

## Identifying the key competitiveness indicators for construction contractors



Vy Dang Bich Huynh<sup>1</sup>, Phong Thanh Nguyen<sup>2,\*</sup>, Thu Anh Nguyen<sup>3</sup>, Quyen Le Hoang Thuy To Nguyen<sup>4</sup>, Tien Thi Hoai Nguyen<sup>3</sup>

<sup>1</sup>Department of Learning Material, Ho Chi Minh City Open University (HCMCOU), 97 Vo Van Tan Street, District 3, Ho Chi Minh City, Vietnam

<sup>2</sup>Department of Project Management, Ho Chi Minh City Open University (HCMCOU), 97 Vo Van Tan Street, District 3, Ho Chi Minh City, Vietnam

<sup>3</sup>Department of Construction Engineering and Management, Ho Chi Minh University of Technology (HCMUT), Ho Chi Minh City, Vietnam

<sup>4</sup>Office of Cooperation and Research Management, Ho Chi Minh City Open University (HCMCOU), 97 Vo Van Tan Street, District 3, Ho Chi Minh City, Vietnam

### ARTICLE INFO

#### Article history:

Received 28 September 2018

Received in revised form

6 February 2019

Accepted 10 February 2019

#### Keywords:

Civil engineering

Competitiveness indicator

Construction contractor

Project management

### ABSTRACT

In today's context of international economic integration and globalization, competition is an objective rule in the commodity production system. Competition is also part of the operational mechanisms of the global market economy. To improve enterprise competitiveness, construction companies need to be concerned. The process involves assessing the competitiveness of the contractors operating in construction activities and the publication of the ranking results to create transparency in the selection of the contractors and improve the quality of the bidding competition. This research identified the indicators necessary for assessing the competitiveness of a contractor in civil and industrial engineering in Vietnam. A survey was used to collect the data for the analysis. The results illustrate that the key competitiveness indicators (KCI) aggregated in six main groups: (1) management skills, (2) financing ability, (3) contractor image, (4) human resources strength, (5) relationships and marketing ability, and (6) technical capacity. This result provides useful information necessary to help construction contractors better understand their strengths and weaknesses and then take the related actions necessary to improve and develop their competitive strategies.

© 2019 The Authors. Published by IASE. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

Globalization is becoming an objective trend in world economic development (Majidi et al., 2018; Sachs et al., 1995). International economic integration helps open up the economy, realize trade liberalization, and engage enterprises in international competition. International competition has also resulted in uneasy challenges for the economy and the enterprises of each country (Avazzadeh, 2015; Mytelka, 2000).

In Vietnam, competition among construction companies, in general, and construction contractors, in particular, is occurring in a very fierce and serious

manner (Ling et al., 2009; Nguyen et al., 2018a). Each enterprise has to face challenges (e.g., improving construction quality products, shortening construction duration, providing warranty services to meet the requirements and demands of customers better). In addition, enterprises are facing new challenges. Therefore, they have to continually promote their images to strengthen their reputation and brands in the market.

For construction businesses, especially construction contractors, to be able to make the most out of future opportunities, it is necessary for them to formulate comprehensive development strategies to adapt to industrial changes and establish a strategy to improve their competitive capacity (Powmya et al., 2017). In this way, companies may be able to develop and seek projects, develop quality and sustainable buildings, and provide a high return on investment. In addition, the construction sector may grow sustainably and achieve a well-positioned and competitive position,

\* Corresponding Author.

Email Address: [phong.nt@ou.edu.vn](mailto:phong.nt@ou.edu.vn) (P. T. Nguyen)

<https://doi.org/10.21833/ijaas.2019.04.007>

Corresponding author's ORCID profile:

<https://orcid.org/0000-0002-6180-2520>

2313-626X/© 2019 The Authors. Published by IASE.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

both regionally and internationally (Jamil and Fathi, 2016). Consequently, the construction contractor should have a proper understanding of the competitive capacity assessment criteria and understand their specific resources to create a competitive advantage and strategy to win the contract. This paper identifies the key competitiveness indicators (KCI) for assessing the competing capacities of the construction contractors.

