eptisa
Fichtner GmbH & Co. KG
Fluor Corp.
Fugro NV
Gensler
Geosyntec Consultants
Ghafari Associates LLC
GHD Pty Ltd.
HDR
HKS Inc.
HOCHTIEF AG
HOK
ILF Consulting Engineers
Ingenium International Inc.
Jacobs
KBR
Kiewit Corp.
Kohn Pedersen Fox Associates PC
Maire Tecnimont
McDermott International Inc.
Moffatt & Nichol
Morrison Hershfield
Mott MacDonald Group Ltd.
MulvannyG2 Architecture
MWH Global
NBBJ
Waldemar S. Nelson and Co. Inc.
Nippon Jogesuido Sekkei Co. Ltd.
Opus International Consultants Ltd.
PageSoutherlandPage
Parsons Brinckerhoff
Parsons
Perkins Eastman
Populous
POWER Engineers Inc.
Poyry
Punj Lloyd Ltd.
Ramboll Group A/S
RCM Technologies Inc.
Saipem
Sargent & Lundy LLC
Sener Ingenieria y Sistemas SA
SETEC
The Shaw Group Inc.
Sinclair Knight Merz
Sinopec Engineering Inc.
Skidmore Owings & Merrill LLP
Adrian Smith + Gordon Gill Architecture
SSOE Group
Steelman Partners
SWECO
SYSTRA
TECHNIP
Tetra Tech Inc.
Thornton Tomasetti Inc.
URS Corp.
WATG / Wimberly Interiors
Wood Group Mustang
WorleyParsons Ltd.
WSP Group plc

UNITED STATES

AMEC plc
ARCADIS NV
Artelia (Sogreah & Coteba)
ARUP Group Ltd.
Atkins
Atlas Group
Ausenco
Cardno Ltd.
China Int'l Water & Electric Corp. (CWE)
China Metallurgical Group Corp.
China National Machinery Industry Corp.
Chiyoda Corp.
Coffey International
COWI
CTCI Corp.
D'Appolonia SpA
Dar Al-Handasah Consultants (Shair and Partners)
Delcan Corp.
DHV Group
Eptisa
exp
Fichtner GmbH & Co. KG
Fugro NV
H.P. Gauff Ingenieure GmbH & Co. KG - JBG
Geodata SpA
GHD Pty Ltd.
Golder Associates Corp.
Hatch Group
HOCHTIEF AG
IBI Group
IDOM
ILF Consulting Engineers
Kajima Corp.
KEPCO Engineering & Construction Co. Ltd.
Lahmeyer International GmbH
Maire Tecnimont
Mott MacDonald Group Ltd.
Opus International Consultants Ltd.
Petrofac Ltd.
PM Group
Poyry
Ramboll Group A/S
Samoo Architects & Engineers
Sener Ingenieria y Sistemas SA
SETEC
Sinclair Knight Merz
SNC-Lavalin International Inc.
Stantec Inc.
SWECO
SYSTRA
TECHNIP
Technital SpA
Tecnica y Proyectos SA (TYPSA)
Toyo-Thai Corp. Public Co. Ltd.
WorleyParsons Ltd.
WSP Group plc

B. LATIN AMERICA

ARGENTINA

AF AB
Artelia (Sogreah & Coteba)

2012 ENR TOP INTERNATIONAL DESIGN FIRMS
Where They Worked – by Country

ARUP Group Ltd.
Ausenco
The Babcock & Wilcox Co.
Bechtel
Cardno Ltd.
Conestoga-Rovers & Assoc.
COWI
Dar Al-Handasah Consultants (Shair and Partners)
DHV Group
Ecology & Environment Inc.
Empresarios Agrupados
ENVIRON Holdings Inc.
Eptisa
Fichtner GmbH & Co. KG
Fluor Corp.
Fugro NV
Gensler
Geodata SpA
GHD Pty Ltd.
Golder Associates Corp.
H&A Architects and Engineers
HKS Inc.
IBI Group
Jacobs
KBR
Lahmeyer International GmbH
Maire Tecnimont
Moffatt & Nichol
MWH Global
Parsons Brinckerhoff
Poyry
Progen, Projetos, Gerenciamento e Engenharia Ltda.
Ramboll Group A/S
Paul C. Rizzo Associates Inc.
Saipem
Sener Ingenieria y Sistemas SA
Sinclair Knight Merz
SNC-Lavalin International Inc.
SYSTRA
Techint Group
Tecnicas Reunidas
Tetra Tech Inc.
URS Corp.
Rafael Vinoly Architects PC
Wood Group Mustang
WSP Group plc

BOLIVIA

AECOM Technology Corp.
Louis Berger
CES Consulting Engineers Salzgitter GmbH
COWI
DHV Group
Dohwa Engineering Co. Ltd.
Eptisa
Fichtner GmbH & Co. KG
Fluor Corp.
Golder Associates Corp.
IDOM
Lahmeyer International GmbH
Nippon Koei Group
Poyry
Sargent & Lundy LLC
SYSTRA
Tecnica y Proyectos SA (TYPSA)
Tecnicas Reunidas
URS Corp.
Wood Group Mustang
WSP Group plc

