DEVELOPMENT OF A COMPETITIVENESS MODEL FOR INTERNATIONAL CONTRACTING FIRMS

by

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ABSTRACT

DEVELOPMENT OF A COMPETITIVENESS MODEL FOR INTERNATIONAL CONTRACTING FIRMS

Competitiveness is an important research topic in construction business. Contractors need to assess their competitive position in order to sustain their existence in increasing globalization and fierce competition environment. However, competitiveness concept is argued by many practitioners and theorists because the term does not have an exact definition, it cannot be assessed easily and measured directly. This study aims to develop a framework that can assess construction contractors competitiveness. For this purpose, the competitiveness parameters for construction contractors competitiveness are identified. Competitiveness factors of construction contractors can be found in literature and in this study, comprehensive list of competitiveness factors of construction contractors are provided. An Analytic Network Process (ANP) model is proposed to analyze these factors involved in the analysis. Data collection is based on the experts opinions from the Turkish construction sector. The developed conceptual model is applied to Turkish contractors. According to the study, these factors are provided in 9 groups that include effectiveness of strategies, management capabilities, organizational capabilities, efficiency of technical resources, efficiency of human resources, efficiency of financial resources, relationship, favorability of host country, and favorability of market conditions. There are 47 factors in total. The analysis shows that "effectiveness of strategies" is the most influential factors that contribute to the competitiveness of the Turkish contractors, followed by "organizational capabilities" and "managerial capabilities", respectively.

ÖZET

ULUSLARARASI MÜTEAHHİT FİRMALAR İÇİN BİR REKABETÇİLİK MODELİNİN GELİŞTİRİLMESİ

Rekabetçilik kavramı inşaat sektöründe önemli bir araştırma konusudur. Müteah hitler, hızla küreselleşen ve rekabetin şiddetli olduğu günümüzde varlıklarını koruyabilmek için rekabetçi pozisyonlarını saptamaları gerekmektedir. Rekabetçilik kavramı geçmişten bu yana tartışılan bir kavram olmuştur. Bunun sepepleri arasında genel bir tanımının olmaması, belirlenmesi ve ölçülmesinin herkes tarafından kabul görmüş bir methodunun olmaması sayılabilir. Bu proje, müteahhit firmaların önemli rekabetçi faktörlerini analiz etmek amacıyla hazırlanmıştır. Müteahhitlik firmalarını etkileyen rekabetçi faktörler literatür taraması ile bulunmuştur. Analitik Ağ Prosesi (ANP) kullanılarak oluşturulan model sayesinde müteahhit firmaların rekabetçi faktörleri ortaya koyulmuştur. Çalışma için gerekli olan Türk İnşaat sektörünün önde gelen uzmanlarınınuzmanlarının görüşlerinden yola çıkarak elde edilmiştir. Kavramsal olarak yaratılan bu model Türk müteahhit firmalarına uyarlanmıştır. Bu çalışmaya göre rekabetçi faktörler 9 başlık altında toplanmıştır: stratejilerin etkiliği, yönetim kabiliyeti, organizasyonel kabiliyet, teknik kaynakların etkililiği, insan kaynakların etkililiği, finansal kaynakların etkililiği, ilişkiler, ev sahibi ülkenin elverişliliği, ev sahibi ülkedeki inşaat pazarının uygunluğu. Bu faktörler toplamda 47 faktöre sahiptir. Çalışmanın sonucunda, Türk müteahhitlerinin rekabetçiliği üzerinde en etkili faktör "stratejilerin etkililiği" olarak belirlenmiştir. Bu faktörü sırasıyla, "organizasyonel kabiliyet" ve "yönetim kabiliyeti" takip etmektedir.

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LIST OF ACRONYMS/ABBREVIATIONS

AHP	Analytic Hierarchy Process
ANP	Analytic Network Process
APP	Assets-Processes-Performance
CSF	Critical Success Factor
DTI	The Departmenr of Trade and Industry, UK
ENR	Engineering News Record
IMD	The International Institute for Management Development
IT	Information Technology
KCI	Key Competitiveness Indicator
OECD	Organization for Economic Co-operation and Development
TCA	Turkish Contractors Association
WRC	World Competitiveness Report
WEF	World Economic Forum

1. INTRODUCTION

1.1. Theory Background

Competitiveness concept is argued by many practitioners and theorists because the term does not have an exact definition, cannot be assessed easily and measured directly.

Competitiveness is an important research topic in construction business. Construction firms need to identify their competitive position in order to sustain their existence in increasing globalization and fierce competition environment.

This study aims to develop a framework which can assess construction contractors competitiveness. For this purpose, the competitiveness parameters for construction contractors competitiveness are identified. Competitiveness factors of construction contractors can be found in literature and in this study, comprehensive list of competitiveness factors of construction contractors are provided. An Analytic Network Process (ANP) model is proposed to analyze these factors involved in the analysis. Data collection is based on the experts opinions from the Turkish construction sector. The developed conceptual model is applied to Turkish contractors.

Below sections summarize the background of this research, problem statement, establishing the aims and objectives of the research, discussing the scope and limitations, and finally present the organization of thesis.

1.1.1. Background of Research

Several studies have suggested that adoptability of competitiveness frameworks to construction contractors is not an easy task. However, many researchers have attempted to build frameworks for construction sector and construction contractors.

The main reason for the need of a competitiveness framework for construction sector is globalization and fierce competitive environment. Globalization and industry competitiveness has led to an urgent need for an effective competitiveness management strategy. Thus, contractors require a better understanding about the definition of competitiveness, factors for determining it, and indices for measuring it. Many frameworks were created to understand and measure the competitiveness at the firm level. However, there are some challenges applying existing competitiveness models to construction industry. Some of the models discussed in this study are not applicable to construction industry while some of them are applicable with some critical deficiencies.

1.1.2. Problem Statement

Developed competitiveness models for construction contractors are generally limited to existing competitiveness models. Existing studies have some deficiencies and one cannot achieve the expected output. Therefore, there is a need for a new framework to be developed in order to assess the contractors competitiveness in an efficient way.

1.1.3. Aims and Objectives of the Research

The main objective of this study is to develop a framework to assess the competitiveness level of contractors. For this purpose, aims of the research include identifying competitiveness factors related to construction contractors and analyzing the factors in terms of their significance on competitiveness.

1.1.4. Scope and Limitations

This research has some limitations mainly based on the data collection process. The data was collected only from the Turkish construction contractors. Since the data reflects the experiences of Turkish construction companies and the markets they operated in, the model may not be applicable to all construction companies.

1.1.5. Organization of Thesis

In the second chapter of this study, comprehensive review of the past studies on competitiveness is provided.

Second chapter examines the concept of competitiveness and its definitions; presents different levels of competitiveness and different approaches on competitiveness and related frameworks; then, introduces the competitiveness studies related to the construction sector.

In the third chapter, research methodology is presented. It includes competitiveness factors affecting contractors and their definitions, ANP model formation and analysis, and findings. It also includes testing of the model.

Finally, conclusions based on the research findings are presented in the last chapter.

2. COMPETITIVENESS

2.1. Introduction

This chapter presents a literature review of competitiveness subject. First, the concept of competitiveness is discussed. Second, several definitions of competitiveness are introduced. Third, different levels of competitiveness are discussed. Fourth, theories on competitiveness are mentioned. Then, various frameworks of competitiveness are reviewed. Finally, competitiveness concept and frameworks related to construction are discussed.

2.2. The Concept of Competitiveness

The concept of competitiveness is an output of a long history of thoughts. (IMD, 2013) To understand the various aspects of the competitiveness, one should mention the practitioners and theorists who have made a decisive contribution:

- Smith (1776) and the other classical economists who have identified the four input factors: land, capital, natural resources and labor,
- Ricardo (1817) with his Law of Comparative Advantage, who indicated how countries should compete,
- Marx (1867) and the Marxist economists, who have focused on the impact of the sociopolitical environment on economic development, thus the communist idea that changing the political context should precede economic performance,
- Weber (1905), the German sociologist, who formed the relationship among values, religious beliefs and the economic performance of nations,
- Schumpeter (1942) , who highlighted the role of the entrepreneur as an indicator of competitiveness, highlighting that progress is the result of disequilibria, which favor innovation and technological improvement,
- Sloan (1964) and Drucker (1969), who have further developed the concept of management as a key input factor for competitiveness,

- Solow (1957), who has studied the factors underlying economic growth in the US to highlight the importance of education, technological innovation and increased know-how,
- Negroponte (1996) and numerous modern economists who are further refining the concept of "Knowledge" as the most recent input factor in competitiveness,
- Porter (1990) who interconnected all these ideas into a systemic model, called the Competitiveness Diamond.

Competitiveness is an abstract concept and many practitioners have tried to concretize the term. Flanagan *et al.*, (2005) summarized the concept of competitiveness as:

- Multi-defined: The competitiveness term can be easily misunderstood and is subject to consequent confusion because there is no general definition of the term.
- Multi-measured: There is no single, generic measurement of competitiveness. Instead, measurements vary with the definitions.
- Multi-layered: Competitiveness can be applied at different levels such as national, industrial and firm levels.
- Dependent: The meaning of competitiveness depends on the values of the stakeholders of the entity.
- Relative: Every measurement of competitiveness needs to be looked at in a relative sense, either against some maximum, ideal level or against its peers.
- Dynamic: The factors that influence competitiveness change with time and context, e.g. as the national economy moves from a less to a more developed stage.
- Process: Competitiveness involved assets, processes and performance, where processes turn assets into performance.

2.3. Definitions of Competitiveness

"Competitiveness originated from the Latin word, competer, which means involvement in a business rivalry for markets". (Murths and Lenway, 1998) "Com-

petitiveness is a concept that economists, industrialists, politicians, journalists and academics frequently refer to, debate and worry about" (Flanagan *et al.*, 2005). To address this ambiguity, Porter (2002) asserted a claim: "Competitiveness remains a concept that is not well understood, despite widespread acceptance of its importance".

A Google search on "competitiveness" hits 10 million results. The most intuitive definition of competitiveness is "a countrys share of world markets for its products" (Porter, 2002). To provide a better understanding of the definition of competitiveness, several definitions can be found through literature review. Definitions of competitiveness are introduced here, mainly adapted from National Competitiveness Council (2003).

According to IMD (2013), academic definition of competitiveness is given by "a field of economic knowledge, which analyses the facts and policies that shape the ability of a nation to create and maintain an environment that sustains more value creation for its enterprises and more prosperity for its people". Also, the shorter definition of the term is "how a nation manages the totality of its resources and competencies to increase the prosperity of its people".

In Global Competitiveness Report, WEF (2013) defined competitiveness as the ability of a country to achieve sustained high rates of growth in GDP per capita.

"Competitiveness is relative and not absolute. It depends on shareholder and customer values, financial strength which determines the ability to act and react within the competitive environment and the potential of people and technology in implementing the necessary strategic changes. Competitiveness can only be sustained if an appropriate balance is maintained between these factors which can be of conflicting nature" (Feurer and Chaharbaghi, 1994).

In the report of the Selected Committee of the House of Lords on Overseas Trade (1985), competitiveness can be realized as a synonymous with a firms long-run profit performance and its ability to compensate its employees and provide superior returns

to its owners. Also, competitiveness of a firm depends on the productivity and services of superior quality and lower costs than its domestic and international competitors.

According to European Management Produce and Market (1991), competitiveness is "the immediate and future ability of, and opportunities for, entrepreneurs to design goods worldwide whose price and non-price qualities form a more attractive package than those of foreign and domestic competitors".

"National competitiveness refers to a countrys ability to create, produce, distribute and/or service products in international trade while earning rising returns on its resources" (Scott and Lodge, 1985).

"Competitiveness includes both efficiency (reaching goals at the lowest possible cost) and effectiveness (having the right goals). It is this choice of industrial goals which is crucial and competitiveness includes both the ends and the means towards those ends" (Buckley *et al.*, 1988).

Competitiveness Advisor Group of European Commission (1995) explained competitiveness in the first of Enhancing European Competitiveness Report as:

"Competitiveness implies elements of productivity, efficiency and profitability. But it is not an end in itself or a target. It is a powerful means to achieve rising living standards and increasing social welfare-a tool for achieving targets. Globally, by increasing productivity and efficiency in the context of international specialization, competitiveness provides the basis for raising peoples earnings in a non-inflationary way."

In the second report of Enhancing European Competitiveness Report (1995), Competitiveness Advisor Group states that competitiveness should be seen as a basic means to raise the standard of living, provide jobs to the unemployed and eradicate poverty".

The broad definition of competitiveness by OECD (1997) is given as the degree to which a nation can, under free trade and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long-term. Competitiveness is supporting the ability of companies, industries, regions, nations or supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels.

US Department of Energy (1994) defined industrial competitiveness as the ability of a company or industry to meet challenges posed by foreign competitors.

Competitiveness Policy Council (1992) defines competitiveness as the ability to produce goods and services that meet the test of international markets while citizens earn a standard of living that is both rising and sustainable over the long-run in the First Report to the President and Congress.

Department of Enterprise, Trade and Employment, UK states that "competitive advantage at firm level is the ability to consistently and profitably deliver products and services which customers are willing to purchase in preference to those of competitors".

According to European Commission (1994), competitiveness is the capacity of businesses, industries, regions, nations or supranational associations exposed, and remaining exposed, to international competition to secure a relatively high return on the factors of production and relatively high employment levels on a sustainable basis.

International Institute for Management Development (1996) states that "competitiveness is the ability of a country to create added-value and thus increase national wealth by managing assets and processes, attractiveness and aggressiveness, by integrating these relationships into an economic and social model".

The range of definitions indicates the complexity of the concept; there is no definition accepted by all. The lack of consensus is due to diversity caused by different

perspectives (Flanagan *et al.*, 2007).

2.4. Different Levels of Competitiveness

Competitiveness can be considered at different levels: nation, industry, and firm.

The definition of competitiveness on a country level was formulated by Scott and Lodge (1985) as: "a countrys ability to create, produce, distribute and/or service products in international trade while earning rising returns on its resources". The US commission on Industrial Competitiveness defined competitiveness as "the ability of a country to produce goods and services that meet the test of international markets and simultaneously to maintain and expand the real income" (Tyson, 1992). The OECD (1997) adopted this definition, and thereby developed the arguably most frequently cited one, but added the criteria that competitiveness is to be proved "under free trade and fair market conditions" and "over the long-term". Storper (1995) takes a different approach to a nations competitiveness by stating; "competitiveness reflects the capability of an economy to attract and maintain firms with stable or rising shares in activity, while maintaining or increasing standards of living for those who participate in it". Clearly, a nations competitiveness may refer to, on the one hand, the relative performance of nations competing in the international market, or on the other hand, a nations ability to attract global capital (Belkacem, 2002). However, there are views that focus on aspects other than productivity. Boltho (1996) argues that the real exchange rate is an indicator of competitiveness, which takes into account both export and import competitiveness. National competitiveness is defined in terms of successful trade performance in the international markets that will in turn lead to sustained and rising standards of living in terms of rising real incomes. (Henricsson, 2005) This observation is also the core of the definition stated by the National Competitiveness Council (2003); "competitiveness is the ability to achieve success in markets leading to better standards for all".

Firm-level competitiveness is of great interest among practitioners. Nations can compete only if their firms can compete, argues Porter (1990); "it is the firms, not

nations, which compete in international markets".

Buckley *et al.*, (1988) found that only a few definitions in the literature were tailored to describe competitiveness at a firm level. Of those which do, the Aldington Report (1985) provided the most complete picture by stating; "a firm is competitive if it can produce products and services of superior quality and lower costs than its domestic and international competitors. Competitiveness is synonymous with a firms long-term profit performance and its ability to compensate its employees and provide superior returns to its owners" In the same line of thinking, but without stressing neither long-term nor the ability to compensate employees or owners, the Department of Trade and Industry (DTI) (1998) states that; "for a firm, competitiveness is the ability to produce the right goods and services, at the right price, at the right time. It means meeting customers needs more efficiently and more effectively than other firms".

Firm competitiveness is defined as "the ability to design, produce and/or market products superior to those offered by competitors, considering the price and non-price qualities" (WCR, 1991).

Firm level competitiveness indicates a firms ability to design, produce and market products superior to those offered by competitors, where superiority can be evaluated from several factors, like price, quality, technological advancement, etc. Also, firm level analysis focuses on behaviors and performance of firms (Depperu, 2005).

Firm competitiveness is related to market performance, with productivity and the exploitation of knowledge capital being keys to success. The objective of firm competitiveness, after having secured survival, is the creation of profits and new growth options that create value and returns for shareholders. Hence, competitiveness is associated with achieving an objective. Competitiveness is not an end, but a means to an end (Buckley *et al.*, 1988).

The issues of competitiveness at the industry level have received much less attention compared to the extensive research of the competitiveness at national and

corporate levels (Flanagan *et al.*, 2007).

Momoya (1998) claims that competitiveness at the industry level is often considered the result of the strategies and actions of firms that operate in that sector. The synergistic role of the non-business infrastructure is often overlooked by firms and policy makers. The non-business infrastructure includes educational and training institutions, R and D institutions, unions, governments, etc. Competitiveness of a sector is shaped by interactions between the non-business infrastructure and business firms. Some related definitions of the concept are:

- Collective ability of firms in that sector to compete,
- Internationally,
- Extent to which a business sector offers potential for growth and attractive return on investment.

The latter definition may appear quite satisfactory from the perspective of an investor; however, it can fail to recognize viewpoints of some of the important stakeholders within the industry. The key components from the above definitions are identified and supplemented by additional components to have a balanced definition.

