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RESEARCH ARTICLE

# Assessing competitiveness of international contracting firms from the managerial perspective by using Analytic Network Process

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#### **Abstract**

Contracting firms need to assess their competitive position in order to sustain their existence under fierce competition and an increasingly globalized business environment. Competitiveness has been investigated widely by both scholars and practitioners. However, it cannot be assessed easily and measured directly. This study aims to develop a framework to assess competitiveness of international contracting firms from the managerial perspective. In this context, competitiveness factors have been identified based on an extensive literature review. These factors are grouped under nine categories including effectiveness of strategies, managerial capabilities, organizational capabilities, efficiency of technical resources, efficiency of human resources, efficiency of financial resources, effectiveness of relationships, favorability of host country conditions, and favorability of market conditions. An Analytic Network Process (ANP) model is proposed to analyze the interrelations among the model parameters and to compute their importance weights. Analysis results suggest that "effectiveness of strategies" is the most influential cluster that contributes to the competitiveness of the contractors, followed by "organizational capabilities" and "managerial capabilities", respectively. The applicability of the proposed model is tested on ten projects, and the results are found to be satisfactory. The findings of this study are expected to guide contractors in developing appropriate strategies to pursue in international markets and selecting right projects to bid for.

## **Keywords**

 $Project\ Management; Construction\ Industry; Contracting\ Firms; Competitiveness; Analytic\ Network\ Process$ 

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#### 1. Introduction

The increasing number of projects in the world can be attributed to many reasons including faster product cycles, increasing currency of projects, and increasing global competitiveness [1]. No matter in what type of industry a company carries on business, achieving the competitive advantage is the common goal of the company [2]. "Competitiveness is a concept that economists, industrialists, politicians, journalists and academics frequently refer to, debate and worry about" [3].

Many definitions of competitiveness can be found in the literature. The most intuitive definition of competitiveness is "a country's share of world markets for its products" [4]. According to World Competitiveness Yearbook [5], competitiveness is "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."

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Construction is an industry where it is necessary and beneficial to make competitive analysis and use business assessment tools [6]. There are many frameworks to analyze the competitiveness at the industry level including the Diamond Model [7], the Three Dimensions Model [8], the Double Diamond Model [9], the Nine-factor Model [10], Assets-Processes-Performance (APP) Model [11], the Competitiveness Triange [12], and Total Value Competitiveness [13]. Ofori [14] used the Diamond framework to formulate a long-term strategy for Singapore's construction industry. Momaya and Selby [15] conducted a comparison of the competitiveness of the Canadian construction industry in relation to that of the USA and Japan by adopting the APP model. Oz [16] applied the Diamond model to the Turkish construction industry. Shen et al. [13] applied Total Value Competitiveness Framework to Chinese construction industry. Mutti [17] adapted the Double Diamond for assessing the competitiveness of Brazilian contractors in the international market. Deng et al. [18] adopted Porter's Diamond Model to develop potential factors formulating the competitiveness of the construction industry, and uncovered factors that formulate the competitiveness of the Chinese construction industry.

Contracting firms need to competitive position in order to sustain their existence in an increasingly globalized and competitive environment. Besides the models developed at the industry level, many scholars tried to investigate the competitiveness factors that affect construction firms. For example, Hatush and Skitmore [19] constructed five major attributes for assessing a contractor's competitiveness during the pre-qualification and bidding process, including financial soundness, technical ability, management capability, health and safety and reputation. Drew and Skitmore [20] measured a contractor's competitiveness among bids according to the type and size of construction work and the type of client involved. Lai and Guan [21] developed a model to assess a large contractor's competitiveness by using the parameters of organizational ability, marketing