BRAZIL

Acciona Infraestructuras
AECOM Technology Corp.
AF AB
ARCADIS NV
Artelia (Sogreah & Coteba)
ARUP Group Ltd.
Ausenco
Ayesa
The Babcock & Wilcox Co.
Beca Group Ltd.
Bechtel
Louis Berger
Black & Veatch
Callison
Cannon Design
CB&I
CDM Smith
CH2M HILL
China Chengda Engineering Co. Ltd.
China Metallurgical Group Corp.
Chiyoda Corp.
Coffey International
Conestoga-Rovers & Assoc.
COWI
Dar Al-Handasah Consultants (Shair and Partners)
DHV Group
Ecology & Environment Inc.
Egis
Empresarios Agrupados
ENVIRON Holdings Inc.
Eptisa
Fichtner GmbH & Co. KG
Fluor Corp.
Fugro NV
Geodata SpA
Geosyntec Consultants
Ghafari Associates LLC
Golder Associates Corp.
H&A Architects and Engineers
Hatch Group
HDR
HKS Inc.
HOK
IBI Group
IDOM
INECO
INGEROP
JGC Corp.
KBR
Kohn Pedersen Fox Associates PC
Lahmeyer International GmbH
Maire Tecnimont
McDermott International Inc.
Moffatt & Nichol
Mott MacDonald Group Ltd.
MWH Global
Waldemar S. Nelson and Co. Inc.
Nippon Jogesuido Sekkei Co. Ltd.
Nippon Koei Group
Parsons Brinckerhoff
Parsons
PCG Profabril Consulplano Group
Perkins Eastman
Populous
POWER Engineers Inc.
Poyry
Ramboll Group A/S
Paul C. Rizzo Associates Inc.
Sargent & Lundy LLC
Sener Ingenieria y Sistemas SA
SETEC
The Shaw Group Inc.
Sinclair Knight Merz
Skidmore Owings & Merrill LLP
SNC-Lavalin International Inc.
SSOE Group
Stantec Inc.
SWECO
SYSTRA
Techint Group
TECHNIP
Tecnica y Proyectos SA (TYPSA)
Tecnicas Reunidas
Tetra Tech Inc.
Thornton Tomasetti Inc.
URS Corp.
Wood Group Mustang
WorleyParsons Ltd.
WSP Group plc

CHILE

AECOM Technology Corp.
AF AB
ARCADIS NV
Artelia (Sogreah & Coteba)
ARUP Group Ltd.

Transparency International is the global civil society organisation leading the fight against corruption. Through more than 90 chapters worldwide and an international secretariat in Berlin, we raise awareness of the damaging effects of corruption and work with partners in government, business and civil society to develop and implement effective measures to tackle it.

CORRUPTION PERCEPTIONS INDEX 2012

Corruption can happen anywhere. When politicians put their own interests above those of the public. When officials demand money and favours from citizens for services that should be free. Corruption is not just an envelope filled with money though – these people make decisions that affect our lives.

We know corruption is a problem around the world. But how bad is it and what can be done? The *Corruption Perceptions Index* measures the perceived levels of public sector corruption in countries worldwide. Based on expert opinion, countries are scored from 0 (highly corrupt) to 100 (very clean). Some countries score well, but no country scores a perfect 100. Two-thirds of the 176 countries ranked in the 2012 index score below 50, showing that public institutions need to be more transparent, and powerful officials more accountable.

> "We must ensure that there are real consequences to corruption. 'No to impunity' cannot just be a slogan – it must be carried out with all our combined strength and inspire citizens to speak up and to no longer tolerate corruption."
>
> Huguette Labelle, Chair, Transparency International

The *Corruption Perceptions Index* forces governments around the world to take notice of corruption – their country's score reflects on them. But recognising the problem is only the first step towards a solution. That is why we help citizens to demand accountability from their leaders. And we show governments what they can do to tackle corruption. Together, we can make corruption a thing of the past.