The resulting definition of industry competitiveness is extent to which a business sector (Momoya, 1998):

- satisfies the needs of customers from the appropriate combination of the following product / service characteristics: price, quality, innovation
- satisfies the needs of its constituents; for example, workers in terms of involvement, benefit programs, training, and safe workplace
- offers attractive return on investment
- offers the potential for profitable growth.

The competitiveness of an industry can be assessed by a comparison with the same industry in another region or country with which there is open trade (Depperu,

2005).

2.5. Theories on Competitiveness

There are two main theories of firm competitiveness: "competitive advantage and competitive models" and "resource-based and core competence approaches".

The first theory is suggested by Porter (1980, 1985). In terms of this theory, competitive advantage stems from the competitive strategy adopted to deal with the strengths, weaknesses, opportunities, and threats facing an organization. According to Kale (2002), the theory is characterized as the industrial organization view of competitive advantage, which was grounded on the earlier works of classical industrial organization scholars, Bain (1959) and Mason (1939) in the area of industrial organization economics. Bain (1959) and Mason (1939) claim that a firm can neither influence industry conditions nor its own performance. Therefore, the competitive advantage originates from external sources rather than internal (firm-specific) sources. Three generic competitive strategies are recommended-cost leadership, differentiation, and focus (Porter, 1980). In his later works, Porter (1985) engaged the value chain to disaggregate a company into many discrete value activities and proposed that the activities for implementing competitive strategy are ultimately the sources for competitive advantage.

The second theory of firm level competitiveness is asserted by strategic management scholars and it belongs to the resource-based and core-competence based and knowledge based approach, which suggests that firm-specific resources that are valuable, rare, non-substitutable, and inimitable, are the sources for competitive advantage (Wernerfelt, 1984; Barney, 1991; Hamel and Prahalad, 1994). Proponents shift the focus from the external to internal sources of competitive advantage, by pointing out that a firm creates a competitive advantage through the accumulation, development, and reconfiguration of its unique resources, capabilities and knowledge.

The resource-based approach is based on Selznicks (1957) study on distinctive

competences and on Penroses (1959) argument that a firm is a collection of resources and its performance depends on its ability to use them (Ambrosini, 2003). According to this perspective, a firms competitive advantage derives from those resources that match specific conditions such as value, heterogeneity, rareness, durability, imperfect mobility, non-substitutability, imperfect imitability, and ex ante limits to competition (Barney, 1991; Peteraf, 1993). Several classifications of firms resources have been developed by literature (Barney, 1997) and generally they build on the distinction between tangible and intangible resources.

In a capability-based perspective a firms competitive advantage derives from its capabilities/competencies (Collis, 1994). This perspective emphasizes a more dynamic view of competition, by focusing on firms business processes rather than on assets or resources in a static view. In a broad sense, this perspective encompasses all research works dealing with concepts like distinctive capabilities (Snow and Hrebiniak, 1980; Hitt and Ireland, 1985), organizational capabilities (Collis, 1994), core competencies (Leonard-Barton, 1992; Prahalad and Hamel, 1989), and dynamic capabilities (Eisenhardt and Martin, 2000; Teece *et al.*, 1997). In a knowledge-based perspective, (Inkpen, 1998; Zack, 1999; Nonaka and Takeuchi, 1995) scholars argue that knowledge-based resources are the most relevant to the achievement of a firms competitive advantages.

2.6. Review of Competitiveness Frameworks

The frameworks of competitiveness found in the literature can be divided into three categories. First category deals with the issue that measuring competitiveness. Second category is related to providing an explanation and understanding of competitiveness. Last one is a combination and measurement that integrates both to analyze competitiveness.

Henricsson *et al.*, (2005) summarized the frameworks for competitiveness analysis. Measurement related frameworks are the Three Dimensions (Feurer and Chaharbaghi, 1994) and Total Value Competitiveness Framework (Shen *et al.*, 2003). Both frameworks investigates the competitiveness at the firms level. There are four frameworks

for understanding competitiveness introduced here. First one is the most broadly accepted model, the Diamond Model, is introduced by Porter (1990). Moon *et al.*, (1998) tried to improve Diamond Model by developing Double Diamond Model. These models analyses the competitiveness at the nation and industry level. Lall (2001) developed the Competitiveness Triangle Framework for understanding competitiveness at the firm level. Lastly, Buckley *et al.*, (1988) and Momaya and Selby (1998) tried to integrate understanding and measurement on competitiveness by developing Assets-Processes-Performance (APP) framework.

Table 2.1. Summary of Frameworks for Competitiveness Analysis (Henricsson *et al.*, 2005).

Framework	Author, Year	Level	Focus
The Three Dimensions	Feurer and Chaharbaghi (1994)	Firm	Measurement
Total Value Competitiveness	Shen *et al.*, (2003)	Firm	Measurement
The Diamond	Porter (1990)	Nation, Industry	Understanding
The Double Diamond	Moon *et al.*, (1998)	Nation, Industry	Understanding
The Nine-Factor Model	Cho (1994)	Nation, Industry	Understanding
The Competitiveness Triangle	Lal (2001)	Firm	Understanding
Assets-Processes-Performance (APP)	Buckley *et al.*, (1988), Momaya and Selby (1998)	Nation, Industry and Firm	Integration of Understanding and Measurement

2.6.1. Frameworks for Measuring Competitiveness

This section consists of two frameworks that have been developed for the measurement purposes. First one is the three dimensions model, introduced by Feurer and Chaharbaghi (1994), is at firm level. Second is total value competitiveness, established by Shen *et al.*, (2003), is applicable also to firms.

Feurer and Chaharbaghi (1994) proposed the three dimensions of competitiveness framework by defining competitiveness in a way that enables the measurement of an organizations competitive position through a mapping process of its business

environment. First, they redefined the concept of competitiveness. They claimed that the current definitions of competitiveness are mainly based on the organization, its customers and competitors and no account is given to the shareholders who provide the necessary capital base and influence the business objectives. They suggested that the nature of competition is determined by both the way in which customers value the offerings and the way shareholders value the profit potential in relation to the competitors. Another dimension of competitiveness is the organizations ability to act and react within its competitive environment that requires financial strength to make the essential investments in technology and people.

Briefly, the three dimensions of competitiveness model consists of three dimensions: customer values, shareholder values, and ability to act and react. (Feurer and Chaharbaghi, 1994).

Customer values: An organization is competitive in the eyes of its customers if it is able to deliver a better value when compared with its competitors. Customer value can therefore be considered as the benefit perceived by the customer in relation to the demanded price.

Shareholder values: An organization is competitive in the eyes of its shareholder if it is able to provide a satisfactory return on investment in the short, medium and long terms. Shareholder values will therefore influence the decisions concerning the dividend policy, growth strategy and capital structure which will in turn determine the long-term wellbeing and profit potential of the organization.

Ability to act and react: It can be defined as the ability to retain the competitive position of an organization by satisfying the expectations of customers and shareholders while constantly eliminating the threats and exploiting the opportunities that arise in the competitive environment. This requires a sound financial strength to fund the necessary strategic changes such as the introduction of new technologies. However, the ability to act and react does not only depend on the financial strength but also on people and access to the key technologies.

Feurer and Chaharbaghi (1994) concluded that the concept of competitiveness would be of no use if it were not furnished with a measurement system. It must therefore be described by a set of measures that gauge the relative competitive position of an organization with respect to different components that contribute to overall competitiveness.

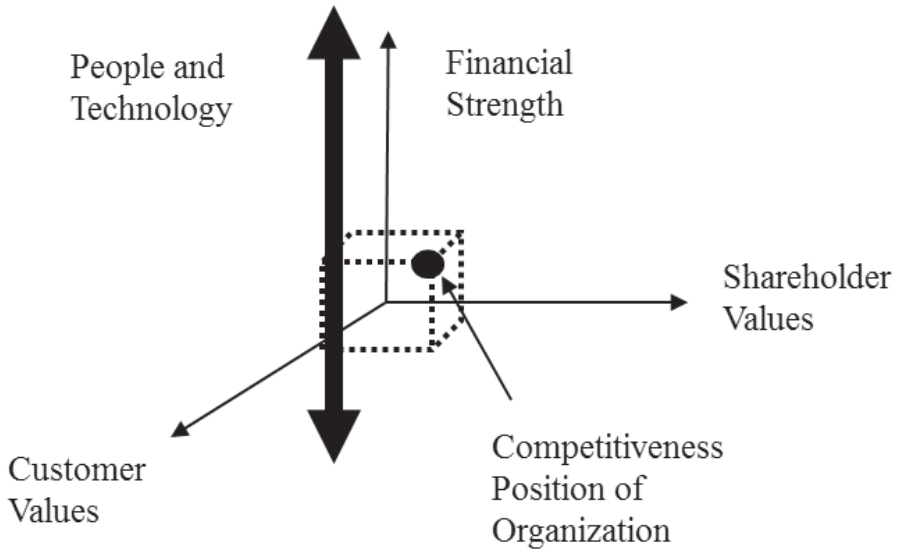

Figure 2.1. Competitive Position Map (Feurer and Chaharbahgi, 1994).

Figure 2.1 presents a competitive position map that plots the competitive position of an organization in relation to its competitors. The map takes a matrix form that employs the components of competitiveness (i.e. customer values, shareholder values and financial strength) in three dimensions. The matrix is allowed to move along a fourth axis which represents the strength of people and the level of technology employed. It must be emphasized that there are two aspects to people and technology. First, they have a direct influence on customer and shareholder values, thus affecting the current competitive position of an organization. Second, they are indicative of the potential of an organization to be able to act and react within a competitive environment in the future.

Shen *et al.*, (2003) established a computer-aided decision support system for assessing a contractors competitiveness. Such assessment can help a contractor to

identify its strengths and weaknesses, thus allowing it to make more competitive bids. It will also enable clients to select more suitable contractors through a more objective and transparent approach. Although the development of this system is demonstrated with references to construction practices in China, the methodology may be of use in other countries.

Based on the study undertaken by Li *et al.*, (2003), the parameters used for assessing a contractors competitiveness in the Chinese construction industry are structured in a three-level tree-like hierarchical system. The parameters used for assessing a contractors competitiveness in the Chinese construction industry are structured in a three level tree-like hierarchical system. The first level (top-level) competitiveness parameters are; Social influence, Technical ability, Financing ability and Accounting status, Marketing ability, Management skills and Organization structure and Operation. Each of these parameters in turn has sub-categories and sub-sub-categories, in all there are 98 criteria, to enable assessments at different levels of the organization. For each of the 98 criteria, there is a benchmark book that provides a benchmark score from 0 to 100. Furthermore, in order to acknowledge the varying importance of the various criteria, a weighted matrix was provided for each of the different levels of the framework.

2.6.2. Frameworks for Understanding Competitiveness.

This section consists of the brief explanation of frameworks that attempts to understand competitiveness concept. The section included Diamond Model (Porter, 1990), the Double Diamond Model (Moon *et al.*, 1998), and the Nine-factor Model (Cho, 1994).

By far the most established, applied and debated framework on competitiveness is the Diamond Framework, introduced by Porter (1990). Porters study includes 10 nations, Denmark, Germany, Italy, Japan, Singapore, South Korea, Sweden, Switzerland, the United Kingdom and the United States, and constructs a new analytical framework which aims to capture the major determinants of competitive advantage together with

their interactions with each other.

Porter (1990) attempted to answer the reasons for why are certain companies based in certain nations capable of consistent innovation and why do they pursue improvements, seeking an ever more sophisticated source of competitive advantage. Also, he investigated that certain companies are able to overcome the substantial barriers to change and innovation that so often accompany success.

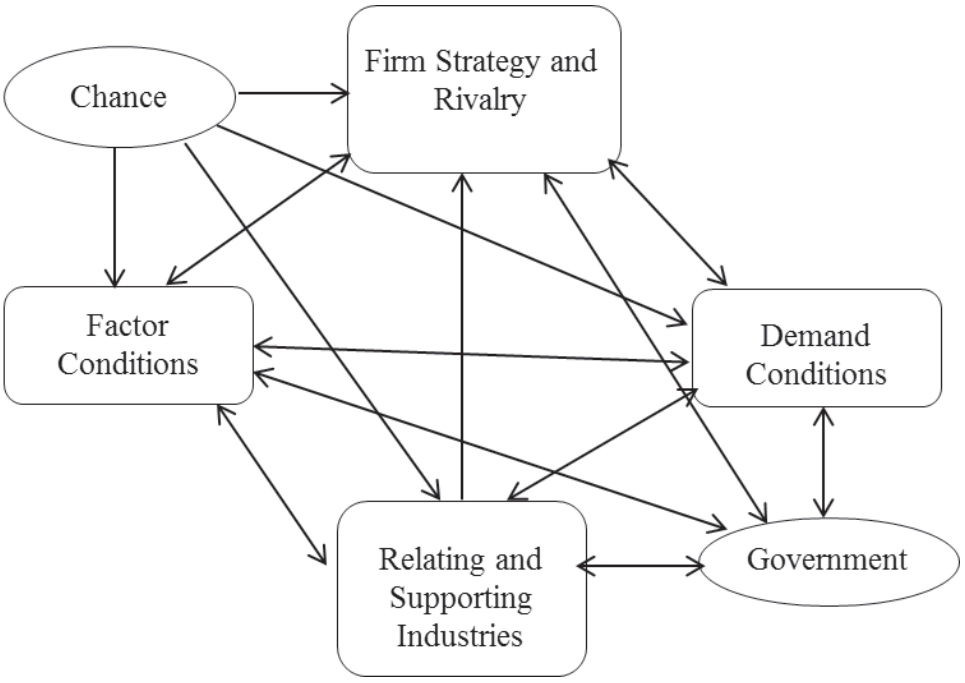

Figure 2.2. Determinants of a Nations Competitiveness (Porter, 1990).

To answer these questions, Porter (1990) introduced four broad attributes of a nation; factor conditions, demand conditions, related and supporting industries, and firms strategy, structure, and rivalry. Also, two exogenous factors, government and chance, in Porters view, influence the functioning of these four major determinants.

Factor conditions include the nations position in factors of production, such as skilled labor or infrastructure, necessary to compete in a given industry. Factor conditions defines two distinctions. First distinction is divided into two groups: basic factors such as natural resources, climate, location, etc. and advanced factors such as modern digital data communications infrastructure, highly educated personnel. Sec-

ond distinction includes generalized and specialized factors. They are relevant to a limited range or even to just a single industry. Porter (1990) believes that basic and generalized factors are either inherited or easy to create, whereas advanced and specialized factors are more decisive and a sustainable basis for competitive advantage. Demand conditions include the nature of home market demand for the industrys product or service. Related and supporting industries include the presence or absence in the nation of supplier industries and other related industries that are internationally competitive. Firm strategy, structure, and rivalry include the conditions in the nation governing how companies are created, organized, and managed, as well as the nature of domestic rivalry. (Porter, 1990).

Porter (1990) thinks that the roles played by the government and chance in the competitive development of an industry are important but indirect, mainly through influencing the four major determinants of competitive advantage. In his view, in the complete framework each determinant is influenced by the others, turning the system into a dynamic one.

As a result of the debate on whether Porter had dealt with multinational activity properly or not, Rugman and DCruz (1993) introduced the so-called Double Diamond, and applied it to Canada, Mexico and New Zealand. As a next step Moon et al. (1998) generalized the Double Diamond, which, they suggest, will suit all countries and appropriately incorporate multinational activity. The Generalized Double Diamond was later applied and tested on Korea and Singapore (Henricsson, 2005).

Figure 2.3 shows the generalized double diamond where the outside one represents a global diamond and the inside one a domestic diamond. The size of the global diamond is fixed within a foreseeable period, but the size of the domestic diamond varies according to the country size and its competitiveness. The diamond of dotted lines, between these two diamonds, is an international diamond which represents the nations competitiveness as determined by both domestic and international parameters. The difference between the international diamond and the domestic diamond thus represents international or multinational activities. The multinational activities include

both outbound and inbound foreign direct investment. (Moon *et al.*, 1998)

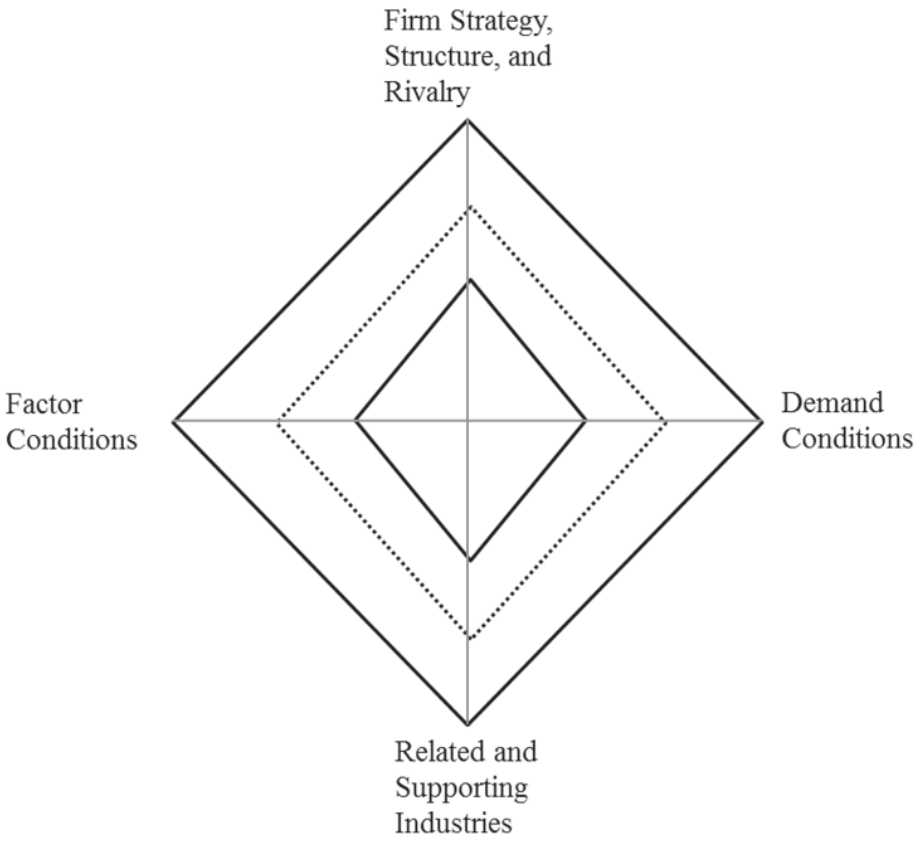

Figure 2.3. Generalized Double Diamond (Moon *et al.*, 1998).