ability, technical ability, financial ability, and image ability. Shen et al. [22] investigated the characteristics of construction business environment in China and identified the key parameters used in assessing contractors' for competitiveness awarding construction contracts in the market. El-Diraby et al. [23] used analytic hierarchy process (AHP) to provide an understanding of how construction companies evaluate market attractiveness and company competitiveness. Ozorhon et al. [24] used casebased reasoning to predict the level competitiveness of a company based on a number of project, market, and host country related factors. Lu et al. [25] identified critical success factors (CSFs) for determining the competitiveness of a contractor in China. Sha et al. [26] developed a competitiveness index to evaluate the industrial competitiveness of ten provinces in China. Orozco et al. [27] presented a study to determine the critical variables that define the competitiveness of Chilean general contractors. Bai et al. [28] proposed an AHP model to analyze essential competitiveness factors for international contractors.

Despite the high number of studies investigating competitiveness at different levels, there is no model analyzing the competitiveness of a contractor in the international markets by the interrelations considering among the determinants of competitiveness. Given this background, the major objective of this paper is to propose an analytic network process (ANP) based competitiveness model for international contracting firms. The model explores the links among various parameters and thereby enables the computation of importance weight of each parameter.

# 2. Competitiveness of contracting firms

There are two main theories of firm competitiveness: competitive advantage and resource-based view (RBV). According to Porter [29], competitive advantage stems from the competitive strategy adopted to deal with the external forces such as opportunities and threats facing an organization [25]. Based on this view, the competitive advantage originates from external

sources rather than internal (firm-specific) sources. Porter [30] later introduced the value chain analysis to define primary and supportive activities within a firm and proposed that the performance of those activities create competitive advantage. The second theory of firm level competitiveness that looks into the resources and capabilities/competencies of the firms is asserted by strategic management scholars. Lu et al. [25] stated that this theory suggests the determinants of competitive advantage as firmspecific resources, which are valuable, rare, nonsubstitutable, and inimitable [31-33]. Proponents shift the focus from the external to internal sources of competitive advantage, by claiming that a firm creates a competitive advantage through the accumulation, development, and use of its unique resources, capabilities, and knowledge.

# 3. Research methodology

The study was conducted in 2014 to develop a framework that can assess contracting firms' competitiveness. For this purpose, firstly, competitiveness parameters affecting construction contractors were identified through an extensive literature review. Competitiveness is defined as the ability of the firms to win contracts in international markets. The initial list of variables included 76 competitiveness factors, which were rearranged and refined into 47 factors to prevent having several factors with similar meanings. To illustrate, "ease of entering the market" and "difficulty in exiting a segment" were merged into "enter/exit barriers". The final list was discussed with industry practitioners including a cost control and reporting director, a vice president, and two board members. Competitiveness factors for contracting firms are combined in 9 groups, namely "effectiveness strategies", "managerial of capabilities", "organizational capabilities", "efficiency of technical resources", "efficiency of human resources", "efficiency of financial resources", "effectiveness of relationships", "favorability of host country conditions", and "favorability of market conditions". Fig. 1 lists the groups and competitive factors located under them.

The proposed model takes both the external and internal factors into account. According to the model, competitiveness depends on both company related factors such as resources and capabilities, and environmental conditions along with how well these factors are exploited through strategies. In that regard, it synthesizes Porter's [29,30] work and RBV. Table 1 shows the definitions and sources of competitiveness factors.

After identifying the determinants of competitiveness, an ANP model was developed to establish and analyze the interrelations among them. The ANP is considered as the most comprehensive framework allowing one to include all the factors and criteria, tangible and intangible [47]. It is an appropriate method to use when the performance assessment model contains a number of interrelated performance criteria, most of which are qualitative rather than quantitative [36]. In this study, to analyze the competitiveness factors, ANP approach was applied. In brief, ANP model consists of the control hierarchies, clusters, elements, interrelationship between elements, and interrelationship between clusters and it is a generic form of AHP [47]. AHP is known as a powerful and flexible multicriteria decision-making method to assist decision makers when both qualitative and quantitative aspects of a decision are considered. The major principle of AHP is the comparison of elements in a decision hierarchy with respect to the controlling criterion at the next higher hierarchical level. However. **AHP** does not allow interdependencies between the components of a problem. The ANP, on the other hand, can accommodate interactions among the model parameters and therefore it is selected as the most appropriate tool for this research.