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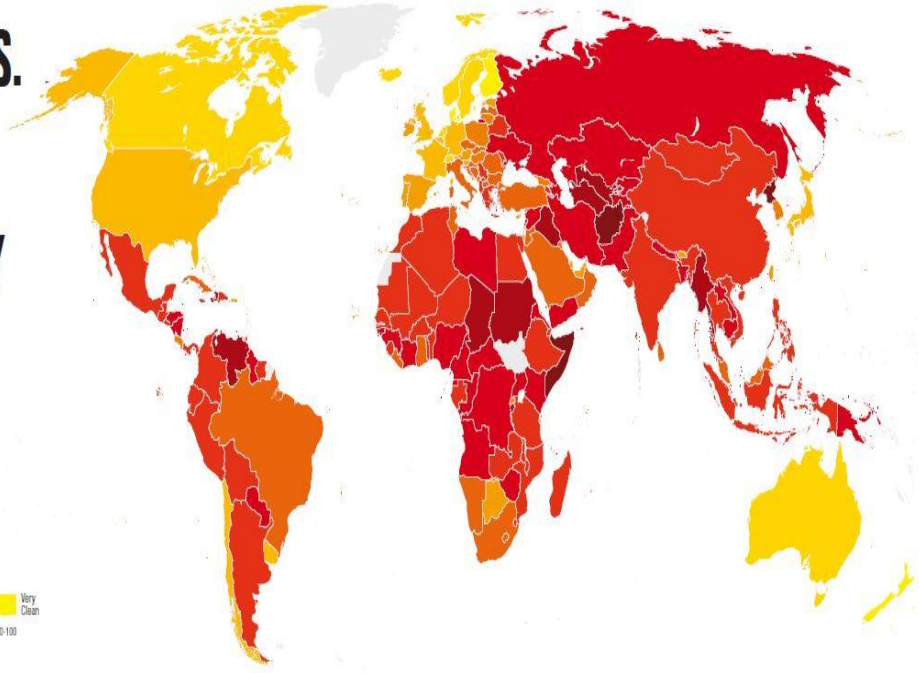
176 COUNTRIES. 176 SCORES. HOW DOES YOUR COUNTRY MEASURE UP?

The perceived levels of public sector corruption in 176 countries/territories around the world.



RANK	COUNTRY/TERRITORY	SCORE
1	Denmark	90
1	Finland	90
1	New Zealand	90
4	Sweden	88
5	Singapore	87
6	Switzerland	86
7	Australia	85
7	Norway	85
9	Canada	84
9	Netherlands	84
11	Iceland	82
12	Luxembourg	80
13	Germany	79
14	Hong Kong	77
15	Barbados	76
16	Belgium	75
17	Japan	74
17	United Kingdom	74
19	United States	73
20	Chile	72
20	Uruguay	72
22	Bahamas	71
22	France	71
22	Saint Lucia	71
25	Austria	69
25	Ireland	69
27	Qatar	68
27	United Arab Emirates	68
29	Cyprus	66
30	Botswana	65
30	Spain	65
32	Estonia	64
33	Bhutan	63
33	Portugal	63
33	Puerto Rico	63
36	Saint Vincent and the Grenadines	62
37	Slovenia	61
37	Taiwan	61
39	Cape Verde	60
39	Israel	60
41	Dominica	58
41	Poland	58
43	Malta	57
43	Mauritius	57
45	Korea (South)	56
46	Brunei	55
46	Hungary	55
48	Costa Rica	54
48	Lithuania	54
50	Rwanda	53
51	Georgia	52
51	Seychelles	52
53	Bahrain	51
54	Czech Republic	49
54	Latvia	49
54	Malaysia	49
54	Turkey	49
58	Cuba	48
58	Jordan	48
58	Namibia	48
61	Oman	47
62	Croatia	46
62	Slovakia	46
64	Ghana	45
64	Lesotho	45
66	Kuwait	44
66	Romania	44
66	Saudi Arabia	44
69	Brazil	43
69	FYR Macedonia	43
69	South Africa	43
72	Bosnia and Herzegovina	42
72	Italy	42
72	Sao Tome and Principe	42
75	Bulgaria	41
75	Liberia	41
75	Montenegro	41
75	Tunisia	41
79	Sri Lanka	40
80	China	39
80	Serbia	39
80	Trinidad and Tobago	39
83	Burkina Faso	38
83	El Salvador	38
83	Jamaica	38
83	Panama	38
83	Peru	38
88	Malawi	37
88	Morocco	37
88	Suriname	37
88	Swaziland	37
88	Thailand	37
88	Zambia	37
94	Benin	36
94	Colombia	36
94	Djibouti	36
94	Greece	36
94	India	36
94	Moldova	36
94	Mongolia	36
94	Senegal	36
102	Argentina	35
102	Gabon	35
102	Tanzania	35
105	Algeria	34
105	Armenia	34
105	Bolivia	34
105	Gambia	34
105	Kosovo	34
105	Mali	34
105	Mexico	34
105	Philippines	34
113	Albania	33
113	Ethiopia	33
113	Guatemala	33
113	Niger	33
113	Timor-Leste	33
118	Dominican Republic	32
118	Ecuador	32
118	Egypt	32
118	Indonesia	32
118	Madagascar	32
123	Belarus	31
123	Mauritania	31
123	Mozambique	31
123	Sierra Leone	31
123	Vietnam	31
128	Lebanon	30
128	Togo	30
130	Côte d'Ivoire	29
130	Nicaragua	29
130	Uganda	29
133	Comoros	28
133	Guyana	28
133	Honduras	28
133	Iran	28
133	Kazakhstan	28
133	Russia	28
139	Azerbaijan	27
139	Kenya	27
139	Nepal	27
139	Nigeria	27
139	Pakistan	27
144	Bangladesh	26
144	Cameroon	26
144	Central African Republic	26
144	Congo Republic	26
144	Syria	26
144	Ukraine	26
150	Eritrea	25
150	Guinea-Bissau	25
150	Papua New Guinea	25
150	Paraguay	25
154	Guinea	24
154	Kyrgyzstan	24
156	Yemen	23
157	Angola	22
157	Cambodia	22
157	Tajikistan	22
160	Democratic Republic of the Congo	21
160	Laos	21
160	Libya	21
163	Equatorial Guinea	20
163	Zimbabwe	20
165	Burundi	19
165	Chad	19
165	Haiti	19
165	Venezuela	19
169	Iraq	18
170	Turkmenistan	17
170	Uzbekistan	17
172	Myanmar	15
173	Sudan	13
174	Afghanistan	8
174	Korea (North)	8
174	Somalia	8