## 2. Research background

The competition concept can be used for the evaluation of enterprises, industries, countries, and even inter-country regions. For example, the goal of a country is to raise the living and well-being standards of its people, while the goal of an enterprise, is to survive and obtain profits on a competitive basis. According to Allman (2001), competition is the fierce contest and struggle between capitalists to win favorable conditions in the production and consumption of goods to achieve excessive profits. In economic perspectives, competition is the rival ship between competing businesses to win customers and the market share. An organization can respond to and compete with its competitors in providing products or services sustainably and profitably.

Although there are many different ways of defining competition, generally, this concept includes several essential components (Bernstein and Gauthier, 1998). Firstly, upon mentioning competition, it refers to the contest to become the winner out of many participants. Secondly, the direct purpose of the competition is a specific object that all parties want to win (e.g., an opportunity, a product, a project) or a variety of beneficial conditions (e.g., a market, a customer). In particular, the ultimate goal of competition is to earn a large profit. Thirdly, competition takes place in a particular environment, with common constraints that the parties must adhere to (e.g., product characteristics, market conditions, legal conditions, business practices). Finally, in the competition process, competing parties may use a variety of tools (e.g., product characteristics, product quality, product price (e.g., low price policy, high price policy, stable price policy, market pricing, price differentiation policy, dumping policy); competing by the art of consuming the products (e.g., organizing consumption channels); competing by offering good sale services; and competing by means of payment).

Competitive capacity is the ability to gain a significant market share from competitors in the market. This includes the ability to retain some, or the entire, market share (Bashyam, 1996). In other words, the competitive capacity of the company is demonstrated as its strengths and advantages in comparison with its competitors in meeting customers' demands and obtaining a higher profit. It is the comparison between the capabilities and activities of a business, a manufacturing sector, or a country, to sell and provide the goods or services in a

defined market. No single company is capable of satisfying all of the customers' requirements. Instead, it only has the advantages in some aspects. The basic problem is that businesses must recognize this fact and try to promote the strengths that they have to meet the customers' requirements.

Customers' requirements are the benchmark for assessing a company's competitive capacity. This is because customers are both the target and motive force behind business production. The strengths and weaknesses within an enterprise are manifested through key business areas (e.g., marketing, finance, manufacturing, human resources, technology, governance, information systems). The proper assessment of business strengths and weaknesses are important in determining the solutions necessary to improve the competitive capacity. A business is just one cell of the economy. This cell is an important element in determining the national competitive capacity. Increasing business competitive capacity is one of the critical goals for improving the national competitive capacity.

At the micro level, competitive enterprises are those enterprises that achieve higher than average levels in the quality of goods and services. These enterprises can also cut down relatively allowable costs, thereby allowing them to increase the profit and market share (Dunford et al., 2001). This definition reflects a relatively broad aspect of an enterprise's competitive capacity, as it clearly states the objectives of the competition and the essential characteristics of successful competition. In other words, to compete successfully, enterprises must have competitive advantages in the form of lower production costs or the ability to differentiate products to achieve higher than average prices. (Porter, 2011). To maintain their competitive advantages, enterprises need to provide higher quality goods or services or produce with higher efficiency.

Some research papers are related to the assessment of a contractor's competitive capacity. Shen et al. (2006) conducted a study on the crucial competitiveness indicators of significant construction contractors in China. This involved several steps: (i) Step 1: establish a list of competitive capacity indicators for a contractor, (ii) Step 2: determine the method to assess the meaning of such criteria, and (iii) Step 3: establish a quantitative model to identify the KCIs. The authors provided 45 indicators for the competitive capacity, including six groups: (1) social impacts, (2) technical capacity, (3) financial capacity, (4) relationships with partners, (5) management systems, and (6) human resources.

Tan et al. (2007) conducted a study on the indicators of the competitive capacity of construction contractors in Hong Kong. Based on the analysis of the data collected, using a questionnaire distributed to 338 contractors, the authors provided a list of 88 indicators for measuring the competitive capacity of a contractor. These indicators were categorized into six main groups: (i) corporate image

measurement, (ii) technical capability measurement, (iii) financial capability measurement, (iv) marketing capability measurement, (v) management skills, and (vi) human resource strength.