Many researchers in the construction industry have used ANP to analyze complicated multivariate decision making problems. Niemira and Saaty [48] made use of ANP in their study of forecasting financial crisis. Dagdeviren et al. [49] formed a model to identify total work load level of employees by ANP.

Effectiveness of strategies	Organizational Capabilities	Managerial Capabilities
Diversification of strategies		Site management Knowledge management
☐ Market selection strategies	Experience in similar projects	☐ Time management ☐ Quality management
Project selection strategies	<ul> <li>Flexibility and adaptability to market changes</li> </ul>	Cost management Subcontractor management
Client selection strategies	Organizational culture/structure	Risk management Claim management
Partner selection strategies	☐ Image and reputation	Environmental management
☐ Bidding strategies		Health and safety management
Efficiency of technical resources	Efficiency of human resources	Efficiency of financial resources
Use of IT	Current capacity of human resources	Credibility
☐ Investment in R&D	Development and use of human resources	Financial status
Construction equipment and plant	Communication and coordination among departments	Financial stability
☐ Innovation capability		
Efficiency of relationships	Favorability of host country conditions	Favorability of market conditions
Relationship with clients/owners	Fiscal policy	Enter/exit barriers
Relationship with suppliers / subcontractors	Socio-cultural conditions	Project funding
Relationship with designers / consultants	☐ Economic conditions	Quality of subcontractors / labors
Relationship with government entities	Regulatory and legal restrictions	Availability of construction materials
Relationship with banks and institutions	Political conditions	Competitive environment
	International relations	

Fig. 1. The categorized competitiveness factors

Chen and Wong [50] utilized ANP in developing a model for environmentally conscious construction planning. Ozorhon et al. [36] developed an 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 [51] 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. [52] identified the determinants of business failure in construction and used their ANP model to predict the failure

likelihood of construction companies by assessing their current situation based on both companyspecific and external factors. Erdem and Ozorhon [53] 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.

A 47x47 matrix was used to determine the links between competitiveness factors. Brainstorming sessions were conducted with a team of experts to discuss the interrelations between the model parameters. Then the results were validated with previous work in the literature.