APPENDIX B

LIST OF COMPANIES AND HOME COUNTRIES

The table in the next page demonstrates all companies that have been studied in this research. The total of 663 companies from 46 countries were investigated. All these companies were analyzed in first model. Model 2 only contains 345 companies from 33 countries. The ◆ sign was used to show companies that have been modeled in both analyses. The columns should be read from left to right.

AUSTRALIA	◆ Golder Associates Corp.
◆ Ausenco	Halcrow/Yolles
◆ Bovis Lend Lease	◆ Hatch Group
◆ Cardno Ltd.	IBI Group
Clough Ltd.	Jacques Whitford Co. Inc.
Coffey International	Klohn Crippen Consultants Ltd
◆ Connell Wagner	◆ Meinhardt Intl. Pty. Ltd.
◆ GHD Pty Ltd.	◆ Met-Chem Canada Inc.
Kinhill Ltd.	◆ MMM Group Ltd.
Lend Lease Property Services	◆ N.D. Lea International Ltd.
McConnell Dowell Corp.	Reid Crowther & Partners
◆ Meinhardt Intl. Pty. Ltd.	◆ Sandwell Inc.
◆ Sinclair Knight Merz	◆ Simons International Corp.
◆ SMEC (Snowy Mountains Neg'g Corp.)	◆ SNC-Lavalin International Inc.
Vipac Engineers & Scientists Ltd	Stanley Technology Group
Woodhead International	◆ Stantec Inc.
Woods Bagot	Steffen, Robertson & Kirsten Consulting Ltd.
◆ WorleyParsons	◆ Tecsult Co.
AUSTRIA	Trow Global
Geoconsult	UMA Group Ltd
◆ ILF Consulting Engineers	Yolles
BELGIUM	CHINA
◆ BESIX SA	Anhui Foreign Economic Construction Co. Ltd.
Jan De Nul Group	Beijing Chang Cheng Const. Corp.
BESIX SA	Beijing Urban Construction Group Co. Ltd.
◆ Tractebel Engineering GDF-Suez	◆ Chengda Chemical Eng. Corp. of China
BRAZIL	◆ China Chengda Engineering Co. Ltd.
◆ Geotecnica	◆ China Communications Construction Ltd.
Hidroservice Engenharia Ltd.	◆ China Gezhouba Group Co. Ltd.
Progen projetos gerencian	China Harbour Engineering Co
CANADA	◆ China HuanQiu Contracting & Eng'g Corp.
◆ Acres International	China Hydropower Eng. Consultant Group Co.
◆ AGRA Industries	◆ China Int'l Water & Electric Corp. (CWE)
Buckland-Taylor Ltd.	◆ China Metallurgical construction Group
◆ Cansult Group Ltd.	◆ China National Chemical Eng. Corp.
Colt WorleyParsons Ltd.	◆ China National Machinery Industry Corp.
◆ Delcan Corp.	China Nonferrous Metal Industry's foreign Co.
◆ Dessau Inc.	◆ China Petroleum Eng. & Construction Corp.
EXP	◆ China Petroleum Pipeline Eng’g Corp.
Genivar	◆ China Power Engineering Consulting Group Co.