The extensions of Porters diamond framework have not received very much attention, but they serve as a good starting point for analysis of the interaction between a nations home base and the global context in which industries operate.

Cho (1994) argues that Porters Diamond Model helps to explain the sources of international competitiveness possessed by the economies of advanced nations, but has a limited application when it comes to explaining the levels and dynamic changes of economies in less developed or developing countries. To broaden the view into less developed or developing countries, he proposed Nine Factor Model.

Cho (1994) divides sources of international competitiveness into two broad categories, namely physical factors and human factors. Physical factors include endowed

resources, the business environment, relating and supporting industries, and domestic demand, which together determine the level of international competitiveness of a given nation at a given time. Human factors include workers, politicians and bureaucrats, entrepreneurs, and professional managers and engineers. By creating, motivating and controlling the four physical elements, these human factors drive the national economy from one stage of international competitiveness to the next. An external factor of pure chance is added to these eight internal factors. This new framework can elucidate the sources of economic growth in less developed countries as well as those dynamic changes as the national economy moves from a less developed stage to a developing stage, to a semi-developed stage, and finally, to a fully developed stage. This framework does not appear to have received any further attention.

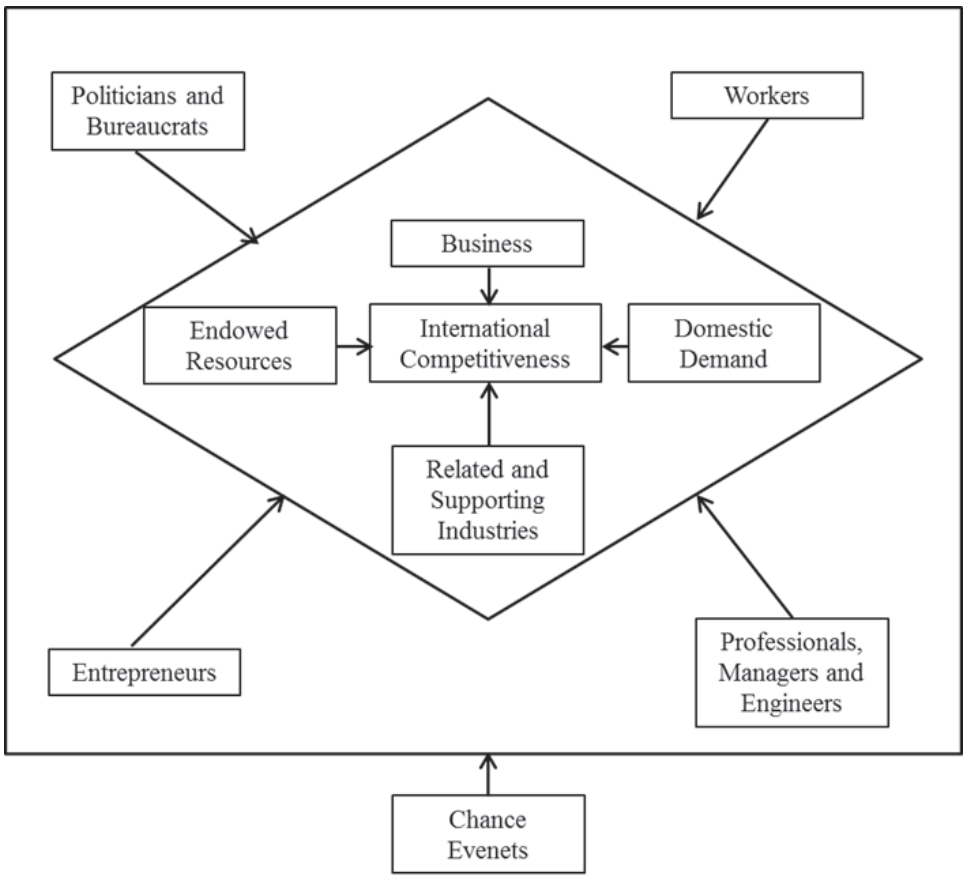

Figure 2.4. Nine Factor Model (Cho, 1994).

A fourth and final framework for understanding and explaining competitiveness is the Competitiveness Triangle, proposed by Lall (2001). It is similar to Porters

Diamond, but whereas Porter (1990) investigated what factors build up national productivity, Lall (2001) focuses her analysis on "the markets within which enterprise learning takes place and the failures that each market is liable to suffer" and "puts government policy in the centre of the action", while Porter (1990) places the role of government as an exogenous factor.

The Competitiveness Triangle contains three inter-connected determinants. Incentive markets, includes a nations macroeconomic management and trade policies and characteristics of the industry and home demand. Factor markets focuses on skills, especially technical skills, and finance for, and information on, technology. Institutional markets refer to bodies that support technological activities and development, e.g. institutions for R and D and training and development (Henricsson, 2005).

2.6.3. Frameworks that Integrate Measurement and Understanding

Buckley *et al.*, (1988) categorized competitiveness measures into three groups: competitive performance, competitive potential, and management process. Potential measures describe the inputs into the operation, performance measures the outcome of the operation and process measures the management of the operation. From this perspective, competitiveness cannot be considered as a static concept, but rather as an ongoing process. Figure 2.5 shows the interrelationships between measures of competitiveness.

This school of thought was later adapted by the WEF and under the name of the world competitiveness formula; Assets (potential) x Processes=Performance (Henricsson, 2005).

2.7. Competitiveness in Construction Sector

Competitiveness is an important concept to contactors due to fierce competition in the construction industry. In order to outperform their competitors in the market, contractors are keen to realize their competitiveness by measuring it for benchmarking

and improvement purposes. That is the reason why competitiveness for construction has been an active research topic (Keung and Shen, 2014).

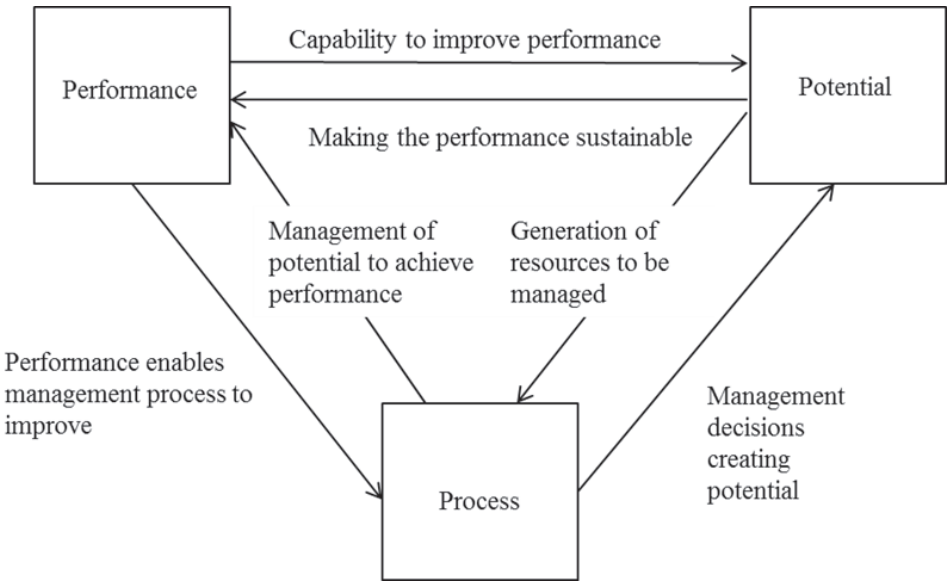

Figure 2.5. APP Framework (Buckley *et al.*, 1988).

Improving the construction industrys competitiveness has long been of interest to the international construction management research community. However, a systemic bias towards positivist and quantitative research approaches too easily translates to a recurring fixation with alternative definitions of competitiveness and the codification of its underlying determinants (Momaya and Selby, 1998).

According to Ling *et al.*, (2012), the components of competitiveness are: "firm is competitive in winning large number of projects"; "firm is competitive in winning high-value projects"; "firm has high level of profitability"; "quality of firms products/services is competitive"; "firm is competitive in achieving customer satisfaction"; "firm is competitive in achieving good public image"; and "firm is competitive in delivering a product/service speedily". Admittedly, there are other components that may also be used to measure competitiveness, and one example is unit cost.

Despite widespread acceptance of its importance, competitiveness remains a concept that is not well understood, particularly in the construction sector (Flanagan *et al.*, 2005). Research on competitiveness conducted by Flanagan *et al.*, (2005) put for-

ward a broad definition for competitiveness in the construction sector as the extent to which a business sector:

- satisfies the needs of customers from the appropriate combination of the product service characteristics such as price, quality, speed of delivery, certainty, innovation and reliability;
- satisfies the needs of its stakeholders, for example, enterprises and workers in terms of wages, safe workplace, training, steady employment and pleasant work environment with career development;
- offers attractive profits and return on investment, the potential for growth, with acceptable levels of risk;
- satisfies the needs of society to be a responsible corporate citizen and to meet the needs of society in terms of pollution, energy conservation, sustainability and safe systems of working.

While discussing the items no.2 above, one should note that there are three stakeholders of an industry; the companies constituting the industry, represented by shareholders and employees, the clients buying its products or services and the society in which the industry is operating. The companies and their shareholders will get sufficient profit on investment and the employees will experience high employee satisfaction. Clients will see their needs fulfilled and for society, a competitive construction industry will contribute, by taxes and job creation, to economic well-being and by environmental and social responsibility to societal well-being.

According to Henricsson (2005), for a construction industry, competitiveness refers to the ability to, in the long-term, satisfy the sophisticated demands of companies, clients and society respectively and simultaneously, while acting under free trade and fair market conditions, exposed to an international market environment.

Also, Weisheng (2006) defines construction competitiveness as the ability of a firm to bid successfully for construction projects, to provide construction services with superior quality, lower costs, and with shorter time than its domestic and international

competitors, and in the long-run to consistently achieve superior firm performance.

Ngowi and Rwelamila (1999) states that the survival of a construction firm depends on its ability to secure contracts and earn a profit while meeting its clients expectations. In general, a client expects to receive value for his money; this can be achieved if a project is completed to a specified quality, in a certain time period, and within the agreed-upon cost. While these are parameters in which all construction firms must operate in the open market, one wonders what makes some construction firms consistently successful while others are not and what exactly is a competitive advantage in the construction industry. First, construction companies can sustain its competitive advantage through relentless improvement. An additional prerequisite for sustaining competitive advantage is adopting a global approach. You must sell your products or services worldwide, under your own brand name, through international marketing channels that you control (Porter, 1990). For the construction point of view, this does not mean that a global player operates in every country. Instead, there are no self-imposed restrictions for lucrative opportunities (Abdulaziz, 1994). Competitive advantages can be based on technology and management. Project financing can also be a competitive advantage. For example, firms that provide the most attractive financing proposals were in a favorable position. However, these competitive advantages alone are not sustainable. To create and sustain a competitive advantage, a company must also establish organizational structures that produce rapid innovations.

2.8. Competitiveness Models for Construction Sector

Various competitiveness frameworks are reviewed up to this section. Some of these frameworks have been applied to construction industry and/or construction firms. In this section, frameworks applied to construction will be presented.

Betts and Ofori (1992) found Porters approach to be a suitable for construction sector. According to their study, the changing nature of the task of the construction industry and the dynamism of its operating environment imply that the strategic planning techniques put forward by Porter (1979; 1985) are vital for survival and progress

of construction industries of all types. They suggested that Porters Five Forces Model is directly relevant to construction. In the Five Forces Model, five inter-related forces are the threat of new entrants, the power of suppliers, the power of buyers, the threat of substitute products, jockeying for position amongst industry members. The threat of new entrants is not particularly potent within the construction industry. Additionally, construction is noted for the ease with which new firms can enter its different parts with minimal investment. The competitive advantage to be gained from powerful supply relationships is greatest when few enterprises dominate supply, where there is no competing product, and when the supplier holds a threat of forward integration over the buyer. In the construction industry, there are often many different suppliers of many products and services. A buyer has greatest competitive advantage when it is a large volume buyer, it purchases undifferentiated products that are price sensitive but not quality sensitive to its processes, and when it holds a threat of backward integration over its supplier. There are many opportunities for large construction enterprises to exploit this opportunity with materials suppliers and specialist subcontractors. The potential for substitute products gives scope for competitive advantage within an industry. Porter (1979) points house thermal insulation market as an example. While there was the possibility of abnormal profits in the fiberglass insulation market, the opportunity was quickly removed by the rapid emergence of substitute products including cellulose, rock wool, and Styrofoam. Lastly, jockeying for position of existing members is a strong competitive force within construction. Also, Tatum (1988) goes as far as to suggest that construction has a high fit with each component of the five forces model. In addition, Porters (1985) value chain analysis has scope for application to construction enterprises. Construction industry mainly relates to the operation segment of the value chain. Lastly, Porters (1985) three generic competitive strategies can be applied to construction industry. (Betts and Ofori, 1992). Tatum (1988) argues that despite the open bidding systems which form the basis of many construction markets, cost leadership is not the only strategic approach used for construction. Concerns with quality and value for money are on the increase, make all three generic strategies relevant. Also, Ofori (1993) used the Diamond framework to formulate a long-term strategy for Singapores construction industry.

Momaya and Selby (1998) conducted a comparison of the competitiveness of the Canadian construction industry in relation to that of the USA and Japan respectively. They adapted the framework developed by Buckley *et al.*, (1988), and hence structured their analysis in the categories of Assets, Process and Performance. In total, Momaya and Selby (1988) used 95 criteria to measure construction industry competitiveness and fed their framework using both available statistics and industry experts opinions obtained from questionnaires. The conclusion was that the Canadian construction industry is competitive in terms of performance, but scores poorly on process and assets. This creates doubts about the industrys future performance. Conversely, the Japanese industry gets good scores on assets and processes, but poorly on performance. The USA, finally, scores positively on assets, but negatively on both processes and performance.

Flanagan *et al.*, (2005) conducted a research to evaluate and measure the competitiveness of the construction industry in three countries: the UK, Sweden and Finland. This research is based on the assumption that competitiveness is determined by six domains such as factors conditions, demands conditions, government, industry characteristics, firm strategy and management, and human resources.

Oz (2001) applied the Diamond model to the Turkish construction industry. The purpose is to contribute towards a better understanding of the sources of competitive advantage of Turkish contractors. She analyzed the international operations of Turkish contractors. Her analysis, which is primarily based on interviews with 21 senior industry experts, concludes that the factors behind the Turkish success go beyond those factor conditions and chance events of "labor cost advantages and geographic and cultural proximity to several promising markets". Another important source of competitive advantage is the dynamic competition and rivalry in the domestic market, which puts pressure on companies to constantly upgrade its operations. The analysis of the Diamond also points out a series of competitive disadvantages, for instance "financing difficulties and the weak international position of the Turkish design engineering and consultancy services industry". Finally, Ozs analysis underlines the significant role played by the Turkish government (Flanagan *et al.*, 2005).

Total value competitiveness framework was applied to construction firms by Shen *et al.*, (2003). Total value competitiveness framework is a computer-aided decision support system for assessing a contractors competitiveness. Although it was specifically designed to suit the Chinese construction industry, the methodology may be of use in other countries. The system was primarily designed for two purposes; namely, for a contractors self-evaluation and to assist clients in making a pre-qualification assessment.

Competitiveness parameters are structured in a three-level hierarchical system, enabling the assessment of competitiveness to be undertaken at different levels. The parameters used for assessing a contractors competitiveness in the Chinese construction industry are structured in a three level tree-like hierarchical system. The first level (top-level) competitiveness parameters are; "Social influence", "Technical ability", "Financing ability" and "Accounting status", "Marketing ability", "Management skills" and "Organization structure" and "Operation". Each of these parameters in turn has sub-categories and sub-sub-categories, in all there are 98 criteria, to enable assessments at different levels of the organization. The operation of the system is assisted with a Windows-standard computing program. The applicability of the system was validated by conducting two workshops.

Mutti (2004) adapted the Double Diamond for assessing the competitiveness of Brazilian contractors in the international market.

Ozorhon (2012) investigated the sources of competitive advantage in the international construction market drawing upon the experiences of the Turkish contracting services abroad. Strengths and weaknesses of the industry along with the opportunities and the threats faced by the industry are identified analyzing the Porters Diamond Framework. The study is at the industry level. The findings of the study revealed that the main strengths have been the close ties with host markets; low cost; positive contribution of related and supporting industries; and high efficiency of the labor while the main weaknesses have been the lack of engineering design expertise; employment problems; and unsupportive organizational structure/culture of firms. This study emphasizes the need for innovation and effective use of technology; international

collaboration; improvement of engineering design services; organizational restructuring; proper risk management; improved human resources; and government support to ensure sustainable growth in international markets. The findings of this study are expected to guide the industry practitioners and policy makers in Turkey to critically review their strategies and thereby to help improve the construction services. Lessons learned from the Turkish contractors experiences may also benefit other countries in terms of devising appropriate strategies under the changing competitive conditions in the global construction market.