 Table 1. Definition of the competitiveness factors

Factor Sources  Diversification strategies [34,35]  Market selection strategies [25,35]  A. Effectiveness Project selection strategies [35,45]  of strategies Client selection strategies [35,37]  Partner selection strategies [35,36]  Bidding strategies [19,23,38,39,40]  Quality management [13,25,27,34,35,3]  Time management [13,22,23,35,38,4]	
Market selection strategies [25,35] A. Effectiveness Project selection strategies [35,45] of strategies Client selection strategies [35.37] Partner selection strategies [35,36] Bidding strategies [19,23,38,39,40] Quality management [13,25,27,34,35,3]	
A. Effectiveness Project selection strategies [35,45] of strategies Client selection strategies [35.37] Partner selection strategies [35,36] Bidding strategies [19,23,38,39,40] Quality management [13,25,27,34,35,3]	
of strategies Client selection strategies [35.37] Partner selection strategies [35,36] Bidding strategies [19,23,38,39,40] Quality management [13,25,27,34,35,3]	
Partner selection strategies [35,36] Bidding strategies [19,23,38,39,40] Quality management [13,25,27,34,35,3]	
Bidding strategies         [19,23,38,39,40]           Quality management         [13,25,27,34,35,3]	
Quality management [13,25,27,34,35,3	
	38,431
Cost management [13,22,23,25,35,4	
Health and safety management [19,22,23,38,42,4	
B. Managerial Environmental management [13,22,27,44]	
capabilities Risk management [22,25,27,34,43,4	141
Site management [13,25,43,44]	
Claim management [25,42,43]	
Subcontractor management [27,44,46]	
Knowledge management [27,35]	
Knowledge and expertise in the market [22,37,40,42]	
Experience in similar projects [13 24 37 42 46]	
C. Organizational Elayibility and adaptability to market changes [34, 35, 40, 43, 44]	
capabilities Organizational culture/structure [13,23,40,42,44]	
Image and reputation [13,19,22,23,39,4	10. 441
Use of information technology [35,39]	, ,
D. Efficiency of Innovation capability [34.35]	
Investment on research and development [38.39]	
Construction equipment and plant [19,22,42,44]	
Current capacity of human resources [13 22 25 38 42 4	15,46]
Development and use of human resources [35 46]	
human resources Communication and coordination among departments [34,38,41,45,46]	
F. Efficiency of Credibility [22,42,44,46]	
financial Financial status [19,35,42,46]	
resources Financial stability [13,25,42,46]	
Relationship with clients/owners [13,39,41,44]	
G. Effectiveness Relationship with suppliers/subcontractors [13,35,41]	
of relationships  Relationship with designers/consultants  [27,44]	
Relationship with government entities [13,24,27,41,44]	
Relationship with banks and institutions [41,44]	
Regulatory and legal restrictions [23,37,38]	
II Forest-litre of Socio-cultural conditions [23,24,38]	
H. Favorability of Economic conditions [23,27,38]	
host country conditions Fiscal policy [23,37]	
Political conditions [23,27]	
International relations [38]	
Enter/exit barriers [23]	
L Favorability of Project funding [24]	
I. Favorability of market conditions Quality of subcontractors/labors [23,27]	
Availability of construction materials [23]	
Competitive environment [24,27,38]	

Respondents were preferred to be experienced civil engineers, who are senior level managers. Their average experience in construction sector is 19 years. The respondents were chosen from the Turkish contracting firms that are members of the Turkish Contractors Association (TCA) and ranked among the world's Top 225 International Contractors, according to the Engineering News-Record (ENR). The average company age is 47.6. Ten experts participated in the data collection. Although there is no minimum number for the panel size, it is common to conduct the ANP exercise with the participation of three or more experts [52]. Table 2 provides brief information about the

respondents, who attended the brainstorming sessions. It should be noted that all experts are chosen from different companies to obtain as diverse opinions as possible.

The network of interrelations was finalized based on both a synthesis of experts' opinions and literature survey. 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). The top level criterion, which is competitiveness, is composed of 9 clusters as mentioned above. Fig. 2 depicts the interrelations among the clusters of the model.

**Table 2.** Information on the respondents

No	Company's Age (Year)	Respondent's Experience (Year)	Respondent's 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

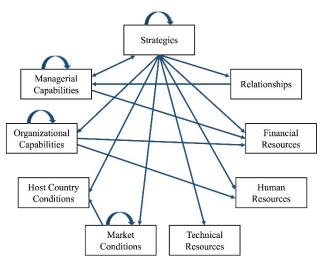


Fig. 2. Interrelations among the clusters

Based on the model, the internal and external factors of competitiveness determine the level of "effectiveness of strategies". Strategies and resources affect the "managerial capabilities", whereas "organizational capabilities" depend on human resources and financial resources. "Market conditions" are affected by host country conditions. Besides the interrelations between these clusters, there are inner dependencies as well. **Nodes** within "strategies", "managerial capabilities", "organizational capabilities", and "market conditions" interact with each other.

After the model was constructed, pairwise comparison matrices were formed based on the interdependencies between the nodes. The pairwise comparisons are made using a nine-point scale. The experts were asked to evaluate these matrices, which were later used to compute the importance weights of the attributes. Tables 3-6 show some examples of the comparison matrices. These include inter-relations between and within clusters and nodes.