◆ China Railway Construction Corp. Ltd.	ECG Engineering Consultants Group SA
◆ China Railway Group Ltd.	◆ EHAF Consulting Engineers
China State Construction Eng. Corp.	◆ Engineering Consultants Group SA
◆ China Tianchen Engineering Corp.	ENGlobal
China Triumph International Eng. Co. Ltd	◆ ENPPI (Eng. For the petru. & process industries
◆ China Zhongyuan Engineering Corp.	Moharram-Bakhoum (ACE)
CNMEG	FINLAND
CPP (China Petroleum pipeline Bureau)	Devecon Oy
CSCEC	◆ Finnmap Consulting Oy/FMC
Hefei Cement Research & Design Institute	Fortum Engineering Ltd.
◆ Hydrochina Corp.	Juva Ltd.
◆ P&T Architects & Engineers Ltd.	LT Consultants Ltd
SEI Engineering	◆ PI-Consulting Ltd.
SEPCO Electric Power Construction Corp.	◆ Poyry
◆ Shandong Electric Power Construction Corp.	Soil & Water Ltd.
Shanghai Electric Group Co. Ltd.	FRANCE
Shanghai Modern Architectural Design Co. Ltd.	◆ ADPI
◆ Shanghai Xian Dai Architectural Design Co.	Aeroports de Paris
Shenyang Yuanda Aluminum Ind. Eng. Co. Ltd.	Artelia (Sogreah & Coteba)
◆ Sinohydro Corp.	◆ BCEOM Societe Francaise d'Ingenierie
◆ Sinopec Engieneering Inc.	◆ Bouygues
Sinopec Shanghai Engieneering Inc.	Coyne et Bellier
◆ Wong Tung & Partners Ltd.	EEG Simecsol
CZECH REPUBLIC	◆ Egis
POWER International SRO.	Europe Etudes Gecti
DENMARK	FC International
◆ Carl Bro Gruppen AS	◆ GTM-Entrepose
◆ COWI A/S	◆ INGEROP
◆ Dangroup International	Omnium Technique OT
Danish Hydraulic Institute	OTH
DHI Water & Environment	SAFEGE
◆ Kampsax International AS	SCETAUROUTE
Niras A/S	◆ SETEC
◆ Ramboll, Hannemann & Hojlund A/S	SODETEG
RH&H Consult	◆ Sofremines
Steensen & Varming International AS	Sofrerail
EGYPT	◆ SOGREAH
◆ AAW Consulting Engineers	◆ SYSTRA
ACE Consulting Engineers	◆ TECHNIP
◆ Dar Al-Handasah Consultants (Shair & Partners)	Thales Engineering & Consulting

GERMANY	TCE Consulting Engineers Ltd.
◆ Agiplan AG	IRAN
Agrar-UndHydrotechnik GMBH	MONENCO
◆ AHT Group	IRELAND
◆ CES Consulting Engineers Salzgitter GmbH	◆ PM Group
◆ Consulting Engineers Salzgitter GMBH	ISRAEL
DE Consult	Baran Group Ltd.
◆ Dorsch Consult	◆ TAHAL Group BV
◆ E.ON Engineering GmbH	ITALY
◆ Fichtner GmbH & Co. KG	ABB SPA
◆ GITEC Consult GmbH	Ansaldo Sistemi Industriali SpA
◆ GKW Group	◆ Bonifica SpA
◆ H.P. Gauff Ingenieure GmbH & Co. KG - JBG	◆ C. Lotti & Associati - Societa di Ingegneria SpA
◆ HAAS Consult	◆ Consulint International
◆ HOCHTIEF AG	CTIP
IGH Group	◆ D'Appolonia SpA
IGIP Ingenieur Gesellschaft	ELC-Electroconsult SPA
Kling Consult GmbH & Co International KG	GEODATA
◆ Kocks Consult GmbH	Geodata SpA
◆ Lahmeyer International GmbH	Idroesse Infrastrutture Spa
Lurgi AG	IRITECNA SPA
Obermeyer Planen + Beraten GmbH	◆ Italconsult
◆ Philipp Holzmann AG	Italferr SpA
◆ Pipeline Engineering GmbH	◆ Maire Tecnimont SpA
Rhein-Ruhr Ingenieur-Gesellschaft GMBH	◆ Net Engineering International SpA
RRI/Siepe Group	Proger Spa
Schmidt Reuter Partner	◆ Saipem
Siepe AG Consulting Partners	Sauti Compagnia Generale d'Ingegneria SRL
◆ Weidleplan Consulting GMBH	◆ Snamprogetti
GREECE	SNIA Engineering SPA
◆ Associated Consulting Engineers	Sotecni SPA
◆ Consolidated Constractors International Co. SAL	◆ STIPE Spa
HONG KONG	◆ Techint Group
J. Roger Preston & Partners	Technip KTI
INDIA	Technit Campagnia Tecnica Internazionale
◆ Development Consultants Ltd.	Technital SpA
Intercontinental Consultants and Technocrats Pvt.	TPL (Tecnologie progetti Lavori SPA)
◆ Larsen & Toubro Ltd.	Astaldi SpA
Punj Lloyd Ltd.	Gemmo Implanti S.P.A
Rail India Technical & Econommic Services	JAPAN