In Tan et al. (2007) study, the Relative Importance Value (RIV) was used as a standard for identifying the KCIs. A high RIV indicator indicates that this indicator has a more significant impact on the competitive capacity of the contractor. The selected indicators are RIV values that are greater than the mean value of each part. Over 50% of the rankings had a value of 4 or 5. In addition, to validate the validity of the KCIs, a workshop was conducted to collect information from group discussions and produce a list of the final indicators: 36 factors that significantly influenced the competitive capacity of a construction contractor.

Darvish et al. (2009) applied graph theory and matrix methods to rank contractors in Iran. The authors present the nine main indicators for rating contractors: (1) work experience, (2) technology and equipment, (3) management, (4) experience and knowledge of the operations team, (5) financial stability, (6) quality, (7) familiarity with the area or country, (8) substitution, (9) creativeness and innovation.

Tan et al. (2011) conducted a preliminary study in Hong Kong on the practices of sustainable construction and the competitive capacity of construction contractors. The authors concluded that, when facing higher requirements in the construction sector, contractors that carry out sustainable operations will also become the source of competitive advantage in the future. The implementation of sustainable construction activities can contribute to improving the quality of the contractor's performance. The concept of sustainable construction focuses on creating a sustainable environment that is based on six principles: (i) minimize resource consumption, (ii) maximize resource reuse, (iii) use renewable or recycled sources, (iv) protect the natural environment, (v) generate a healthy, non-toxic environment, and (vi) pursue quality in creating a construction environment. This study evaluated sustainable practices in the construction sector and the given practical requirements: compliance with the law on sustainability; design and procurement; technology and innovation; organizational structure and process; education and training; measurement and report.

Setiawan et al. (2015) investigated the competitive capacity of Indonesian contractors. This study aimed to clarify the competitive issues of the contractors by interviewing the top 19 managers from contractors in Indonesia, thereby exploring the concept of contractor competition. The results identified five critical elements of contractor competition: (i) solve problems for customers; (ii) difference from competitors; (iii) build and maintain the trust of customers; (in) maintain good relationships with customers; and (v) position yourself in the market with a focus on quality.

In Nigeria, Oyeyipo et al. (2016) conducted a study on the factors that influence contractors' bidding decisions in construction projects; they also assessed their importance. The study used 100 questionnaires. The questions were based on the Likert rating scale. The study found that 48 factors influenced the bid price decisions. The three factors with the highest average rating included: (i) the financial capacity of the customer, (ii) the availability of funds, and (iii) the availability of building materials.

### 3. Research methodology

The research process consisted of the following three steps:

(i) Step 1: Identify the 66 indicators necessary for assessing the competitor's competitive capacity; base the indicators on the domestic and international literature review. Interview construction experts to screen for suitable indicators for the construction environment in Vietnam. Develop a questionnaire with 36 key competitiveness indicators for the assessment of the capacity of the construction contractors.

(ii) Step 2: Perform a pilot test by distributing the questionnaires to experts to answer, comment on, correct and add to the list of indicators proposed. Formulate the official questionnaire. Base the survey responses on the 5-point Likert scale. Survey respondents will be people working in the civil and industrial construction fields. In this survey, we adopt the convenient sampling method technique. 241 surveys were distributed; 141 (63.8%) were returned.

(iii) Step 3: Perform an analysis of the collected data, analysis of the results, and rating of the competitiveness indicators of the construction contractors.

### 4. Results and discussion

The descriptive statistical analysis and the rankings, by the mean values of the competitiveness indicators, were assessed. Table 1 illustrates the five key indicators with the highest influence on the competitive capacity of construction contractors in Vietnam: (1) construction method, (2) quality management, (3) experienced staff, (4) relationship with the project owner, and (5) schedule management.