Deng *et al.*, (2012) adopted Porters Diamond Model to develop potential factors formulating the competitiveness of the construction industry, and uncovered the factors that formulate the competitiveness of the construction industry in a specific country i.e., the Chinese construction industry. In order to get empirical findings, a questionnaire survey is done to investigate the significance of these factors, and factor analysis is also applied. Factor analysis further reveals six underlying factors: "stable home market", "supply chain management", "corporate management practices", "qualified professionals", "satisfactory business environment", and "migrant workers".

3. RESEARCH METHODOLOGY

In this report, study procedures are summarized as follows:

- Identifying full set of competitiveness parameters affecting construction contractors through an extensive literature review,
- Developing a conceptual model to analyze competitiveness of construction firms
- Identifying the interrelations between model parameters and computing the importance weights of those parameters
- Testing the performance of the proposed model

3.1. Competitiveness Factors Affecting Contractors

There are many parameters affecting contractors competitiveness factors. Yates *et al.*, (1994) conducted a research project, called the "Anatomy of Construction Competition in the Year 2000" to investigate the driving forces and trends that will affect engineering and construction competition. The main purpose of the project was exploring the factors that affect competitiveness. Also, it aimed to provide information to support strategy development. The scope of the research included literature review; interviews with members of selected firms with expertise in various business sectors, including commercial building, heavy industrial construction, institutional buildings, infrastructure construction, light industrial construction, power, process, and space; a symposium and workshops; and data compilation and analysis. Overall findings were categorized into six areas: business strategies, economies, government, work force, technology, and quality.

Drew and Skitmore (2001) employing regression analysis, measured a contractors competitiveness among bids according to the type and size of construction work and the type of client involved. Drew and Skitmore (2001) focused on the effect of construction type and size on a contractors competitiveness.

Hatush and Skitmore (1997) constructed five major attributes for assessing a contractors competitiveness during the pre-qualification and bidding process, including financial soundness, technical ability, management capability, health and safety and reputation.

Lai and Guan (2001) developed a model to assess a large contractors competitiveness by using the parameters of organizational ability, marketing ability, technical ability, financial ability and image ability.

Shen *et al.*, (2004) investigated the characteristics of construction business environment in China and identifies the key parameters used in assessing contractors competitiveness for awarding construction contracts in the market. The parameters are useful tools for assisting contractors in identifying their strength and weakness, thus reengineering actions can be adopted for improving competitiveness.

El-Diraby *et al.*, (2006) made a research study to provide an understanding of how Toronto construction companies evaluate market attractiveness and company competitiveness. The research deployed the analytic hierarchy process to identify the most important factors that can be used for measuring company competitiveness and market attractiveness.

During his PhD thesis, Weisheng (2006) developed an IT based decision-support system that enables contractors competitiveness to be easily understood and communicated. He suggested that contractors competitiveness can be assessed by measuring factors that formulate competitiveness of a given contractor. A survey was conducted to identify Critical Success Factors (CSFs) that contribute to a contractors competitiveness.

Lu *et al.*, (2008) identified critical success factors (CSFs) for determining the competitiveness of a contractor in Mainland China.

Sha *et al.*, (2008) developed a competitiveness index to evaluate the industrial

competitiveness of ten provinces in China. This hierarchical index model consists of five aspects, including scale, structure, capacity, performance, and related industries.

Orozco *et al.*, (2011) presented a study to determine the critical variables that define the competitiveness of Chilean general contractors. Critical variables comprise both those that are sources or determinants of competiveness (i.e. factors) and those that reflect and measure the competitive performance (i.e. indices).

Bai *et al.*, (2011) proposed an AHP model to analyze essential competitiveness factors which based on experts evaluation opinions from the international construction areas, and determines some main indicators constituting the competitiveness of international contractors through model analysis. According to the study, there are 6 main essential factors is set up such as "marketing competitiveness", "productivity competitiveness", "human resource competitiveness", "technology and innovation competitiveness", "capital and financing competitiveness", and "management competitiveness".

3.1.1. Grouping of Competitiveness Factors Affecting Contractors

Factors affecting competitiveness can be found in literature review with different names. An extensive list of competitiveness factors has been established from the literature review. Ninety three competitiveness factors have been identified through the literature review. Studies indicate that competitiveness parameters are examined at two parts: internal factors and external factors. There are seventy four internal factors combined in eight groups and nineteen external factors that are combined in three groups.

Table 3.1 provides a comprehensive list of competitive internal factors obtained from the literature.

Table 3.1. Literature Review about Internal Competitiveness Factors.

Internal Factors	**Holt *et al.*, 1994**	**Yates, J. K., 1994**	**Warszawski, A., 1996**	**Venegas and Alarcon, 1997**	**Hatush and Skitmore, 1997**	**Dikmen and Birgonul, 2003**	**Shen *et al.*, 2004**	**Ajitabh and Momaya, 2004**	**Shen *et al.*, 2003**	**El-Diraby *et al.*, 2006**	**Weisheng, L., 2006**	**Tan *et al.*, 2007**	**Flanagan *et al.*, 2007**	**Cheah *et al.*, 2007**	**Lu *et al.*, 2008**	**Sha *et al.*, 2008**	**Orozco *et al.*, 2011**	**Tan *et al.*, 2011**	**Items Referenced**
Effectiveness of Strategies	x	x	x		x			x		x	x	x			x		x	x	11
Differentiation strategies		x	x																2
Market selection strategies			x												x				2
Project selection strategies			x																1
Client selection strategies			x																1
Partner selection strategies			x																1
Competitive strategy		x	x								x				x				4
Quality focus		x								x							x		3
Customer focus								x									x		2
Leadership										x					x		x		3
Operations management																	x		1
Benchmarking																	x		1
Continuous improvement																	x		1
Company vision and mission										x									1
Bidding Strategies	x		x	x	x	x	x	x	x	x	x	x			x	x		x	14
Method of construction									x										1
Tender price							x		x										2
Quality plan						x	x		x										3
Safety plan							x		x										2
Environmental protection plan							x		x										2
Construction time							x												1
Market knowledge							x	x			x	x							4
Company experience	x								x	x					x				4
Marketing coverage			x				x	x				x							4
Business coverage							x				x	x			x			x	5
Knowledge and expertise in law												x			x				2
Availability of key personnel									x									x	2
Contract negotiation			x																1
Marketing			x	x		x		x											4

Table 3.1. Literature Review about Internal Competitiveness Factors (Cont.).

Internal Factors	**Holt *et al.*, 1994**	**Yates, J. K., 1994**	**Warszawski, A., 1996**	**Venegas and Alarcon, 1997**	**Hatush and Skitmore, 1997**	**Dikmen and Birgonul, 2003**	**Shen *et al.*, 2004**	**Ajitabh and Momaya, 2004**	**Shen *et al.*, 2003**	**El-Diraby *et al.*, 2006**	**Weisheng, L., 2006**	**Tan *et al.*, 2007**	**Flanagan *et al.*, 2007**	**Cheah *et al.*, 2007**	**Lu *et al.*, 2008**	**Sha *et al.*, 2008**	**Orozco *et al.*, 2011**	**Tan *et al.*, 2011**	**Items Referenced**
Managerial Capabilities		x	x	x	x	x	x		x	x	x	x	x	x	x		x	x	15
Quality management		x	x	x			x		x		x	x			x		x	x	10
Time management			x	x			x		x	x	x	x			x		x		9
Cost management			x				x		x	x	x	x			x		x		8
Contract management							x				x				x		x		4
Coordination							x												1
Health and Safety management				x	x		x		x	x	x	x	x		x		x	x	11
Environmental management							x		x			x	x		x		x		6
Risk management		x					x					x	x		x		x	x	7
Site management									x		x	x			x			x	5
Claim management											x				x			x	3
Logistic and supply chain management			x								x				x		x		4
Process management																	x		1
Labor management																	x		1
Resource management																	x		1
Subcontractors management												x					x	x	3
Knowledge management			x														x		2
Efficiency of Human Resources	x	x	x	x		x	x	x	x	x	x	x		x	x	x	x	x	16
Current capacity of human resources				x			x		x		x				x	x			6
Use of human resources											x	x							2
Development of human resources			x								x	x					x		4
Training program			x	x			x					x				x	x	x	7
Motivation level			x	x						x					x		x		5
Communication and coordination among departments		x		x							x				x		x		5
Organizational Capabilities	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	16
Flexibility and adaptability of market changes		x	x					x				x						x	5

Table 3.1. Literature Review about Internal Competitiveness Factors (Cont.).

Internal Factors	**Holt *et al.*, 1994**	**Yates, J. K., 1994**	**Warszawski, A., 1996**	**Venegas and Alarcon, 1997**	**Hatush and Skitmore, 1997**	**Dikmen and Birgonul, 2003**	**Shen *et al.*, 2004**	**Ajitabh and Momaya, 2004**	**Shen *et al.*, 2003**	**El-Diraby *et al.*, 2006**	**Weisheng, L., 2006**	**Tan *et al.*, 2007**	**Flanagan *et al.*, 2007**	**Cheah *et al.*, 2007**	**Lu *et al.*, 2008**	**Sha *et al.*, 2008**	**Orozco *et al.*, 2011**	**Tan *et al.*, 2011**	**Items Referenced**
Experience in operating similar projects	x								x										2
Firms age									x						x				2
Firms size									x						x				2
Image and reputation / Public Image					x	x	x	x	x	x	x			x					8
Efective and efficient organizational structure			x	x			x		x					x	x		x	x	8
Organizational culture								x	x	x	x	x	x		x				7
Efficiency of Financial Resources	x	x	x	x	x	x	x		x		x	x		x	x	x	x	x	15
Creditability							x		x			x				x		x	5
Financial status			x		x		x		x		x	x					x	x	8
Financial ability			x		x				x		x				x		x		6
Financial stability									x						x				2
Financial resources															x				1
Efficiency of Technical Resources		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	17
Information management and IT application			x			x	x	x	x				x		x				7
Technology innovation ability		x	x		x	x	x				x				x	x	x		9
Technological sophistication			x				x			x							x		4
Development of technology		x							x		x	x				x			5
R and D integration				x		x	x		x	x	x	x	x		x	x	x		11
Construction equipment and plant					x				x			x				x		x	5
Relationship		x	x			x	x	x	x		x	x		x	x		x	x	12
Relationship with client/owners						x			x		x				x		x	x	6
Relationship with suppliers			x						x		x	x			x		x	x	7
Relationship with subcontractors			x						x		x	x			x		x	x	7

Table 3.1. Literature Review about Internal Competitiveness Factors (Cont.).

Internal Factors	**Holt *et al.*, 1994**	**Yates, J. K., 1994**	**Warszawski, A., 1996**	**Venegas and Alarcon, 1997**	**Hatush and Skitmore, 1997**	**Dikmen and Birgonul, 2003**	**Shen *et al.*, 2004**	**Ajitabh and Momaya, 2004**	**Shen *et al.*, 2003**	**El-Diraby *et al.*, 2006**	**Weisheng, L., 2006**	**Tan *et al.*, 2007**	**Flanagan *et al.*, 2007**	**Cheah *et al.*, 2007**	**Lu *et al.*, 2008**	**Sha *et al.*, 2008**	**Orozco *et al.*, 2011**	**Tan *et al.*, 2011**	**Items Referenced**
Relationship with competitors			x			x											x		3
Relationship with designers/consultants															x		x	x	3
Relationship with public/mass media							x		x		x	x			x				5
Relationship with government entities									x		x	x			x		x		5
Relationship with banks and financial institutions												x							1
Relationship with subcontractors			x						x		x	x			x		x	x	7
Relationship with competitors			x			x											x		3
Relationship with designers/consultants															x		x	x	3
Relationship with public/mass media							x		x		x	x			x				5
Relationship with government entities									x		x	x			x		x		5
Relationship with banks and financial institutions												x							1

Below table provides a comprehensive list of competitive external factors obtained from the literature.

Table 3.2. Literature Review about External Competitiveness Factors.

External Determinants	**Holt et al., 1994**	**Venegas and Alarcon, 1997**	**El-Diraby et al., 2006**	**Cheah et al., 2007**	**Orozco et al., 2011**	**Times Referenced**
Country-specific	x	x	x		x	4
Regulatory restrictions	x	x	x		x	4
Legal restrictions	x	x	x		x	4
Environmental regulations			x		x	2
Health and safety regulations					x	1
Socio-cultural conditions		x	x			2
Economic conditions		x	x		x	3
Fiscal policy			x			1
Political conditions			x		x	2
International relations		x				1
Market-specific			x	x		2
Enter/Exit barriers			x	x		2
Project Funding	x					1
Profitability and risk levels among different regions				x		1
Profitability and risk levels among sectors				x		1
Inefficiencies and irregularities of procurement systems				x		1
Shortage of quality subcontractors/labors	x				x	2
Availability of construction materials			x			1
Competitive environment		x				1
Number of competitors		x			x	2
Position of competitors		x	x		x	3
Concentration ratios for various market product segments				x		1

3.1.2. Identified Competitiveness Factors Affecting Contractors

In previous section, competitiveness factors obtained from literature review were listed. Ninety three competitiveness factors have been founded and these factors were divided into internal and external factors. There were seventy four internal factors combined in eight groups and nineteen external factors that are combined in three groups. These factors are rearranged and refined into fourty seven factors. Factors are provided as internal and external factors. Internal factors are combined in seven groups that include effectiveness of strategies, management capabilities, organizational capabilities, efficiency of technical resources, efficiency of human resources, efficiency of financial resources, and relationship. There are thirty six internal competitiveness factors. Figure 3.1 provides the list of internal clusters. External factors are combined in two groups and eleven competitiveness factors. Figure 3.2 provides the external competitiveness clusters.

Effectiveness of strategies includes diversification strategies, market selection strategies, project selection strategies, client selection strategies, partner selection strategies, and bidding strategies.

Managerial capabilities include quality management, time management, cost management, health and safety management, environmental management, risk management, site management, claim management, subcontractors management, and knowledge management.

Organizational capabilities include knowledge and expertise in the market, experience in similar projects, flexibility and adaptability of market changes, organizational culture/structure, image and reputation/public image. Efficiency of technical resources includes use of IT, innovation capability, investment on R and D, and construction equipment and plant.

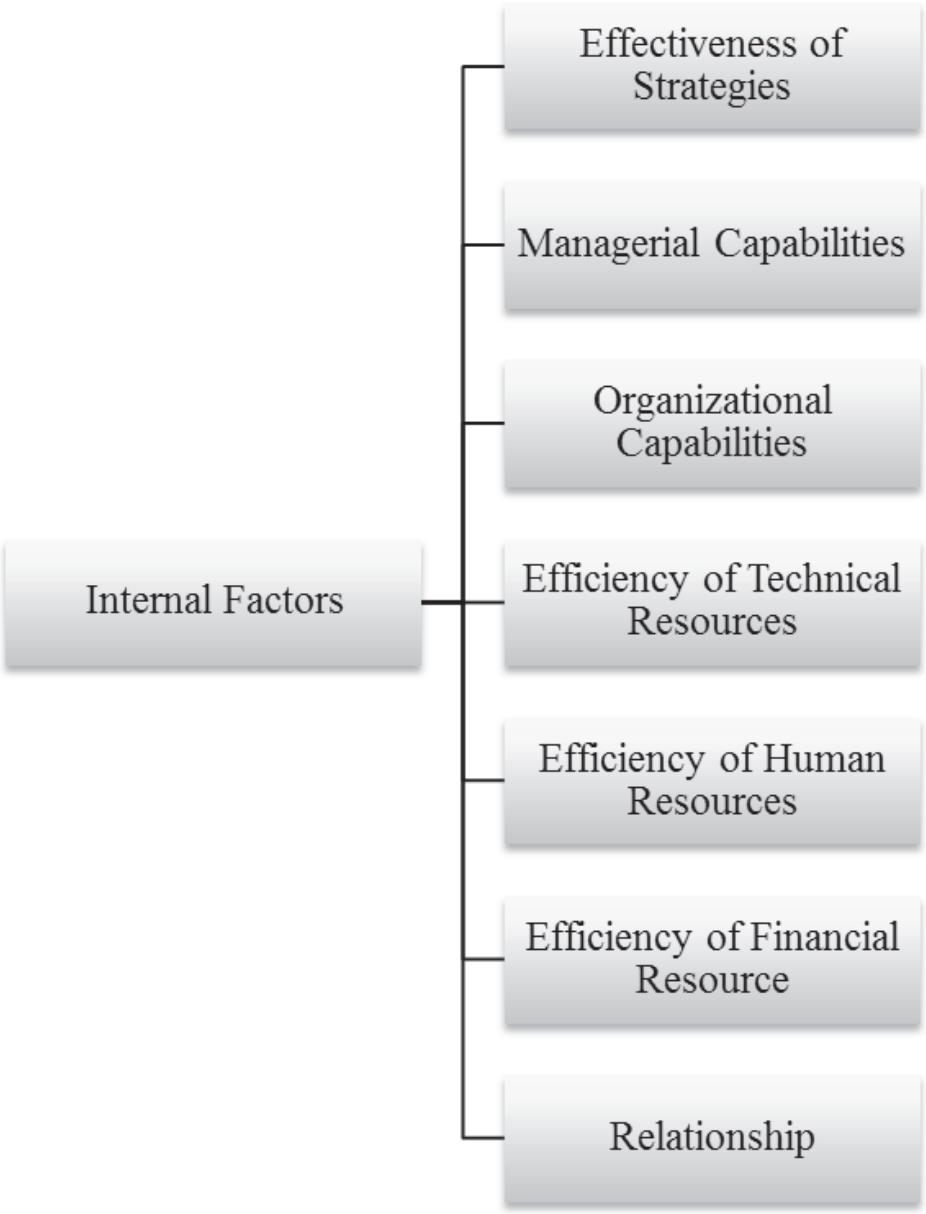

Figure 3.1. Internal Competitiveness Factors.