◆ Chiyoda Corp.	◆ Fugro NV
Chodai Co. Ltd.	Grabowsky & Poort BV
◆ CTI Engineering Co. Ltd.	◆ Grontmij NV
Japan Port Consultants Ltd.	HBG
◆ JGC Corp.	Heerema Fabrication Group BV
◆ Kajima Corp.	◆ Heidemij NV
◆ Kiso-Jiban Consultants Co. Ltd.	◆ NACO BV
◆ Kume Sekkei Co. Ltd.	◆ NEDECO
◆ Mitsubishi Heavy Industries Ltd.	◆ Nethconsult
NEWJEC Inc.	◆ Royal BAM Group
◆ Nihon Sekkei Inc.	◆ Royal Haskoning
◆ Nihon Suido Consultants Co. Ltd.	Schoonenwolf Consulting Engineers
Nikken Consultants Inc.	◆ TAHAL Group BV
◆ Nikkon Sekkei Inc.	◆ Tauw BV
◆ Nippon Jogesuido Sekkei Co. Ltd.	◆ Tebodin Consultants & Engineers
◆ Nippon Koei Group	◆ Witteveen + Bos Consulting Engineers
◆ Oriental Consultants (ACKG Ltd.)	NEW ZEALAND
◆ Pacific Consultants International group	◆ Beca Group Ltd.
Shimizu Corp.	Meritec Ltd.
◆ Sumitomo Mitsui Construction Co. Ltd.	◆ Opus International Consultants Ltd
Toshiba Eng. & Construction Co. Ltd.	◆ WorleyParsons
◆ Toyo Engineering Corp.	NORWAY
◆ Yachiyo Engineering Co. Ltd.	◆ Norconsult AS
◆ Yamashita Sekkei Inc	◆ Norplan A.S.
JORDAN	PAKISTAN
Arabtech Jardaneh	Descon Engineering Ltd.
KUWAIT	PHILIPPINS
KEO International Consultants WLL	Trans Asia Engineering Associates
LEBANON	PORTUGAL
◆ Khatib & Alami Consolidated Engineering Co.	◆ PCG Profabril Consulplano Group
MACEDONIA	◆ Profabril-Consulplano Group
Granit Construction Stock Co.	RUSSIA
NETHERLANDS	SiBCOTES
◆ ARCADIS NV	SERBIA
Ballast Nedam Engineering BV	◆ Energoprojekt Holding plc
◆ de Weger Architects and consulting engrs.	SINGAPORE
Deerns Group	◆ Aurecon
◆ Delft Hydraulics	CPG Consultants Pte. Ltd.
◆ DHV Group	M.E.I Project Engineers Pte. Ltd.
Euro Consult	RSP Architects Planners and Engineers Pte. Ltd.

SOUTH AFRICA	◆ Colenco Power Engineering Ltd.
◆ Africon	◆ Electrowatt Engineering Services
◆ Murray & Roberts	Ernst Basler + Partner AG
Stewart Scott International	◆ PEG SA
SOUTH KOREA	◆ Renardet SA
◆ Daelim Engineering Co. Ltd	SGI Consulting Engineers
◆ Daewoo Engineering Co.	Suter & Suter Corp.
DOHWA Engineering Co.	TAIWAN
◆ Heerim Architects & Planners Co. Ltd.	◆ CTCI Corp.
◆ Hyundai Engineering Co., Ltd.	THAILAND
KEPCO Engineering & Construction Co. Ltd.	Toyo-Thai Corp. Public Co. Ltd.
◆ Korea Power Engineering Co.	TUNESIA
◆ LG Engineering Co. Ltd.	Studi International
Lucky Engineering Co. Ltd.	TURKEY
◆ POSCO Engineering & Construction	Ant Yapi Contruction Co. Ltd.
POSCO Engineering Co.	Atlas Group
SAMOO Architects & Engineers	Cukurova Construction
◆ Samsung Engineering Co.	GAMA
◆ SK Enginerring & Construction	Guris Construction and Engineering Co. Inc.
SPAIN	Summa Turizm Yatirimciligi AS
Acciona Infraestructuras	Temelsu International Engineering Services Inc.
AYESA	UAE
◆ Empresarios Agrupados	DEWAN Architects & Engineers
Eptisa	DIA Holding Fzco
Grupo Ferrovial	National Petroleum Construction Co (NPCC)
IDOM	UNITED KINGDOM
◆ INECO	◆ Acer Consultants Ltd.
Intecsa Uhde Industrial SA	◆ Aker Kvaerner ASA
Sener Ingenieria y Sistemas SA	Allott & Lomax
◆ Tecnicas Reunidas	◆ AMEC
Temelsu International Engineering Services Inc.	◆ ARUP Group Ltd.
◆ TYPSA	◆ Atkins
SWEDEN	Babcock King Wilkinson Ltd.
◆ AB Jacobson & Widmark	Babtie Group Ltd
Afab	◆ Balfour Beatty
◆ Scandiaconsult International	◆ Binnie & Partners
◆ Skanska AB	Buro Happold Ltd.
◆ SWECO	Ewbank Preece Group Ltd.
◆ Swedpower AB	◆ Graham Consulting Group Ltd.
SWITZERLAND	◆ Halcrow Group Ltd.