**Table 1:** Key competitiveness indicators of construction contractors in Vietnam

No.	Key competitiveness indicators	Mean	Ranking
1	Construction methods	4.35	1
2	Quality management	4.31	2
3	Experienced staff	4.22	3
4	Relationship with the project owner	4.21	4
5	Schedule management	4.20	5

Construction methods are the most crucial factor to consider in assessing the competitive capacity of

construction contractors. These methods illustrate the order and manner of implementing a construction investment project from the beginning to the end. Each construction structure has a separate construction method that is applied consistently, from commencement to finish. To organize a suitable construction method, it is vital to first determine the priority objectives (e.g., quality, progress, cost, safety) (Nguyen and Quyen, 2017; Rehacek, 2017). Each objective will be associated with a different direction (Nguyen et al., 2018b). The next step is to determine the company's potential for machinery, labor, technology, and material supply ability.

The construction method is an excellent measure to utilize the appropriate resources of construction contractors. It should be easy to implement and highly efficient. It is especially important to ensure the quality and minimize the costs and construction period. The results illustrated that a project owner has the most interest in this factor, as it dramatically affects the progress, quality, and cost of the project. According to the Bidding Law of Vietnam, the bidding documents of a project must always have indicators for evaluating a bid by reviewing the construction method. In fact, an owner requires the contractors to maintain a detailed, reasonable and clear construction plan to prove that the implemented plan is the most optimal and meets the time requirements.

The management capacity demonstrates the ability to deliver high-quality products and services to customers. In particular, quality management is the second most important factor in evaluating the contractors' competitive capacity. In developing countries (e.g., Vietnam), the quality of project management is always a principal concern (Nguyen and Quyen, 2017; Sohu et al., 2018).

Construction enterprises are encouraged to apply ISO 9001 standards to create scientific practices and consistency in their work. Indeed, an enterprise that wants to continuously grow, achieve high profits and continuously maintain high-profit margins, must definitely have a strict quality management system and promote the effectively available resources. Throughout the study, ISO experts have identified 8 principles that should be considered as the foundation for building the standard of a quality management system: (1) customer orientation, (2) responsibility of the leader, (3) participation of all concerned parties, (4) process approach, (5) systematic approach, (6) continuous improvement, (7) event-based decision-making, and (8) mutual cooperation with suppliers.

Quality management has also been mentioned; it obtains quite a high position in the previous studies around the world (Darvish et al., 2009; Lu et al., 2008; Setiawan et al., 2015; Shen et al., 2006; Tan et al., 2007). This is not only a great concern of owners, but also for the development of the state. Vietnam's system of legal documents has clearly defined the provisions of the quality management of work in Decree No. 46/2015/ND-CP. Bidding documents also

provide clear regulations on the type of supplies; this is one of the factors that affects the quality of the project.

In today's construction sector, every aspect of science and technology is increasingly innovated. Advanced machinery is used to meet the increasing demand for production. In parallel with the development of science and technology, the human factor is always considered (Nguyen and Nguyen, 2015). Technical staff and experienced, qualified and highly trained staff are trained systematically; this is an essential factor contributing to the success and sustainable development of a contractor. Moreover, owning a strong personnel force also helps the contractor meet the owner's requirements in the personnel assessment, when participating in the project bidding process.

The experienced staff factor has been studied in many works around the world (Darvish et al., 2009; Oyeyipo et al., 2016; Shen et al., 2006; Tan et al., 2007). Most of the published research highly appreciates the role of personnel, especially experienced staff/workforce. This can be considered the greatest intangible asset, the gray matter that a construction contractor or business needs. It can be said that competent personnel are an essential factor in the assessment of the contractor's competitive capacity.

The relationship between the owner and the contractor in the performance of the construction contract is an equal partnership. In practice, however, the contractor is still in a lower position as an employee hired by the project owner (Hinze and Tracey, 1994). Whenever a construction project is delayed, or its quality is questionable, the first thing that many people will think of is the poor or inadequate performance of the contractor. Nevertheless, the reason may still belong to the owner, for example, because the owner makes a late payment, compared to the contractual progress, or the owner makes changes to the construction process.

As Vietnam is a developing country, most of the investment from the state budget is considerable. If a business has a good relationship with the owners, who are State management agencies, there will be many opportunities to win large-scale projects managed by the State. These projects include infrastructure projects, such as bridges, roads, airports, and social projects (e.g., schools, hospitals, trade centers, sports centers) (Nguyen and Likhitrungsilp, 2017).