Efficiency of human resources includes current capacity of human resources, development and use of human resources, and communication and coordination among departments.

Efficiency of financial resources includes credibility, financial status, and financial stability.

Relationship includes relationship with clients/owners, relationship with suppliers/contractors, relationship with designers and consultants, relationship with government entities, and relationship with bank and institutions.

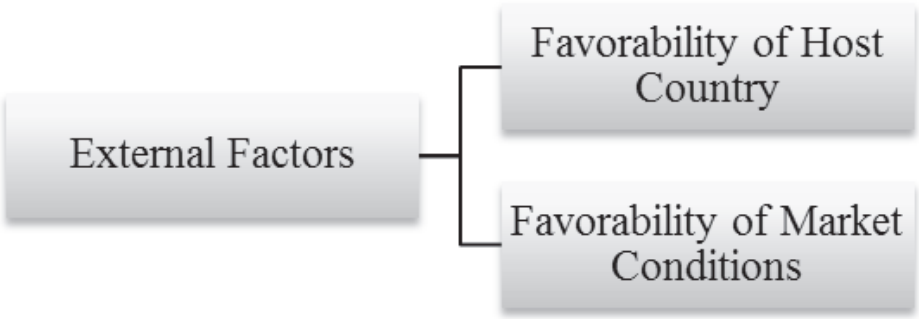

Figure 3.2. External Competitiveness Factors.

Favorability of host country include regulatory and legal restrictions, socio-cultural conditions, economic conditions, fiscal policy, political conditions, and international relations.

Favorability of market conditions include enter/exit barriers, project funding, quality of subcontractors/labors, availability of construction materials, and competitive environment.

Table 3.1 provides the total list of the competitiveness factors used in this study. There are nine groups in total; seven of them are internal and two of them are external. There are fourty seven competitiveness factors in total.

Table 3.3. Competitiveness Factor in the Conceptual Model.

Cluster	**Competitiveness Factor**
Effectiveness of Strategies	Diversification strategies
	Market selection strategies
	Project selection strategies
	Client selection strategies
	Partner selection strategies
	Bidding strategies
Managerial capabilities	Quality management
	Time management
	Cost management
	Health and Safety management
	Environmental management
	Risk management
	Site management
	Claim management
	Subcontractor management
	Knowledge management
Organizational capabilities	Knowledge and expertise in the market
	Experience in similar projects
	Flexibility and adaptability of market changes
	Organizational culture/structure
	Image and reputation/Public Image
Efficiency of Technical Resources	Use of IT
	Innovation capability
	Investment on R and D
Efficiency of Human Resources	Construction equipment and plant
	Current capacity of humant resources
	Development and use of human resources
	Communication and coordination among departments (teamwork)
Efficiency of Financial Resources	Credibility
	Financial Status
	Financial Stability
Relationship	Relationship with clients/owners
	Relationship with suppliers/subcontractors
	Relationship with designers/consultants
	Relationship with government entitites
	Relationship with banks and institutions
Favorability of host country	Regulatory and legal restrictions
	Socio-cultural conditions
	Economic conditions
	Fiscal policy
	Political conditons
	International relations
Favorability of market conditions	Enter/exit barriers
	Project Funding
	Quality of subcontractors/labors
	Availability of construction materials
	Competitive environment

3.2. Network Process (ANP)

According to Saaty (1996), "the Analytic Network Process (ANP) is a general theory of relative measurement used to derive composite priority ratio scales from individual ratio scales that represent relative measurement of the influence of elements that interact with respect to control criteria".

The ANP is a structure to deal with decisions without making assumptions about the independence of higher-level elements from lower level elements and about the independence of the elements within a level. The ANP consists of two parts. The first part is a control hierarchy or network of criteria and sub criteria that control the interactions. The second part forms a network of influences among the elements and clusters. The network varies from criterion to criterion. For each control criterion, a different supermatrix of limiting influence in computed. Each of these supermatrices is weighted by the priority of its control criterion. Lastly, the results are combined through addition for all the control criteria (Saaty, 1996).

The ANP can be considered as the first mathematical theory that makes it possible to deal with all kinds of dependence and feedback systematically. ANP is used mainly to extend AHP to case of dependence and feedback again by use of the "supermatrix" approach. (Egilmezer, 2007) AHP structures the multivariate decision making problems into a hierarchical structure and analyze the factors contributing to the problem systematically within the hierarchy to determine the priorities of the factors relative to each other. In doing so, the most important feature of AHP is that it accepts that there is no interaction among the factors located in the same level of the hierarchy; that is, the model does not take into account the influences among the same level elements (Eğilmezer, 2007).

The ANP is the most comprehensive framework that allows one to include all the factors and criteria, tangible and intangible that has bearing on making a best decision. In brief, ANP model consists of the control hierarchies, clusters, elements, interrelationship between elements, and interrelationship between clusters (Saaty, 1996).

The ANP method may transform qualitative judgments into quantitative values. It has been applied to project selection, production planning, and strategic decision (Tsai and Chou, 2009).

In construction sector, ANP have been used by many researchers as the analyzing tool for complicated multivariate decision making problems. Niemira *et al.*, (2004) made use of ANP in their study of forecasting financial crisis. Dağdeviren *et al.*, (2005) formed a model to identify total work load level of employees by ANP. Chen and Wong (2005) utilized ANP in developing a model for environmentally conscious construction planning. Cheng and Li (2005) studied on project selection in construction industry by ANP. Ozorhon *et al.*, (2007) developed ANP model to examine the links between the determinants of performance and observed the influences of these factors on the international construction joint venture performance. Polat and Donmez (2009) proposed an ANP model to assist construction companies to select the marketing activities for which they should primarily allocate their limited resources. Dikmen *et al.*, (2010) tried to identify the determinants of business failure in construction and to predict the failure likelihood of construction companies by assessing their current situation based on both company-specific and external factors. For this purpose, they utilized the ANP together with the Delphi method to compute the importance weights of variables on business failure through interviews and discussions with experts. Erdem and Ozorhon (2013) developed an ANP model to examine the links between the attributes of success and compute the importance weights of these variables on the real estate project success.

3.3. ANP Model Formation

Analytic network process (ANP) is a tool for multi-criteria decision-making but can also be applied in academic research to prioritize factors or criteria. It is seen as a generic form of analytic hierarchy process (AHP). In AHP, it is assumed that a decision problem can be translated into a hierarchical structure that consists of unidirectional relations between decision levels (Cheng and Li, 2007). As Meade and Sarkis (1998) mentioned, the top level of the hierarchy is usually the overall goal

for the decision model, which can be decomposed to one or more specific levels of clusters until a manageable level of sub-clusters is met. Yet, the strict hierarchical structure may need to be relaxed when modeling a more complicated problem that involves interdependencies among elements between and within model levels, which are assumed to be uncorrelated in AHP. It is expected that by using ANP, researchers are able to establish a complete multicriteria model without sacrificing the validity due to limitations of the analytical tool (Cheng and Li, 2005).

AHP and ANP are two separate concepts introduced by Saaty (1980, 1996). First, AHP was developed, which helps to establish decision models through a process that contains both qualitative and quantitative components. Qualitatively, it helps to decompose a decision problem from the top overall goal to a set of manageable clusters, sub-clusters, and so on down to the bottom level that usually contains scenarios or alternatives. Quantitatively, it uses pair-wise comparison to assign weights to the elements are the cluster and sub-cluster levels and finally calculates "global" weights for assessment taking place at the bottom level. Each pair-wise comparison measures the relative importance or strength of the elements within a cluster level by using a ratio scale. (Cheng and Li, 2007) One of the main functions of AHP is to calculate the consistency ratio to ascertain that the matrices are appropriate for analysis (Saaty, 1980). Nevertheless, AHP models assume that there are uni-directional relationships between elements of different decision levels along hierarchy and uncorrelated elements within each cluster as well as between clusters. It is not appropriate for models that specify interdependent relationships in AHP. ANP is then developed for filling this gap (Cheng and Li, 2007).

ANP is known as the systems-with-feedback approach. By incorporating interdependencies, a supermatrix will be created. The supermatrix adjusts the relative weights in individual matrices to form a new "overall" matrix with the eigenvectors of the adjusted relative weights (Meade and Sarkis, 1998).

There are several generic steps for AHP and ANP as well as specific steps for ANP. The generic steps are shown below (Saaty, 1980, 1996):

First step is developing the structure of the decision model. This forms the goal or objective of the model. The decision model is of AHP is always restricted to being hierarchical, containing several levels. Only adjacent levels are assumed to have correlations. ANP is a network structure where the correlations can be stipulated in any part of the decision model to form sub-matrices for the supermatrix (Cheng and Li, 2007).

Second step is conducting pair-wise comparisons on the clusters and sub clusters. The normal procedure of a pair-wise comparison is to invite experts to compare two elements with respect to their respective adjacent higher levels element. Saaty (1980) has developed a 9-point priority scale of measurement, with a score of 1 representing equal importance of the two-compared elements and 1 being overwhelming dominance of one element (row element) over another element (column element). When there is overwhelming dominance of a column element over a row element, a score of 1/9 is given (Cheng and Li, 2007). Table shows 9-point priority scale.

Table 3.4. Nine-Point Priority Scale of Measurement (Saaty, 1980).

1	Equal Importance	Two activities contribute equally to the objective
2	Weak or slight	
3	Moderate importance	Experience and judgment slightly favor one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgment strongly favors one activity over another
6	Strong plus	
7	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance demonstrated in practice
8	Very, very strong	
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation

Third step is calculating the relative weights of elements and consistency ratio of matrices. After the pair-wise comparison matrices are developed, a vector of priorities in each matrix is calculated and is then normalized to sum to 1.0 or 100%. This is done by dividing the elements of each column of the matrix by the sum of that column; then, obtaining the eigenvector by adding the elements in each resulting row and dividing

this sum by the number of elements in the row to obtain "priority" or "relative weight" (Cheng and Li, 2002). For ascertaining the consistency of the judgment matrices, Saaty (1996) suggested three threshold levels: 0.05 is for 3 x 3 matrix; 0.08 for 4 x 4 matrix; and 0.1 for all matrices.

3.4. Data Collection

The target population was set as the members of the Turkish Contractors Association (TCA) that ranked among the worlds top 250 international contractors, according to the Engineering News-Record (ENR). Respondents were preferred to be experienced civil engineers who are senior level managers. Their average experience in construction sector is 19.4 years. Average of companies age is 47.6. A total of ten experts participated in data collection. Table 3.3 shows the information of respondents.

Table 3.5. Respondents Information.

No.	**Companys Age (Year)**	**Respondents Experience (Year)**	**Respondents Position**
1	60	18	Deputy General Manager
2	50	15	Tendering and Project Development Coordinator
3	65	20	Business Development and Tendering Coordinator
4	21	12	Business Development Manager
5	20	30	Executive Committee Member
6	38	14	Business Development Manager
7	76	10	Business Development Manager
8	11	20	Business Development and Tendering Coordinator
9	67	20	Business Development Manager
10	68	35	Deputy General Manager

3.5. Competitiveness Model Construction

Categorization of the identified competitiveness factors leads to a two-level hierarchy, where the top level elements (clusters) are decomposed into lower level factors(node). Top level criteria which is competitiveness level is composed of 9 groups including "effectiveness of strategies", "management capabilities", "organizational capabilities", "efficiency of technical resources", "efficiency of human resources", "effi-

ciency of financial resources", and "relationship", "favorability of host country", and "favorability of market conditions". Based on the ANP, model hierarchy is as follows:

Table 3.6. Competitiveness Level Evaluation Hierarchy.

Goal	Perspective	Competitiveness Factor
Competitiveness Level of the Firm	Effectiveness of Strategies	Diversification strategies Market selection strategies Project selection strategies Client selection strategies Partner selection strategies Bidding strategies
	Managerial capabilities	Quality management Time management Cost management Health and safety management Environmental management Risk management Site management Claim management Subcontractor management Knowledge management
	Organizational capabilities	Knowledge and expertise in the market Experience in similar projects Flexibility and adaptability of market changes Organizational culture/structure Image and reputation/Public Image
	Efficiency of Technical Resources	Use of IT Innovation capability Investment on R and D
	Efficiency of Human Resources	Construction equipment and plant Current capacity of human resources Development and use of human resources Communication and coordination among departments (teamwork)
	Efficiency of Financial Resources	Credibility Financial status Financial stability
	Relationship	Relationship with clients/owners Relationship with suppliers/subcontractors Relationship with designers/consultants Relationship with government entities Relationship with banks and institutions
	Favorability of host country	Regulatory and legal restrictions Socio-cultural conditions Economic conditions Fiscal policy Political conditions International relations
	Favorability of market conditions	Enter/exit barriers Project Funding Quality of subcontractors/labors Availability of construction materials Competitive environment

A simple network contains clusters, nodes, connections or links. When a parent node is linked to nodes in another cluster, these are known as its children nodes. The

children nodes are to be compared with respect to the parent node. When a parent node is linked to children nodes in another cluster, a line or link appears between the clusters with an arrow on it from the cluster containing the parent node. When the parent node and children are in the same cluster there will be a self-loop on that cluster.

In this study, "Super Decisions" software was used and all the network hierarchy model of the research with its clusters, nodes and node connections was entered into the program as shown below:

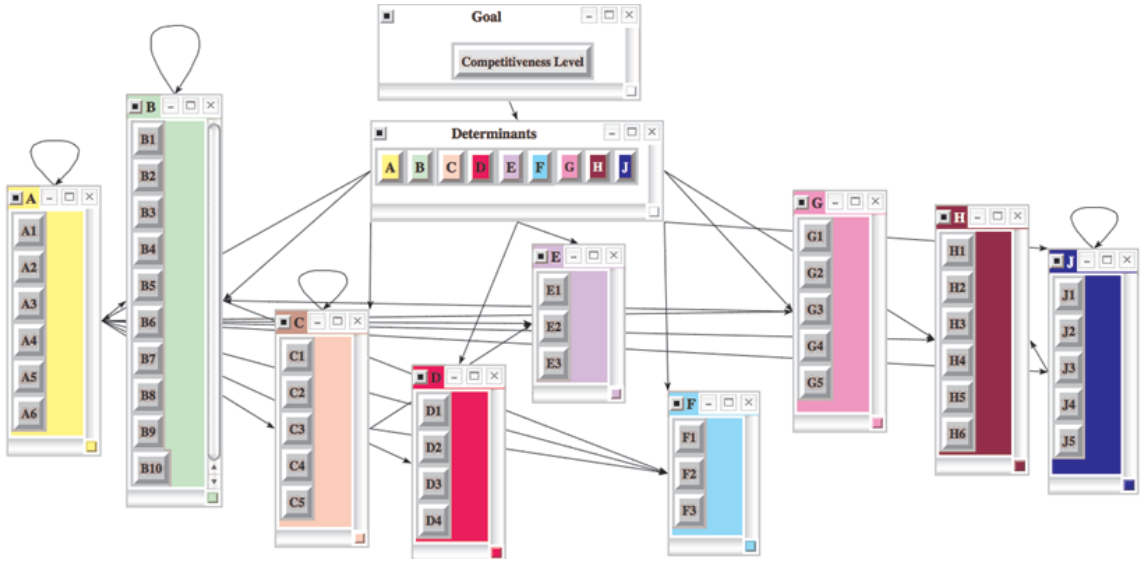

Figure 3.3. Network Hierarchy Model out of Superdecision Software.

The influence diagram among the clusters has shown below:

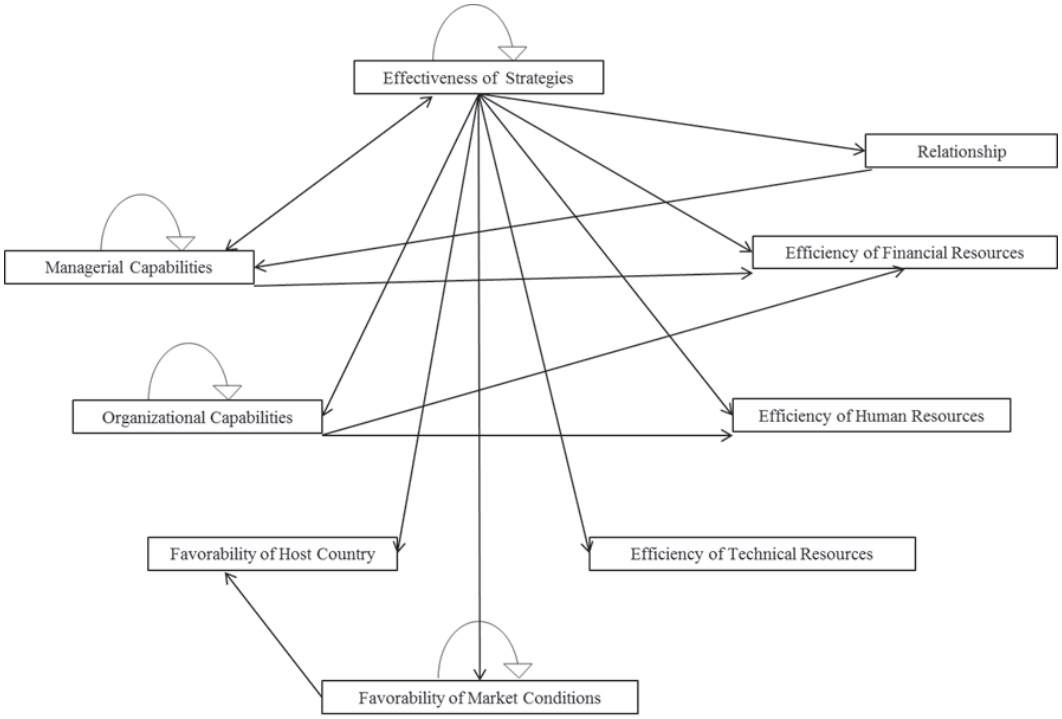

Figure 3.4. Influence Diagram.