◆ Harris & Sutherland	American Nukem Corp.
◆ High-Point Rendel	◆ Anshen Allen Architects
◆ HR Wallingford Ltd.	◆ Arquitectonica
◆ Hyder Consulting	ASRC Energy Services
John Brown/Davy	AVCA Corp.
Kennedy & Donkin Group	Bateman Engineering Inc.
◆ Knight Peisold & Partners	BBG-BBGM
Laing Limited	BDM Environ. Assessment
Llewellyn Davis	◆ BE&K Inc.
◆ Maunsell GROUP	◆ Bechtel
Morrison Hershfield	Behar-Ybarra & Associates PSC
◆ Mott MacDonald Group Ltd.	Belcan Engineering Group Inc
Parkman Group Ltd	◆ Belt Collins
Penspen Holdings Ltd	Bermello Ajamil & Partners Inc.
Petrofac LTD.	Bibb & Associates Inc.
Posford Duvivier	◆ Black & Veatch
Rendel Palmer & Tritton Ltd.	Blasland, Bouck & Lee Inc
◆ RMJM	◆ Brown & Root Inc.
◆ Roughton International	BSW International Inc
◆ Scott Wilson Group	◆ Buchart-Horn Inc./BASCO Associates
Structoris	◆ Burns & McDonnell
Tarmac Professional Services	◆ Burns and Roe Group Inc.
◆ The Mouchel Group	◆ Burt Hill
Trafalgar House Engineering & Construction	◆ Callison
Travers Morgan International	CAMBRIDGE Seven Associates
Wallace Evans Ltd	◆ Camp Dresser & McKee Inc.
Watson Hawksley Consulting Engineers	◆ Cannon Design
◆ WSP Group plc	◆ CB&I
UNITED STATES	◆ CDI Engineering Solutions
◆ A. Epstein and Sons International Inc.	◆ CDM
◆ ABB Lummus Global	◆ CH2M HILL
ABS Consulting	◆ Chester Environmental Inc
Adrian Smith + Gordon Gill Architecture	Chiang, Patel, & Yerby
◆ AECOM Technology Corp.	Clark-Nexsen PC Architecture & Eng.
Aedas	◆ CMA Architects & Engineers
AEPCO Inc.	◆ Conestoga-Rovers & Assoc.
AkerSolutions	◆ Corrpro Cos. Inc.
Albert Garaudy Consulting Engineers	CRA
Albert Kahn Associates Inc	CRB Consulting Engineers Inc.
◆ AMEC	CRSS Inc.

CSO Aker Maritime Inc	
◆ CUH2A	◆ Frederic R. Harris Inc.
Cuningham Group Architecture PA	GCL/BDM Environmental
◆ Dames & Moore	◆ General Physics Corp.
◆ Daniel, Mann, Johnson, & Mendenhall	◆ Gensler
David Evans and Associates	◆ Geomatrix Consultants Inc.
◆ Day & Zimmermann International Inc.	◆ Geosyntec Consultants
◆ Delta Environmental Consultants Inc.	Geraghty & Miller Inc.
Dewberry & Davis	◆ Ghafari Associates LLC
DMJM Aviation	Gilbert Associates Inc.
◆ Duke Engineering & Services Inc	Goettsch Partners
Durrant Group Inc.	Greenman-Pedersen Inc.
EA Engineering, Science and Technology	◆ Greiner Engineering Inc
Eagleton Engineering Co.	◆ Groundwater Technology Inc.
◆ Earth Tech Inc.	◆ Gulf Interstate Corp.
Ebasco Services Inc.	H&A Architects and Engineers
ECC	Haley & Aldrich Inc.
◆ Ecology & Environment Inc.	Halff Associates
◆ EDAW	Halliburton Corp.
EDI Architecture Inc	◆ Han Padron Associates LLP
◆ EDSA	◆ Hankins and Anderson Inc.
Edwards and Kelcey Inc.	◆ Harding Lawson Associates
Eichleay Holdings Inc.	◆ Harris Group Inc
Einhorn Yaffee Prescott Arch. & Eng'g	Hart Crowser Inc
Engineering Design Group (EDG)	◆ Harza Engineering Co.
Engineering Science Inc	Hatch Mott MacDonald
ENGlobal	Hazen and Sawyer P.C.
◆ ENPPI (Eng. For the petru. & process industries	◆ HDR
ENSERCH Environmental Corp.	◆ Heery International Inc
◆ ENSR International	◆ Hellmuth, Obata & Kassabaum Inc.
◆ ENVIRON Holdings Inc.	Hill International Inc.
◆ Environmental Resources Management (ERM)	◆ Hillier Architecture
◆ EQE International Inc.	◆ HKS Inc.
◆ EYP Mission Critical Facilities	HLM Design
Fentress Bradburn Architects	◆ HLW International
◆ Fish Engineering & Construction Partners	◆ HOK
◆ Flack + Kurtz	Holder Construction Co.
◆ Fluor Corp.	◆ Holmes & Narver Inc
◆ Foster Wheeler AG	Honeywell Process Solutions
FRCH Design Worldwide	HPA LLC