Finally, schedule management is one of the indicators used to assess the technical capacity of the contractor. The construction schedule of the work performed by the contractor must be in line with the overall progress of the project approved by the project owner (Luong et al., 2018; Nguyen et al., 2018c). The purpose of planning and managing the project schedule is to set the sequence of tasks (Khan et al., 2017). In the meanwhile, it is performed by the set objectives, specific implementation conditions, and specific requirements on human resources,

equipment, and materials, as well as the financial and legal regulations. In this way, the organization can complete the best quality projects, in the shortest construction time and at the lowest cost (Lu et al., 2008; Oyeyipo et al., 2016; Shen et al., 2006; Tan et al., 2007).

The indicators related to the management of the schedule and project duration are also mentioned in a number of studies around the world. It has a vital role in the content of construction project management (i.e., time, quality, cost). The success of the project is most likely to be met on schedule, as it entails many other economic benefits (e.g., reduced investment costs, early hand-over for operations). These will ensure the return of the investment capital for the project. Therefore, schedule management should be paid special attention by the parties involved in the project implementation process.

## 5. Conclusion

The assessment of the competitive capacity of construction contractors is not merely governed by one or two factors; it is influenced by many factors. Based on the summary of previous studies and field surveys, this study has identified the key indicators for assessing the competitive capacity of civil and industrial construction contractors in Vietnam. They are classified into six main groups: (i) management skills, (ii) financing ability, (iii) contractor image, (iv) human resources strength, (v) relationships and marketing ability, and (vi) technical capacity.

The research results can help the contractors to obtain a comprehensive view of their competitive capacities. It can also help them to better understand their strengths and weaknesses, as well as their abilities to position themselves in the market. This information can be used to formulate proper measures to use resources efficiently and create the motivation for construction companies to actively establish proper and sustainable development strategies in line with practical conditions. This will enhance the competitiveness of their bids in the domestic construction markets and the requirements of the context of international integration.

## Acknowledgment

The authors gratefully acknowledge Ho Chi Minh City Open University (HCMCOU), 97 Vo Van Tan Street, District 3, Ho Chi Minh City, Vietnam for supporting this research.

## Compliance with ethical standards

## Conflict of interest

The authors declare that they have no conflict of interest.