In ANP model, elements are dependent and responding to each other, so that the structure is a dependent and feeding-back network. Thus, it is needed to compare two elements with each other (Tang and Li, 2009).

Respondents were asked to determine the factors that influence on other factors based on their own experiences before they examine the matrices. Determining the interaction among the factors was the requirement for the ANP application for pairwise priority decision matrices to be prepared. Pairwise relation decision matrix formed based on node connections in the hierarchy was wanted to be filled by the experts who will participate to the study. This step aims to perform pairwise comparisons among the clusters, as well as pairwise comparisons between nodes, as they are interdependent on each other. The pair-wise comparisons are made using a nine-point scale. After the answers of the respondents were collected, their answers were compared with each other and they meet on common values. The method used for the purpose of data collection is the brain storming sessions that brings all of respondents together to have consensus for the scoring of matrices. The last step of the analysis is to compute the

magnitudes of influence of each node on the level of competitiveness. Pairwise comparison matrices are combined by the program to form a synthesized matrix called the "supermatrix" that is constructed for the analysis of relationships between the nodes and clusters of the ANP model. A supermatrix is computed in three-step calculation; the unweighted supermatrix is formed based on scorings of pairwise comparison matrices among interacting elements as the first step, then the program calculates the weighted supermatrix by multiplying the values of the unweighted supermatrix with cluster weights on which nodes connect, and as last step a limiting supermatrix is achieved by raising the weighted supermatrix to powers until all the columns corresponding to any node concentrate on the same values.

As a result for each factor in the network, the priorities with respect to their contribution to competitiveness level were defined.

Table 3.7. Weighted Rates of Clusters and Nodes.

Code	Cluster Name	Limiting
A	Effectiveness of Strategies	0.26628
A1	Diversification strategies	0.12886
A2	Market selection strategies	0.16729
A3	Project selection strategies	0.0856
A4	Client selection strategies	0.11724
A5	Partner selection strategies	0.16333
A6	Bidding strategies	0.33767
B	Managerial capabilities	0.13895
B1	Quality management	0.03737
B2	Time management	0.11693
B3	Cost management	0.17289
B4	Health and Safety management	0.03902
B5	Environmental management	0.03355
B6	Risk management	0.18093
B7	Site management	0.1139
B8	Claim management	0.14053
B9	Subcontractor management	0.08081
B10	Knowledge management	0.08406
C	Organizational capabilities	0.16743
C1	Knowledge and expertise in the market	0.26193
C2	Experience in similar projects	0.46994
C3	Flexibility and adaptability of market changes	0.14411
C4	Organizational culture/structure	0.07925
C5	Image and reputation/Public Image	0.04478
D	Efficiency of Technical Resources	0.03697
D1	Use of IT	0.09518
D2	Innovation capability	0.33781
D3	Investment on R and D	0.1605
D4	Construction equipment and plant	0.40651
E	Efficiency of Human Resources	0.03248
E1	Current capacity of human resources	0.24931
E2	Development and use of human resources	0.59363
E3	Communication and coordination among departments (teamwork)	0.15706
F	Efficiency of Financial Resources	0.12334
F1	Credibility	0.11722
F2	Financial Status	0.61441
F3	Financial Stability	0.26837
G	Relationship	0.10441
G1	Relationship with clients/owners	0.36767
G2	Relationship with suppliers/subcontractors	0.07354
G3	Relationship with designers/consultants	0.0847
G4	Relationship with government entities	0.24137
G5	Relationship with banks and institutions	0.23272
H	Favorability of host country	0.06689
H1	Regulatory and legal restrictions	0.25709
H2	Socio-cultural conditions	0.04
H3	Economic conditions	0.25078
H4	Fiscal policy	0.15706
H5	Political conditions	0.18135
H6	International relations	0.11372
J	Favorability of market conditions	0.06325
J1	Enter/exit barriers	0.18872
J2	Project Funding	0.30834
J3	Quality of subcontractors/labors	0.10413
J4	Availability of construction materials	0.09449
J5	Competitive environment	0.30433

By multiplying the limiting weights of nodes with the limiting weights of their related cluster, the relative weights of effectiveness of each node on competitiveness level goal was calculated.

Table 3.8. Importance Weights of Nodes.

Code	Factor Name	Normalized to Goal
A6	Bidding strategies	0.08991
C2	Experience in similar projects	0.07868
F2	Financial Status	0.07578
A2	Market selection strategies	0.04454
C1	Knowledge and expertise in the market	0.04386
A5	Partner selection strategies	0.04349
G1	Relationship with clients/owners	0.03839
A1	Diversification strategies	0.03431
F3	Financial Stability	0.0331
A4	Client selection strategies	0.03122
G4	Relationship with government entities	0.0252
B6	Risk management	0.02514
G5	Relationship with banks and institutions	0.0243
C3	Flexibility and adaptability of market changes	0.02413
B3	Cost management	0.02402
A3	Project selection strategies	0.02279
B8	Claim management	0.01953
J2	Project Funding	0.0195
E2	Development and use of human resources	0.01928
J5	Competitive environment	0.01925
H1	Regulatory and legal restrictions	0.0172
H3	Economic conditions	0.01677
B2	Time management	0.01625
B7	Site management	0.01583
D4	Construction equipment and plant	0.01503
F1	Credibility	0.01446
C4	Organizational culture/structure	0.01327
D2	Innovation capability	0.01249
H5	Political conditions	0.01213
J1	Enter/exit barriers	0.01194
B10	Knowledge management	0.01168
B9	Subcontractor management	0.01123
H4	Fiscal policy	0.0105
G3	Relationship with designers/consultants	0.00884
E1	Current capacity of human resources	0.0081
G2	Relationship with suppliers/subcontractors	0.00768
H6	International relations	0.00761
C5	Image and reputation/Public Image	0.0075
J3	Quality of subcontractors/labors	0.00659
J4	Availability of construction materials	0.00598
D3	Investment on R and D	0.00593
B4	Health and Safety management	0.00542
B1	Quality management	0.00519
E3	Communication and coordination among departments (teamwork)	0.0051
B5	Environmental management	0.00466
D1	Use of IT	0.00352
H2	Socio-cultural conditions	0.00268

3.6. Findings

According to the analysis, "effectiveness of strategies" competitiveness factors are the most influential factors that contribute to competitiveness level of Turkish contractors.

Effective strategy enables construction firms to match their activities to the changing environment and achieve superior performance in competition. Therefore, there is a need for studying contractors competitive strategies (Tan *et al.*, 2011).

Strategic management originated in the 1950s and 1960s, along with the development of influential theories, such as the theory of management by objectives (Drucker, 1954), "structure follows strategy" (Chandler, 1962), gap analysis (Ansoff, 1965), and SWOT analysis (Learned *et al.*, 1965). The development of strategic management methodology led to numerous schools of thought, which were summarized by Green *et al.*, (2008) as "the strategic positioning school (Porter, 1980), the process school (Pettigrew and Whipp, 1991; Pettigrew, 1997), the action school (Mintzberg, 1990), the dynamic capabilities school (Teece *et al.*, 1997), the resource-based view, (Barney, 1991), and the practice school (Jarzabkowski, 2005)". Porter, one of the most influential researchers in the discipline of strategic management, introduced the widely quoted model of five-force analysis and three generic strategies (Porter, 1979; 1980).

According to the definition introduced by Thompson *et al.*, (2006), strategy is managements game plan for growing the business, staking out a market position, attracting and pleasing customers, competing successfully, conducting operations, and achieving targeted objectives. Mintzberg *et al.*, (2003) reviewed the concepts related to strategy and grouped them into five categories, including strategy as plan, ploy, pattern, position, and perspective. From a practical viewpoint, developing a strategy is a complex process because all factors affecting strategic decisions should be considered. This led to the study by Thompson and Strickland (2003), who suggest that an effective strategy should incorporate three elements: customer needs, customer groups to be served, and the competencies the firm needs to deliver value. To deliver this

value and accomplish an organizations mission, firms need to clearly understand their strategic intent and set up long-term business goals, for example being dominant in a certain market. Strategic intent occurs when a firm wants to pursue an ambitious objective and concentrates its competitive resources on that objective. (Tan *et al.*, 2011) Executives may not be clear about the existing strategy of the organization. It is particularly essential for senior management staff to examine and understand the actual emerging pattern of the organizations goals, policies, and major programs to determine what its true strategy is (Mintzberg, 2003). Strategies are the answers at a management level to how the firm will pursue its organizational mission and strategic vision. Thompson and Strickland (2003) highlight the idea that whether a firms strategy is good or not rely on its completeness, internal consistency, rationale, and suitability to the situation.

Table 3.9. Importance Weights of Clusters.

Code	**Cluster Name**	**Limiting**
A	Effectiveness of Strategies	0.26628
B	Managerial capabilities	0.13895
C	Organizational capabilities	0.16743
D	Efficiency of Technical Resources	0.03697
E	Efficiency of Human Resources	0.03248
F	Efficiency of Financial Resources	0.12334
G	Relationship	0.10441
H	Favorability of host country	0.06689
J	Favorability of market conditions	0.06325

Turkish contractors are expected to face stiff competition from both Turkish and foreign firms. More Turkish contractors are also expected to enter the construction industry due to the excessive opportunities in Turkey and international markets. To succeed in such a competitive environment, Turkish contractors need to utilize appropriate strategies. An inappropriate choice of strategies may lead to low profits, productivity and efficiency.

"Effectiveness of strategies" are followed by "organizational capabilities" factors and "managerial capabilities" factors in terms of influencing the competitiveness of a Turkish contractor firm, respectively.

By considering management capabilities such as time, cost, risk, and claim, site management, all relevant factors are rated as critical in affecting a contractors competitiveness, except for the environment and health and safety management factor. Managerial capabilities reflect a contractors ability to provide clients high quality products or service. Good managerial capabilities help contractors to maintain and improve their operation effectiveness and form the competitive advantages in bidding (Raftery *et al.*, 1998).

"Efficiency of human resources" and "efficiency of technical resources" are found to be the least influencing factors affecting Turkish construction contractors.

In this study, "bidding strategies" is found to be the most influencing competitiveness factor. Similar findings can be found in the literature (Lu *et al.*, 2008; Weisheng, 2006). Lu *et al.*, (2008) conducted factor analysis to reveal the most critical success factors for determining the competitiveness of a contractor and carried a survey out in Mainland China. His result is in line with this study. He also investigated "bidding strategy" as the most important determinant for indicating a contractors competitiveness.

In the construction business, winning a contract will sustain workloads for 1 or 2 years. Therefore, winning enough projects by adopting a successful bidding strategy is essential for contractors to survive in the current market, and progress toward the future. The importance of a successful bidding strategy to a contractors competitiveness has been echoed by the extensive research on competitive bidding models published over past several years (Shen and Song, 1998).

Good bidding technique will enable contractors to win more contracts, which in turn helps to sustain a contractors competitiveness (Lu *et al.*, 2008). On the other

hand, bidding is a process for a contractor to show competence through organizing its resources effectively. Contractors may not win in a bidding process if its resources are not properly organized even though they are very competent (Shen *et al.*, 2004).

"Bidding strategies" are followed by "experience in similar projects", and "financial status". "Market selection strategies", "knowledge and expertise in the market" and "partner selection strategies" are also affecting competitiveness level of Turkish contractors.

Experience in similar projects is traditionally known to be a very important source of competitive advantage, as it provides easy entrance to markets and lowers costs due to tried and proven practices/ techniques (Dikmen and Birgonul, 2003).

For the big-scale projects, prequalification stage is the first step of contractor selection process. It is a process used to investigate and assess the capabilities of the contractors to carry out a job if it is awarded to them. Financial status is one of the most important factors in the prequalification stage because financial status of a contractor shows that whether a contractor is suitable to meet obligations required by work. Hence, financial status is a very effective competitiveness factor in the construction business. Dikmen and Birgönül (2003) found that experience and financial capability were the major strengths of Turkish contractors. This finding ensures the results founded in this study where experience and financial status are the most influencing competitiveness factors after bidding strategies.

According to the results, "market selection strategies" have an importance weight of 0.04454. A firm requires comprehensive research and analysis on macro and microenvironment of the new market before market selection and then need to build strategies to enter into new regions where a firm has not been active before. Kangari (1988) states that lack of experience in the companys line of work accounts for 18.2% of all failures. Therefore, experience is a critical issue in market entry decision and source of competitive advantage.

Interviewees also point out “Partner selection strategies” factor. A key aspect of the globalization of construction activity is the increasing tendency for construction firms to co-operate strategically across national borders. Reasons for the formation of multinational consortia and joint ventures are to pool technical expertise, reduce the level of exposure to risk or to get round protectionist barriers. (Andrews, 1984) Forming partnerships for construction projects is very important while it is a way of entering new markets and expanding business opportunities. Forming partnership combines the distinctive competencies and the complementary resources of each partner. Although it is advantageous to build a partnership, it is difficult manage because of its complexity. (Ozorhon, 2007) Hence, partner selection is an significant determinant that influences the competitiveness of the firms. In line with the literature, “partner selection strategies” factor is also have an influence on competitiveness level of a contracting firm.

Diversification strategies, which have an importance weight of 0.03431, should be mentioned. According to Channon and Hillebrandt (1990) diversification is a major contributor to corporate growth. Firms need to adapt diversification strategies to completely utilize existing resources and capabilities. Although it is difficult and complex to coordinate different and related businesses, diversification has some advantages such as expanding product offerings or expanding into new regions. In addition, diversification creates opportunities to grow after a firm has matured and to reduce cyclical fluctuations in revenues and cash flows.

One should state that “flexibility and adaptability of market changes” also has an influence on competitiveness of a contractor. Adaptability can be achieved by “being flexible in shape” and “adapting plans according to the changes in the environment”. Lansley (1987) found that flexible contractors who are able to adapt to the changing demands of the environment are those who have clearly defined and stated objectives that are supported by strong management commitment, consider employees welfare, emphasize high levels of employees morale and job satisfaction, promote effective corporate planning strategies, have an effective market-sensing mechanism, make full use of employees knowledge and potential in every aspect of decision making, have

a management style with a strong employee emphasis and have an organic organizational structure. Other practices to develop flexibility include training of employees, a systematic problem- solving approach and adopting a flexible firm model that uses functional and numerical flexibility to respond to the fluctuations in production demand (Ofori and Debrah, 1998). Gil *et al.*, (2005) suggested over-designing products to accommodate future needs as one of the important managerial strategies to achieve process flexibility.

In this study, relationship with government entities is considered as most important among the various external relationships. Government can act as a client, winning it trust can increase the possibility of winning contracts in the future. Government can also act as a regulator. Contractors who have a good relationship with government may receive more supports such as information, finance, or protections (Lan and Jackson, 1998). Also, relationships with banks and institutions is necessarily effective on competitiveness level of a contractor. According to Yates (1994), network with these institutions need to be purposely constructed. Effective networks require good communication channels to facilitate the smooth flow of information along the supply chain (DeVilbiss and Leonard, 2000).

"Socio-cultural conditions of the host country" and "use of IT" are the least influencing factors affecting Turkish contractors.

It is interesting to observe that the use of IT ranked as one of the factors at the bottom of the list. There are many reasons for the limited application of I.T., including few I.T. trained staff, an absence of I.T. awareness, poor I.T. infrastructure, and the in- capability of software development (Lu *et al.*, 2008).

Although highly cited in the literature (Pries and Janzsen, 1995; Allen and Helms, 1994), the importance weight of "investment on R and D" was found to be very low. According to Pries and Janszen (1995), firms can gain competitive advantage by innovating and competing on the basis of product or process innovation. Investment in R and D is necessary to design new construction processes and methods, alternative

corporate structures and new financing methods. By fostering innovation and creativity as well as building a reputation of being technologically advanced, a firm is assured of meeting the interests of new clients as well as catering to the demands of existing clients for uniqueness (Allen and Helms, 1994).

3.7. Testing of the Model

It was required to test the suitability of the developed model with case studies. Ten construction professionals from Turkish construction companies selected among ENRs 2013 Top 225 International Contractors List were selected for the model justification step. The team composed of civil engineers and their average experience in construction sector is 19.4 years. A table was prepared and presented to the respondents (Table 3.7). It was requested to score their real projects for 47 competitiveness factors and for their competitiveness level.

Table 3.10. Evaluation of Projects.