◆ Huntington Engineering & Envir. Inc	Murphy/Jahn
◆ ICF Kaiser Engineers Inc.	◆ Mustang Engineering
◆ Ingenium International Inc.	◆ MWH Global
Insituform Technologies Inc.	Natchiq Inc.
International Technology Corp.	◆ NBBJ
J. Muller International Inc.	◆ Ogden Environmental and Energy Services
◆ Jacobs	◆ On Board Chemical Corp.
JBA Consulting Engineers	◆ Otak Inc.
Johnson Fain and Pereira Associates	◆ Pacific Architects & Engineers Inc.
◆ Kaplan/McLaughlin/Diaz Inc.	◆ PageSoutherlandPage
◆ KBR	◆ Paragon Engineering Services Inc.
KCM Inc	Parametrix Co.
Keith Cos. Inc.	◆ Parsons
◆ Kiewit Corp.	◆ Parsons Brinckerhoff Inc.
Kling Lindquist	Parsons De Leuw Inc.
◆ KlingStubbins	Paul C. Rizzo Associates Inc.
◆ Kohn Pedersen Fox Associates PC	Pegasus TSI Inc
KTI Corp.	◆ Pei Cobb Freed & Partners Architects
Landrun & Brown Inc	Pennoni Associates Inc.
Langan Engineering and Environmental Services	Perini Corp.
◆ Langdon Wilson Arch. Plng. Interiors	Perkins & Will
◆ Law Cos. Group Inc./SirAlexander Gibb	◆ Perkins Eastman
◆ Leo A Daly	◆ Petrocon Engineering Inc.
◆ Lester B. Knight & Associates Inc.	Philip Environmental Services Corp.
Litwin Engineers & Constructors Inc	Pitt Des Moines
◆ Lockwood Greene Engineers Inc.	Populous
◆ Louis Berger Group	Post, Buckley, Schuh & Jemigan Inc.
M-E Engineers Inc.	◆ POWER Engineers Inc.
◆ Malcolm Pirnie Inc.	◆ PRC Environmental Management Inc.
McClier	Process Facilities Inc
◆ McDermott International Inc.	R.M. Towill Corp.
McLaren/Hart Environmental Engrg. Corp.	◆ R.W. Armstrong & Associates
◆ Metcalf & Eddy Cos. Inc.	R.W. Beck and Associates
◆ Michael Baker Corp.	◆ Radian Corp.
Middough Consulting Inc.	◆ Rafael Vinoly Architects P.C.
Minproc Engineers Inc.	◆ Raymond Professional Group Inc
◆ Moffatt & Nichol	◆ Raytheon Engineers & Constructors
◆ Montgomery/Watson Inc	◆ RCM Technologies Inc.
◆ Morrison Knudsen Corp.	River Consulting Inc.
◆ MulvannyG2 Architecture	RMT Inc

RNL	◆ The M.W. Kellogg Co.
◆ Rosser Fabrap International	◆ The PBSJ Corp.
◆ Roy F. weston Inc.	◆ The Shaw Group Inc.
◆ RTKL Associates Inc.	The Smith Group
Rust International Inc.	The Stellar Group
S&B Engineers & Constructors Ltd.	◆ Thompson, Ventulett, Stainback & Associates
◆ Sargent & Lundy LLC	◆ Thornton Tomasetti Inc.
◆ Sasaki Associates Inc.	TransCore
SB Architects	TranSystems Corp.
Science Applications International Corp. (SAIC)	TRC Cos. Inc.
SDI/HTI	TRO JunglBrannen
Sear-Brown	Tvsdesign
SECOR International Inc.	United Engineers & Constructors
◆ Sheladia Associates Inc.	◆ Universal Ensco Inc.
◆ Skidmore Owings & Merrill LLP	Universal Pegasus International Inc.
Skilling Ward Magnusson Barkshire Inc	Urbitran Group
◆ Smallwood, Reynolds, Stewart	◆ URS Corp.
SSOE Inc	USS Cal Builders Inc.
◆ Stanley Consultants Inc.	Vanderweil Engineers
◆ Steelman Partners	◆ VECO Corp.
Steffian Bradley Architects	Vector Engineering
Stellar	VECTRA
◆ Stone & Webster	◆ Versar Inc
Studios Architecture	W.H. Linder & Associates Inc.
◆ STV Group	◆ Waldemar S. Nelson And Co. Inc.
◆ Sverdrup Corp.	Walk, Haydel & Associates Inc.
◆ Swanke Hayden Connell Architects	◆ Washington Group International Inc.
Syska & Hennessy	◆ WATG
◆ T.Y. Lin International	Weidlinger Associates
◆ TAMS Consultants Inc	◆ Wilbur Smith Associates Inc.
◆ Tetra Tech Inc.	Willbros Group Inc.
The Architects Collaboration	WOOD Group Mustang
◆ The Austin Co.	◆ Woodward Clyde Group Inc.
The Babcock & Wilcox Co.	X-nth
The Badger Co. Inc	Zimmer Gunsul Frasca Partnership
◆ The Benham Cos. LLC	VENEZUELA
◆ The Ellerbe Becket Co.	Otepi Consultores SA
The IT Group	
The Jerde Partnership Inc.	
◆ The Kulijan Corp.	