**Table 3.** Inter-dependencies between clusters with respect to "competitiveness level"

Competitiveness Level (Goal)	A	В	C	D	E	F	G	Н	I
Effectiveness of strategies (A)		2	3	5	6	4	3	4	3
Managerial capabilities (B)	1/2		1/2	3	4	2	2	3	2
Organizational capabilities (C)	1/3	2		3	4	2	3	3	2
Efficiency of technical resources (D)	1/5	1/3	1/3		1/2	1/3	1/2	1/2	1/2
Efficiency of human resources (E)	1/6	1/4	1/4	2		1/4	1/4	1/3	1/4
Efficiency of financial resources (F)	1/4	1/2	1/2	3	4		3	3	2
Effectiveness of relationships (G)	1/3	1/2	1/3	2	4	1/3		4	3
Favorability of host country conditions (H)	1/4	1/3	1/3	2	3	1/3	1/4		3
Favorability of market conditions (I)	1/3	1/2	1/2	2	4	2	1/3	1/3	

**Table 4.** Inter-dependencies between nodes with respect to "effectiveness of strategies"

Effectiveness of strategies (A)	A1	A2	A3	A4	A5	A6
Diversification strategies (A1)		5	1/3	1/4	1/5	1/6
Market selection strategies (A2)	1/5		4	4	2	1/3
Project selection strategies (A3)	3	1/4		1/2	1/2	1/4
Client selection strategies (A4)	4	1/4	2		1/2	1/4
Partner selection strategies (A5)	5	1/2	2	2		1/3
Bidding strategies (A6)	6	3	4	4	3	

**Table 5.** Inter-dependencies between nodes with respect to "risk management"

Risk management (B6)	B1	B2	B3	B4
Quality management (B1)		1/4	1/5	3
Time management (B2)	4		1	3
Cost management (B3)	5	1		3
Health and safety management (B4)	1/3	1/3	1/3	

Table 6. Inter-dependencies between nodes with respect to "market selection strategies"

Market selection strategies (A2)	I1	I3	I4	I5
Enter/exit barriers (I1)		3	3	1
Quality of subcontractors/labor (I3)	1/3		1	1/2
Availability of construction materials (I4)	1/3	1		1/2
Competitive environment (I5)	1	2	2	

Pairwise comparisons between parameters were performed based on brainstorming sessions of the expert team. This collaborative approach was used to achieve a more reliable model through consensus among the experts. The consistency of judgment needs to be also computed, as it can be a problem during the ANP exercise. In this step, a software package called "Super Decisions" is used to calculate the consistency ratio values (as an indicator of inconsistency of the evaluations). Saaty [54] set three acceptable levels for consistency: 0.05 for a 3 by 3 matrix, 0.08 for a 4 by 4 matrix, and 0.10 for other matrices. Consistency ratios for all matrices were found to be less than the recommended level of 0.10 as set by Saaty [54].

A synthesized matrix, called the "supermatrix", was formed by combining the pairwise comparison matrices to analyze the relationships between the nodes and clusters. 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. The values in the limiting supermatrix are equal to the resultant priorities (importance weights) of the parameters.

#### 4. Results and discussion

The importance weights of clusters and nodes are given in Table 7 and Table 8, respectively. The analysis shows that "effectiveness of strategies" is the most influential cluster that contributes to the competitiveness of the 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 [43]. "Effectiveness of strategies" is followed by "organizational capabilities" and "managerial capabilities", respectively. Bv considering managerial capabilities such as time, cost, risk, claim, and site management, all relevant factors are rated as critical in affecting a contractor's competitiveness, except for the environment and health and safety. Managerial capabilities reflect a contractor's ability to provide clients high quality products or service. Good managerial capabilities help contractors maintain and improve their operational effectiveness and form the competitive advantages in bidding [55]. It should be noted that "efficiency of human resources" and "efficiency of technical resources" are found to be the least influencing factors affecting competitiveness. This might be because without proper strategies and skills, resources cannot be mobilized and they do not solely create competitive advantage