	Evaluation of the Projects	Score
No.	Factor Name	(1-100)
1	Diversification strategies	
2	Market selection strategies	
3	Project selection strategies	
4	Client selection strategies	
5	Partner selection strategies	
6	Bidding strategies	
7	Quality management	
8	Time management	
9	Cost management	
10	Health and Safety management	
11	Environmental management	
12	Risk management	
13	Site management	
14	Claim management	
15	Subcontractor management	
16	Knowledge management	
17	Knowledge and expertise in the market	
18	Experience in similar projects	
19	Flexibility and adaptability of market changes	
20	Organizational culture/structure	
21	Image and reputation/Public Image	
22	Use of IT	
23	Innovation capability	
24	Investment on R and D	
25	Construction equipment and plant	
26	Current capacity of humant resources	
27	Development and use of human resources	
28	Communication and coordination among departments (teamwork)	
29	Credibility	
30	Financial Status	
31	Financial Stability	
32	Relationship with clients/owners	
33	Relationship with suppliers/subcontractors	
34	Relationship with designers/consultants	
35	Relationship with government entities	
36	Relationship with banks and institutions	
37	Regulatory and legal restrictions	
38	Socio-cultural conditions	
39	Economic conditions	
40	Fiscal policy	
41	Political conditions	
42	International relations	
43	Enter/exit barriers	
44	Project Funding	
45	Quality of subcontractors/labors	
46	Availability of construction materials	
47	Competitive environment	

Table 3.7 shows information about the projects for case studies for which the competitiveness factors are rated. Projects are mainly big scale infrastructure projects and from Kazakhstan, Turkmenistan, Algeria, Libya, UAE, Kuwait, Saudi Arabia, Qatar, and Oman. Projects are having a contract value USD 50 to 780 Million. The

average age of the companies is 47.6.

Table 3.11. Information of the Projects.

Project	**Type**	**Size (USD Million)**	**Location**	**Age**	**Activities**
1	Road	350	Kazakhstan	60	General Contracting
2	Bridge	280	Turkmenistan	50	General Contracting
3	Road	220	Algeria	65	General Contracting
4	Hospital	50	Libya	21	General Contracting and Investment
5	Hotel	100	UAE	20	General Contracting and Investment
6	Dam	620	Libya	38	General Contracting
7	Port	240	Kuwait	76	Infrastructure
8	Airport	625	Saudi Arabia	11	General Contracting
9	Metro	780	Qatar	67	Infrastructure
10	Rail	350	Oman	68	General Contracting

Respondents evaluated their real projects through the competitiveness factors in order to test the performance of the model. Taking into account the characteristics of the projects, each respondent was required to assign a rate to the availability or success of each competitiveness factors and the level of the competitiveness of the company using the point scale from 1 to 100. The estimated competitiveness and the actual competitiveness are compared and the results are summarized in Table 3.7. Table suggests that the accuracy of the model is satisfactory.

Table 3.12. Testing of the ANP Model for Competitiveness Level.

Factor Name	1	2	3	4	5	6	7	8	9	10
Diversification strategies	90	40	60	70	50	80	80	40	90	80
Market selection strategies	80	80	90	60	80	40	80	60	90	90
Project selection strategies	60	80	90	90	80	70	80	80	90	90
Client selection strategies	60	80	80	90	80	60	60	80	90	90
Partner selection strategies	90	90	90	90	80	80	40	60	90	80
Bidding strategies	90	90	90	90	80	90	80	60	90	90
Quality management	80	60	90	80	70	60	60	10	80	80
Time management	80	90	90	90	70	90	70	70	80	90
Cost management	80	90	80	90	70	90	70	70	80	90
Health and Safety management	60	50	60	80	50	50	40	30	40	50
Environmental management	20	50	60	80	50	50	40	30	40	50
Risk management	70	90	80	80	70	90	80	60	90	90
Site management	40	90	80	90	70	90	80	80	90	90
Claim management	40	80	80	80	70	80	60	60	90	80
Subcontractor management	40	50	60	80	50	50	60	80	70	50
Knowledge management	80	80	90	80	80	80	60	80	80	90
Knowledge and expertise in the market	70	80	90	60	90	80	80	80	90	90
Experience in similar projects	90	90	90	80	90	70	80	80	90	90
Flexibility and adaptability of market changes	50	90	80	60	90	70	60	60	90	80
Organizational culture/structure	80	70	90	60	40	80	80	40	90	80
Image and reputation/Public Image	60	70	90	60	40	80	90	40	70	80
Use of IT	40	40	60	50	60	50	40	60	90	70
Innovation capability	20	40	60	50	60	50	40	40	60	50
Investment on R and D	20	40	60	50	60	50	20	40	60	50
Construction equipment and plant	20	60	60	50	70	80	60	40	60	80
Current capacity of humant resources	50	70	80	80	90	80	50	50	80	80
Development and use of human resources	60	90	80	90	90	90	50	60	70	90
Communication and coordination among departments (teamwork)	50	80	80	70	90	70	50	70	70	80
Credibility	50	80	90	70	90	70	80	60	80	80
Financial Status	60	90	90	90	90	80	80	70	90	80
Financial Stability	60	90	90	40	90	80	80	60	90	80
Relationship with clients/owners	60	80	80	70	70	70	70	80	80	90
Relationship with suppliers/subcontractors	30	50	60	70	70	60	40	70	80	50
Relationship with designers/consultants	30	50	60	70	70	50	20	60	80	50
Relationship with government entities	70	80	90	70	70	90	60	80	90	90
Relationship with banks and institutions	20	50	60	20	70	40	40	40	50	50
Regulatory and legal restrictions	70	80	90	90	80	90	60	80	90	90
Socio-cultural conditions	20	50	30	40	50	10	20	30	60	40
Economic conditions	60	80	80	90	90	50	50	60	80	90
Fiscal policy	60	90	80	90	90	80	80	50	90	90
Political conditions	50	80	80	90	80	40	60	80	40	10
International relations	20	50	90	80	80	90	40	50	90	10
Enter/exit barriers	50	50	60	70	80	40	60	80	80	20
Project Funding	70	80	90	80	90	80	80	80	90	50
Quality of subcontractors/labors	80	50	60	50	40	40	60	60	70	20
Availability of construction materials	50	50	60	50	40	40	60	20	70	20
Competitive environment	60	80	90	80	90	90	40	80	90	90
Competitiveness level (Actual)	70	80	90	80	80	80	70	70	90	80
Competitiveness level (Estimated)	66	79	83	75	78	73	68	65	84	80
Error (%) $[\frac{\lvert Estimated-Actual\rvert}{Actual}] * 100\%$	5	1	8	5	2	8	3	7	6	0
	85	61	22	69	68	24	31	14	57	61

The precision for prediction is found to be ±4.99%. To conclude, the developed model can serve Turkish contractors to assess their competitiveness level.

4. CONCLUSION

Turkish contractors need to understand the concept of competitiveness and continuously improve their competitiveness in order to sustain their competitive position. However, competitiveness is not easily understood and measured because the definition is abstract and direct assessment cannot be obtained. In this study, a framework was developed to assess the competitiveness level of construction firms. A comprehensive list of competitiveness factors of construction contractors was provided for this purpose. These factors were collected in 9 groups. These are "effectiveness of strategies", "management capabilities", "organizational capabilities", "efficiency of technical resources", "efficiency of human resources", "efficiency of financial resources", "relationship", "favorability of host country", and "favorability of market conditions". There were 47 factors in total. An ANP model was used to analyze these factors involved in the analysis of Turkish contractors competitiveness. Data collection was based on the experts opinions from the Turkish construction sector. The analysis shows that "effectiveness of strategies" factors are the most influential factors that contribute the Turkish contractors, followed by "organizational capabilities" and "managerial capabilities", respectively.

The factors adapted in this study can be applied to build an orderly process to develop competitive strategy of a contracting firm. First, strategies adapted by a firm are a tool to achieve firms goals and sustain its competitive advantage. Hence, building effective strategies is the most important factor in terms of competitive advantage. Second, firms capabilities show how successfully they convert strategies to actions and directly reflect the results of the strategies adapted. Hence, the results in this study are reasonable in terms of the importance weights of the factors. Third, firms resources such as financial, technical and human resources can be perceived as supportive tools of a firm. Strength of firms resources can be enhanced by required investments and utilization of these resources depends on how well strategies are developed. Fourth, relationship with external bodies indirectly affects firms competitive advantage. Finally, external factors such as country conditions and market conditions should be carefully

monitored by contracting firms. In order to build effective strategies, contracting firms require comprehensive research and analysis on macro and microenvironment of the market that they want to enter into new regions where they have not been active before or the market that they want to sustain their existence. It is no matter whether there are excessive opportunities in a specific market if a contractors strengths and weaknesses do not match with the opportunities and threats of the specified market. A firm could be successful to the degree to which the internal environment of the firm matches with the external environment. Therefore, a firm should analyze its capabilities and resources when entering into a new market. According to the results in this study, Turkish contractors are not considering investment on R and D and innovation as required and lowering their costs accordingly. In short term, firms can be competitive with this approach. However, investment on R and D and innovation can provide low cost advantages and decrease on costs in the long run and result in increase of competitive advantage.

This study has an effective methodology for assessing contractors by identifying a set of parameters, developing a model, analyzing by ANP and testing the model with case studies. The research findings have been gained from the context of the Turkish contractors. The findings may provide reference for assessing competitiveness of contractors in other regions. Researchers can conduct comparative studies between Turkish and other construction contractors by using the developed framework. Moreover, this methodology may be recommended for studying subjects in different markets.

There are a number of limitations in this study. The study limits the focus on the assessment of the contractors competitiveness. It has not yet measured the level of competitiveness and examined how to improve the competitiveness level of the contractors. The research data is confined to Turkey and research findings were developed from Turkish construction industry. Thus, the study findings only refer to the Turkish contractors. The model was validated only by 10 case studies. To have more accurate result, methodology needs further evaluation.

This research has only focused on the assessment of the Turkish contractors. Therefore, it is recommended that future research may include measuring the competitiveness level, developing strategies and actions for improving competitiveness, and for this direction, the results achieved in this study established a valuable basis.

APPENDIX A: DATA COLLECTION



Figure A.1. Boğaziçi University.

BOGAZICI UNIVERSITY
THE INSTITUTE OF SCIENCE AND ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
MASTER OF SCIENCE IN CONSTRUCTION MANAGEMENT
ADVISOR : ASSOC. PROF. BELIZ OZORHON
PREPARED BY : CANSU KUS

A.1. DEVELOPMENT OF A COMPETITIVENESS MODEL FOR INTERNATIONAL CONTRACTING FIRMS PAIRWISE RELATION DECISION MATRIX

Requested:

Please examine the Pairwise Relation Decision Matrices that is formed based on relations between factors effecting competitiveness level.

The aim of the matrices is to determine the relations between competitiveness factors.

Row elements in matrix are questioned whether they effect on the column element or not.

"+" means, that row element has effect on the column element as seen in example below. **Example:**

Table A.1. Pairwise Relation.

Pairwise Relation Decision Matrix	A	B	C
A		+	+
B			
C		+	

Explanation:

According to the example above, factor A affect factors B and C; factor B has no influence on factors A and C; factor C is effective for the factor B, but not for factor A.

Table A.2. Factors Affecting Competitiveness Level.

Factors Affecting Competitiveness Level	
No.	**Factor Name**
1	Diversification strategies
2	Market selection strategies
3	Project selection strategies
4	Client selection strategies
5	Partner selection strategies
6	Bidding strategies
7	Quality management
8	Time management
9	Cost management
10	Health and Safety management
11	Environmental management
12	Risk management
13	Site management
14	Claim management
15	Subcontractor management
16	Knowledge management
17	Knowledge and expertise in the market
18	Experience in similar projects
19	Flexibility and adaptability of market changes
20	Organizational culture/structure
21	Image and reputation/Public Image
22	Use of IT
23	Innovation capability
24	Investment on R and D
25	Construction equipment and plant
26	Current capacity of human resources
27	Development and use of human resources
28	Communication and coordination among departments (teamwork)
29	Credibility
30	Financial Status
31	Financial Stability
32	Relationship with clients/owners
33	Relationship with suppliers/subcontractors
34	Relationship with designers/consultants
35	Relationship with government entities
36	Relationship with banks and institutions
37	Regulatory and legal restrictions
38	Socio-cultural conditions
39	Economic conditions
40	Fiscal policy
41	Political conditions
42	International relations
43	Enter/exit barriers
44	Project Funding
45	Quality of subcontractors/labors
46	Availability of construction materials
47	Competitive environment

Table A.3. Bearing capacity factors.

Explanations	
Diversification strategies	Expanding product offerings or expanding into new regions
Market selection strategies	Comprehensive research and analysis on macro and micro environment of the new market before entering a market and to building strategies to enter into new regions where a firm has not been active before
Project selection strategies	Establishing strategy, using techniques and procedures for project selection
Client selection strategies	Strategies, techniques and procedures developed for client selection
Partner selection strategies	Partner selection strategies in terms of assessing the relative importance of strong resource endowments and aligned strategic aspirations over time.
Bidding strategies	Strategies related to winning a project such as pricing strategies
Quality management	The processes and activities of the firm that determine quality policies, objectives, and responsibilities
Time management	The processes required to manage timely completion of a specific work/product/project.
Cost management	the ability of a firm to complete a specific work/product/project that possesses a high quality to cost ratio.
Health and Safety management	Availability and effectiveness of health and safety management staff, availability and effectiveness of health and safety methods on site, and effectiveness of accident settlement
Environmental management	Availability and effectiveness of environmental management staff, availability and effectiveness of environmental protection methods
Risk management	The processes of conducting risk management planning, identification, analysis, response planning, and monitoring and control.
Site management	management of all parties, processes and activities that produce products or services
Claim management	Management of claims and disputes between Construction owners, contractors and other participants
Subcontractor management	Effectiveness of co-ordination with subcontractors
Knowledge management	Functions to identify, acquire, maintain, search, retrieve, and distribute knowledge
Knowledge and expertise in the market	Business at various regional levels (domestic and international)
Experience in similar projects	Business by sectors (building, infrastructure, civil, industrial etc.)
Flexibility and adaptability of market changes	Companys ability to manage market conditions changes
Organizational culture/structure	Companys objectives, visions and missions
Image and reputation/Public Image	Reputation within the segment with respect to customers, media and competitors

Table A.3. Bearing capacity factors (Cont.).

Explanations	
Use of IT	The utilization of information technology and the level of software development capacity achieved by a firm
Innovation capability	New technology or management methods in application and status of technology advancement
Investment on R and D	Application of the new technology developed internally and establishment of research unit and capacity of research staff
Construction equipment and plant	Level and sophistication of construction equipment and production plant and processes.
Current capacity of human resources	Availability of key personnel
Development and use of human resources	Human resource development programs and effective mechanism for staff recruitment
Communication and coordination among departments	Healthy relations among departments
Credibility	Creditability grade certificated by relevant bodies, annual value of loans obtained, level of satisfaction in communication with bankers, and knowledge about financial policy
Financial Status	Assets status, profit status, and debt status
Financial Stability	Companys capability of withstanding shocks and financial crises
Relationship with clients/owners	Level of communication with clients/owners
Relationship with suppliers/subcontractors	Level of communication with suppliers/subcontractors
Relationship with designers/consultants	Level of communication with designers/consultants
Relationship with government entities	Level of communication with government entities
Relationship with banks and institutions	Level of communication with banks and institutions
Regulatory and legal restrictions	Any restrictions on company activity by technical specifications and codes and any restrictions imposed by the juridical environment such as licensing requirements
Socio-cultural conditions	The social environment and wealth in a country
Economic conditions	The state of the economy in a country or region
Fiscal policy	Regulations related to government revenue collection (taxation) and expenditure (spending)
Political conditions	Government changes and the level of political stability
International relations	The power on the companies established in the relevant countries
Enter/exit barriers	Ease of entering/exiting a segment
Project Funding	Project funding methods such as privatization, BOTs, financing by owner, financing by private organizations
Quality of subcontractors/labors	The availability and quality of subcontractors and labors
Availability of construction materials	The availability of resources such as raw materials
Competitive environment	The position and the number of the competitors in the market

APPENDIX B: DATA ANALYSIS

Table B.1. Examples of Comparison Matrices.

Effectiveness **of Strategies**	Diversification Strategies	Market Selection Strategies	Project Selection Strategies	Client Selection Strategies	Partner Selection Strategies	Bidding Strategies
Diversification Strategies		5	1/3	1/4	1/5	1/6
Market Selection Strategies	1/5		4	4	2	1/3
Project Selection Strategies	3	1/4		1/2	1/2	1/4
Client Selection Strategies	4	1/4	2		1/2	1/4
Partner Selection Strategies	5	1/2	2	2		1/3
Bidding Strategies	6	3	4	4	3	

Table B.2. Managerial Capabilities.

Managerial Capabilities	Quality Management	Time Management	Cost Management	Health and Safety Management	Environmental Management	Risk Management	Site Management	Claim Management	Subcontractor Management	Knowledge Management
Quality Management		1/3	1/3	1	1	1/3	1/3	1/3	1/2	1/3
Time Management	3		1	3	3	1/2	2	1/3	2	2
Cost Management	3	1		4	4	3	2	1/2	3	2
Health and Safety Management	1	1/3	1/4		1	1/3	1/2	1/3	1/2	1/2
Environmental Management	1	1/3	1/4	1		1/4	1/3	1/3	1/3	1/3
Risk Management	3	2	1/3	3	4		3	2	4	3
Site Management	3	1/2	1/2	2	3	1/3		3	1	2
Claim Management	3	3	2	3	3	1/2	1/3		3	2
Subcontractor Management	2	1/2	1/3	2	3	1/4	1	1/3		3
Knowledge Management	3	1/2	1/2	2	3	1/3	1/2	1/2	1/3	

Table B.3. Organizational Capabilities.

Organizational Capabilities	Knowledge and expertise in the market	Experience in similar projects	Flexibility and daptability of market changes	Organizational culture structure	Image and reputation /Public Image
Knowledge and expertise in the market		1/3	3	4	5
Experience in similar projects	3		4	5	6
Flexibility and adaptability of market changes	1/3	1/4		3	4
Organizational culture /structure	1/4	1/5	1/3		3
Image and reputation /Public Image	1/5	1/6	1/4	1/3	

Table B.4. Efficiency of Technical Resources.

Efficiency of Technical Resources	Use of IT	Innovation capability	Investment on R and D	Construction equipment and plant
Use of IT		1/4	1/2	1/3
Innovation capability	4		3	1/2
Investment on R and D	2	1/3		1/2
Construction equipment and plant	3	2	2	

Table B.5. Efficiency of Human Resources.

Human	capacity of human	human resources	among departments
Resources	resources		(teamwork)
Current capacity of human resources		1/3	2
Development and use of human resources	3		3
Communication and coordination among departments (teamwork)	1/2	1/3	

Table B.6. Efficiency of Financial Resources.

Efficiency of Financial Resources	Credibility	Financial Status	Financial Stability
Credibility		1/4	1/3
Financial Status	4		3
Financial Stability	3	1/3	

Table B.7. Relationship.

Relationship	Relationship with clients/owners	Relationship with suppliers/subcontractors	Relationship with designers/consultants	Relationship with government entitites	Relationship with banks and institutions
Relationship with clients/owners		4	4	1	3
Relationship with suppliers/subcontractors	1/4		1	1/4	1/3
Relationship with designers/consultants	1/4	1		1/3	1/2
Relationship with government entities	1	4	3		1/2
Relationship with banks and institutions	1/3	3	2	2	

Table B.8. Favorability of host country.

Favorability of host country	Regulatory and legal restrictions	Socio-cultural conditions	Economic conditions	Fiscal policy	Political conditons	International relations
Regulatory and legal restrictions		4	2	1	2	2
Socio-cultural conditions	1/4		1/4	1/4	1/6	1/5
Economic conditions	1/2	4		2	3	2
Fiscal policy	1	4	$\frac{1}{2}$		1/2	2
Political conditions	1/2	6	1/3	2		2
International relations	1/2	5	1/2	1/2	1/2	

Table B.9. Favorability of market conditions.

Favorability of market conditions	Enter/exit barriers	Project Funding	Quality of subcontractors/labors	Availability of construction materials	Competitive environment
Enter/exit barriers		1/3	2	2	1
Project Funding	3		3	3	1/2
Quality of subcontractors/labors	1/2	1/3		1	1/2
Availability of construction materials	1/2	1/3	1		1/3
Competitive environment	1	2	2	3	

Table B.10. Competitiveness Level.

Competitiveness Level	Effectiveness of Strategies	Managerial capabilities	Organizational capabilities	Efficiency of Technical Resources	Efficiency of Human Resources	Efficiency of Financial Resources	Relationship	Favorability of host country	Favorability of market conditions
Effectiveness of Strategies		2	3	5	6	4	3	4	3
Managerial capabilities	1/2		1/2	3	4	2	2	3	2
Organizational capabilities	1/3	2		3	4	2	3	3	2
Efficiency of Technical Resources	1/5	1/3	1/3		1/2	1/3	1/2	1/2	1/2
Efficiency of Human Resources	1/6	1/4	1/4	2		1/4	1/4	3	1/4
Efficiency of Financial Resources	1/4	1/2	1/2	3	4		3	3	2
Relationship	1/3	1/2	1/3	2	4	1/3		4	3
Favorability of host country	1/4	1/3	1/3	2	3	1/3	1/4		3
Favorability of market conditions	1/3	1/2	1/2	2	4	2	1/3	1/3	

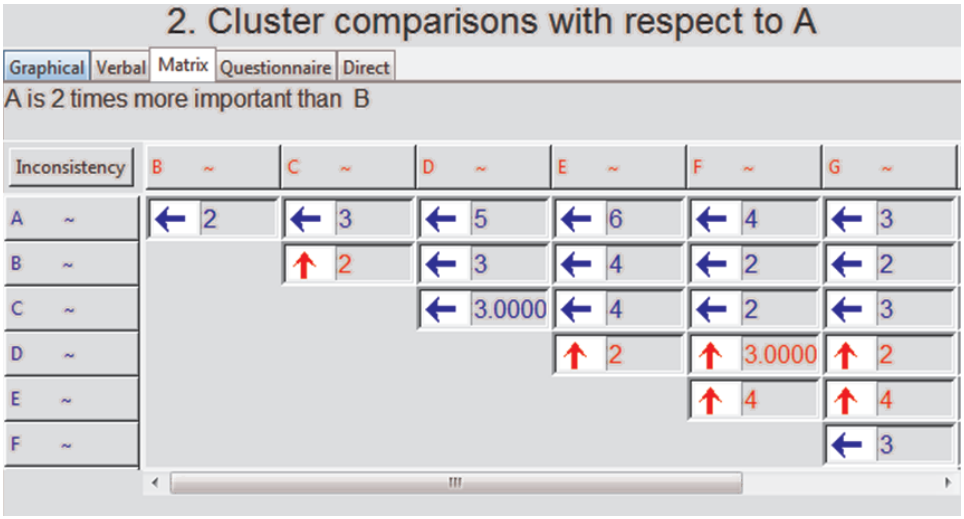

Figure B.1. Screenshots from Superdecision 1.

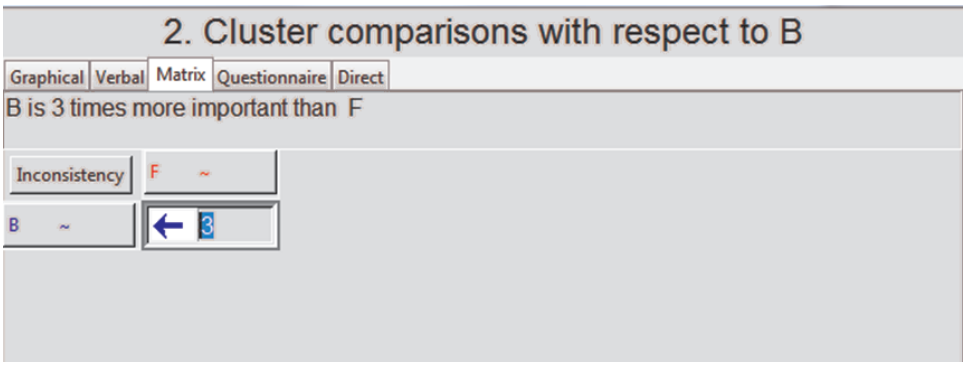

Figure B.2. Screenshots from Superdecision 2.

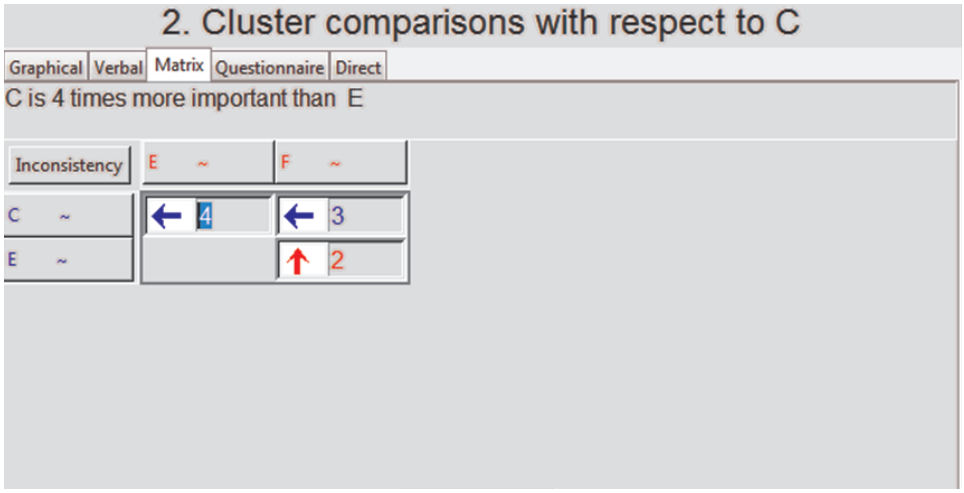

Figure B.3. Screenshots from Superdecision 3.

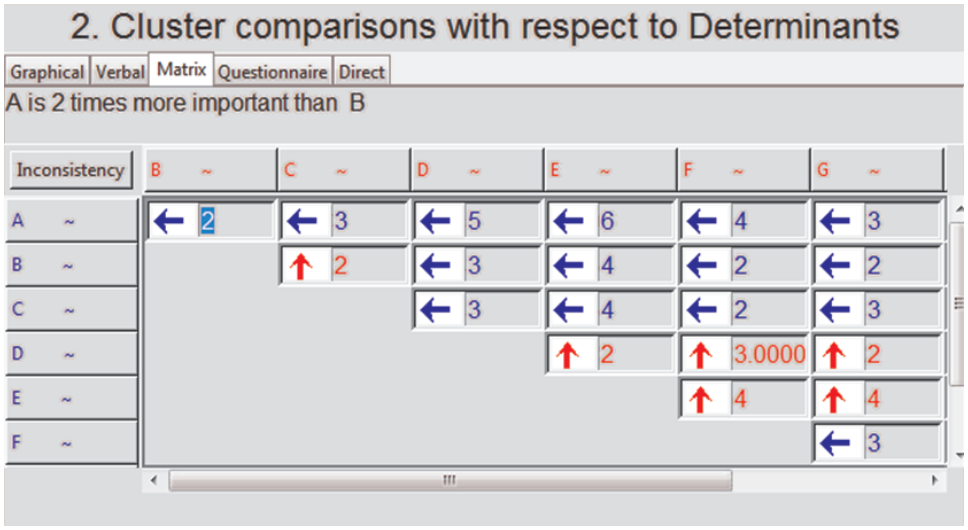

Figure B.4. Screenshots from Superdecision 4.

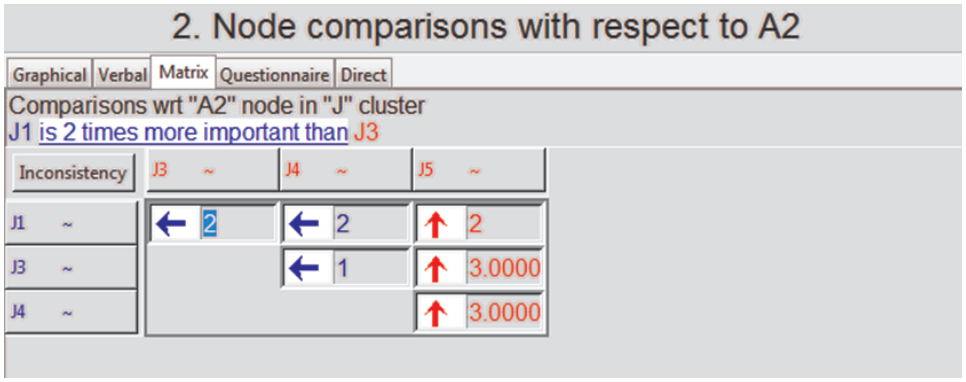

Figure B.5. Screenshots from Superdecision 5.

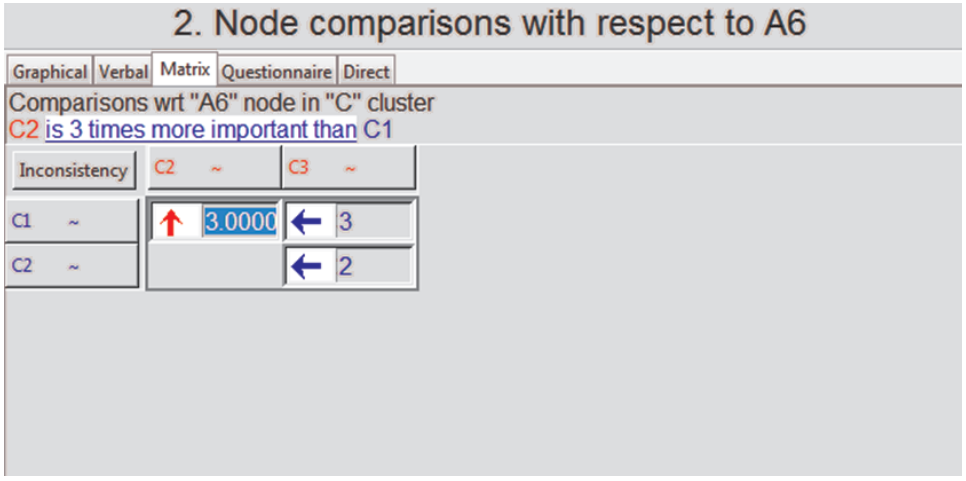

Figure B.6. Screenshots from Superdecision 6.

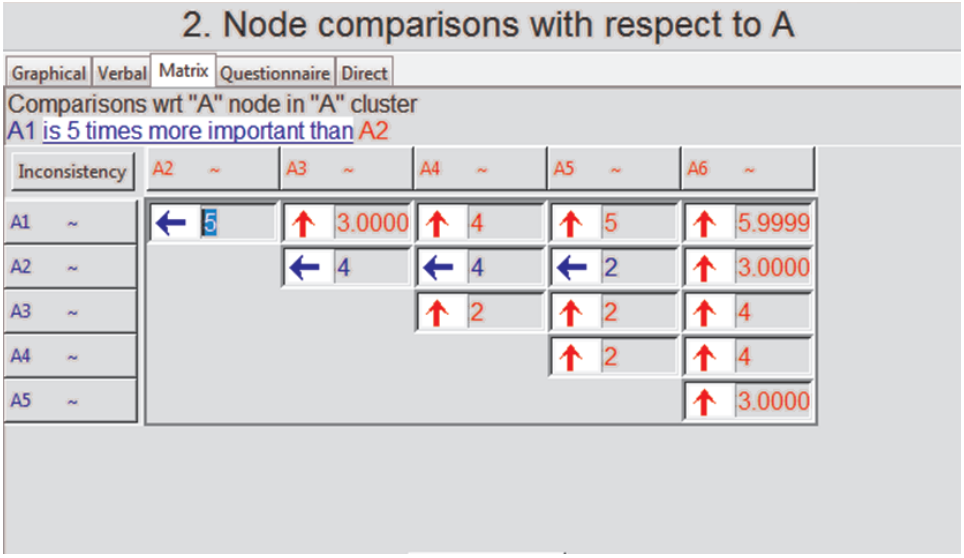

Figure B.7. Screenshots from Superdecision 7.

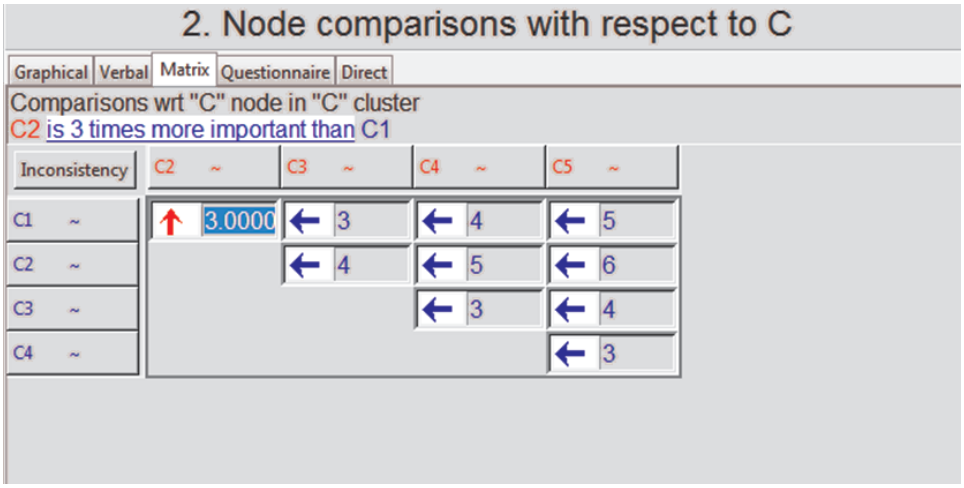

Figure B.8. Screenshots from Superdecision 8.

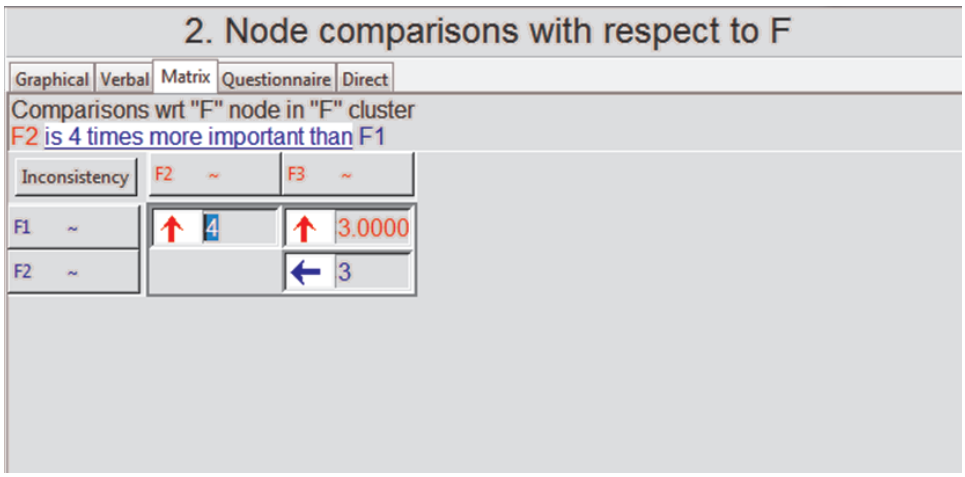

Figure B.9. Screenshots from Superdecision 9.

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