**Table 7.** Importance weights of clusters

able 7. Importance weights of clusters					
Code	Cluster Name	Limiting			
A	Effectiveness of strategies	0.26628			
В	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	Effectiveness of relationships	0.10441			
Н	Favorability of host country conditions	0.06689			
I	Favorability of market conditions	0.06325			

Table 8. Importance weight nodes

Code	Node	Importance Weight	Code	Node	Importance Weight
A6	Bidding strategies	0.08991	D4	Construction equipment and plant	0.01503
C2	Experience in similar projects	0.07868	F1	Credibility	0.01446
F2	Financial status	0.07578	C4	Organizational culture/structure	0.01327
A2	Market selection strategies	0.04454	D2	Innovation capability	0.01249
C1	Knowledge and expertise in the market	0.04386	Н5	Political conditions	0.01213
A5	Partner selection strategies	0.04349	I1	Enter/exit barriers	0.01194
G1	Relationship with clients/owners	0.03839	B10	Knowledge management	0.01168
A1	Diversification strategies	0.03431	В9	Subcontractor management	0.01123
F3	Financial stability	0.03310	H4	Fiscal policy	0.01050
A4	Client selection strategies	0.03122	G3	Relationship with designers/consultants	0.00884
G4	Relationship with government entities	0.02520	E1	Current capacity of human resources	0.00810
B6	Risk management	0.02514	G2	Relationship with suppliers/subcontractors	0.00768
G5	Relationship with banks and institutions	0.02430	Н6	International relations	0.00761
C3	Flexibility and adaptability to market changes	0.02413	C5	Image and reputation/public image	0.00750
В3	Cost management	0.02402	I3	Quality of subcontractors/labor	0.00659
A3	Project selection strategies	0.02279	I4	Availability of construction materials	0.00598
B8	Claim management	0.01953	D3	Investment on R&D	0.00593
I2	Project funding	0.01950	B4	Health and safety management	0.00542
E2	Development and use of human resources	0.01928	B1	Quality management	0.00519
I5	Competitive environment	0.01925	E3	Communication and coordination	0.00510
H1	Regulatory and legal restrictions	0.01720	B5	Environmental management	0.00466
Н3	Economic conditions	0.01677	D1	Use of IT	0.00352
B2	Time management	0.01625	H2	Socio-cultural conditions	0.00268
B7	Site management	0.01583			

In terms of the nodes, "bidding strategies" is found to be the most influencing competitiveness factor. Similar findings can be found in the literature as well. Good bidding technique will enable contractors to win more contracts, which in turn helps to sustain a contractor's competitiveness [25]. 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 [22].

"Bidding strategies" is followed by "experience in similar projects", and "financial status". 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 [39]. Kangari [56] stated that lack of experience in the company's 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. For big-scale projects, prequalification stage is the first step of contractor selection process. It is 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 indicates whether a contractor is suitable to meet obligations required by work. Hence, financial status is a very critical competitiveness factor in the construction business. Dikmen and Birgonul [39] found that experience and financial capability were the major strengths of Turkish contractors. This finding ensures the results found in this study, where experience and financial status are the most influencing competitiveness factors following bidding strategies.

According to the results, "market selection strategies" is also among the top determinants of competitiveness. 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 new regions where a firm has not been active

before. This finding is similar to what has been reported previously by Lu et al. [25].

Another critical competitiveness factor is "knowledge and expertise in the market". The more knowledge and expertise the companies have in the market, the easier it becomes for the companies to get prepared for the bidding process. This factor was cited in the literature in several studies, i.e. Shen et al. [22] and Ajitabh and Momaya [40].

"Partner selection strategies" is another important 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 [57]. 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, therefore partner selection is very critical [36].

"Relationships with clients/owners" should also be mentioned. In some markets, the clients prefer to do repeat business with the contractors, in such cases if the relationships with the clients are strong, then the companies have better chances of being awarded the contracts. Several studies mention the significance of this factor, i.e., Dikmen and Birgonul [39], Shen et al. [13], and Tan et al. [44]. "Diversification strategies" another important factor. According to Cannon and Hillebrandt [58], 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.

"Socio-cultural conditions of the host country", "use of IT", and "environmental management" are

the least influencing factors affecting competitiveness of the contractors. It is interesting to note that although highly cited in the literature [59,60], the importance weight of "investment on R&D" was found to be very low. According to Pries and Janszen [59], firms can gain competitive advantage by innovating and competing on the basis of product or process innovation. This finding may be attributed to the fact that contracting firms are reluctant to innovate, since the output of innovation is not always guaranteed [61]. Rather, contractors try to create competitive advantage by offering low cost and timely construction.

# 4.1. Testing of the model

It was required to test the suitability of the developed model with real cases. The expert team provided international project data for the research. It was requested to score their real projects for 47 competitiveness factors and for their competitiveness level. Table 9 shows information on the real projects for which the success attributes are rated. **Projects** are mainly big scale projects and they infrastructure Kazakhstan, Turkmenistan, Algeria, Libya, UAE, Morocco, Kuwait, Saudi Arabia, Qatar, and Oman.

Projects have a contract value of 50 to 780 Million USD.

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 factor 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 10. Table suggests that the accuracy of the model is satisfactory. The precision for prediction is found to be  $\pm 5\%$ . All of the error rates are less than 10%. The percentage error is calculated by Eq. 1 as follows:

$$Error\% = \frac{Estimated - Actual}{Actual} x 100\%$$
 (1)

It should also be noted that the assessments are highly subjective and they reflect the experience and opinions of Turkish practitioners and the markets that the Turkish contractors operate. The projects are located in Middle East and North Africa. The data can be enriched by adding projects from all around the world and the model may be improved by incorporating the experiences of contractors from other countries.

**Table 9.** Information on the projects

D : .	T	Size			Company
Project	Type	(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	Housing	620	Morocco	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

#### 5. Conclusions

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 was identified for this purpose. A total of 47 factors were collected in 9 interrelated groups. An ANP model was used to analyze the influence of these factors on competitiveness. Data collection was based on the expert opinions from the Turkish construction sector. The analysis shows that "effectiveness of strategies" group of factors is the most influential cluster that contributes to competitiveness, followed by "organizational capabilities" and "managerial capabilities", respectively. This implies that to succeed in the competitive business environment, contractors need to utilize appropriate strategies. Inappropriate choice of strategies may lead to lower profits, productivity, and efficiency. Besides, resources of the companies should be converted into capabilities that have the potential to increase competitiveness. Resources solely have limited capacity to create competitive advantage.

The factors presented in this study can be applied to build an orderly process to develop competitive strategy of a contracting firm. First of all, strategies employed by a firm serve as a tool to achieve firm's goals and sustain its competitive advantage. Hence, building effective strategies is most important factor in terms competitiveness. Secondly, firm capabilities show how successfully it converts strategies into actions and directly reflect the results of the strategies adopted. Hence, the results in this study are reasonable in terms of the importance weights of the factors. Thirdly, a firm's resources such as financial, technical, and human resources can be perceived as valuable assets that need to be mobilized enhance competitiveness by employing appropriate strategies. relationships should be carefully managed since they affect a firm's competitive advantage. Finally, external factors such as country conditions and

market conditions should be carefully monitored by contracting firms. Environmental scanning is one of the most important components of strategic analysis. Therefore, potential market search should be done to identify the opportunities and threats. A firm becomes 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 before entering into a new market and enhance these if necessary.

This study adopted ANP to develop and effective model to assess competitiveness. However, there are a number of limitations of the study. Firstly, the findings reflect the experiences of the Turkish contractors. A similar model may be developed to incorporate different views and experiences from other countries. Secondly, the model was validated only by 10 case studies. To have more accurate results, data should be collected from more and diverse markets.

# **Declaration of conflicting interests**

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