## References

- Allman P (2001). Critical education against global capitalism: Karl Marx and revolutionary critical education. Greenwood Publishing Group, Westport, Connecticut, USA.
- Avazzadeh E (2015). Investigation the effect of customer relationship management on customer's loyalty and satisfaction (Case study: Shiraz city Refah chain stores). *International Journal of Advanced and Applied Sciences*, 2(2): 11-15.
- Bashyam T (1996). Competitive capacity expansion under demand uncertainty. *European Journal of Operational Research*, 95(1): 89-114.  
[https://doi.org/10.1016/0377-2217\(95\)00170-0](https://doi.org/10.1016/0377-2217(95)00170-0)
- Bernstein AB and Gauthier AK (1998). Defining competition in markets: Why and how?. *Health Services Research*, 33(5): 1421-1438. **PMid:9865227 PMCID:PMC1070327**
- Darvish M, Yasaei M, and Saeedi A (2009). Application of the graph theory and matrix methods to contractor ranking. *International Journal of Project Management*, 27(6): 610-619.  
<https://doi.org/10.1016/j.ijproman.2008.10.004>
- Dunford M, Louri H, and Rosenstock M (2001). Competition, competitiveness, and enterprise policies. In: Hall R, Smith A, and Tsoukalis L (Eds.), *Competitiveness and cohesion in EU policies*: 109-146. Oxford University Press, Oxford, UK. **PMCID:PMC1314007**
- Hinze J and Tracey A (1994). The contractor-subcontractor relationship: The subcontractor's view. *Journal of Construction Engineering and Management*, 120(2): 274-287.  
[https://doi.org/10.1061/\(ASCE\)0733-9364\(1994\)120:2\(274\)](https://doi.org/10.1061/(ASCE)0733-9364(1994)120:2(274))
- Jamil AHA and Fathi MS (2016). The integration of lean construction and sustainable construction: A stakeholder perspective in analyzing sustainable lean construction strategies in Malaysia. *Procedia Computer Science*, 100: 634-643.  
<https://doi.org/10.1016/j.procs.2016.09.205>
- Khan RA, Gazder U, and Qayoom A (2017). Comparison of delay factors and remedies' rankings for building construction projects in developing countries. *International Journal of Advanced and Applied Sciences*, 4(4): 33-42.  
<https://doi.org/10.21833/ijaas.2017.04.006>
- Ling FYY, Pham VMC, and Hoang TP (2009). Strengths, weaknesses, opportunities, and threats for architectural, engineering, and construction firms: Case study of Vietnam. *Journal of Construction Engineering and Management*, 135(10): 1105-1113.  
[https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0000069](https://doi.org/10.1061/(ASCE)CO.1943-7862.0000069)
- Lu W, Shen L, and Yam MC (2008). Critical success factors for competitiveness of contractors: China study. *Journal of Construction Engineering and Management*, 134(12): 972-982.  
[https://doi.org/10.1061/\(ASCE\)0733-9364\(2008\)134:12\(972\)](https://doi.org/10.1061/(ASCE)0733-9364(2008)134:12(972))
- Luong DL, Tran DH, and Nguyen PT (2018). Optimizing multi-mode time-cost-quality trade-off of construction project using opposition multiple objective difference evolution. *International Journal of Construction Management*.  
<https://doi.org/10.1080/15623599.2018.1526630>
- Majidi AF, Gowdini S, and Moradiafshar PA (2018). Energy exports, globalization and economic growth: Evidence from OPEC countries. *International Journal of Advanced and Applied Sciences*, 5(2): 118-126.  
<https://doi.org/10.21833/ijaas.2018.02.019>
- Mytelka LK (2000). Local systems of innovation in a globalized world economy. *Industry and Innovation*, 7(1): 15-32.  
<https://doi.org/10.1080/713670244>
- Nguyen PT and Quyen NLHTT (2017). Application fuzzy multi-attribute decision analysis method to prioritize project

- success criteria. In the AIP Conference Proceedings, AIP Publishing, 1903(1): 070011.
- Nguyen PT and Likhitrungsilp V (2017). Identification risk factors affecting concession period length for public-private partnership infrastructure projects. *International Journal of Civil Engineering and Technology*, 8(6): 342-348.
- Nguyen PT, Nguyen NV, Pham HL, Nguyen AT, Nguyen QTTHL, Huynh DBV (2018a). Application of supply chain management in construction industry. *Advances in Science and Technology Research Journal*, 12(2): 11-19.  
<https://doi.org/10.12913/22998624/92112>
- Nguyen PT, Nguyen TA, Nguyen QLHTT, Huynh VDB (2018b). Application of SWOT for construction company quality management using building information modelling. *Journal of Mechanics of Continua and Mathematical Sciences*, 13(5): 25-33.  
<https://doi.org/10.26782/jmcms.2018.12.00003>
- Nguyen PT, Nguyen TA, Nguyen QLHTT, Huynh VDB and Vo KD (2018c). Ranking project success criteria in power engineering companies using fuzzy decision-making method. *International Journal of Advanced and Applied Sciences*, 5(8): 91-94.  
<https://doi.org/10.21833/ijaas.2018.08.011>
- Nguyen TA, and Nguyen PT (2015). Explaining model for supervisor's behavior on safety action based on their perceptions. *Journal of Engineering and Applied Sciences*, 10(20): 9562-9572.
- Oyeyipo O, Odusami KT, Ojelabi RA, and Afolabi AO (2016). Factors affecting contractors' bidding decisions for construction projects in Nigeria. *Journal of Construction in Developing Countries*, 21(2): 21-35.  
<https://doi.org/10.21315/jcdc2016.21.2.2>
- Porter ME (2011). *Competitive advantage of nations: Creating and sustaining superior performance*. Simon and Schuster, New York, USA.
- Powmya A, Abidin NZ, and Azizi NSM (2017). Contractor firm strategies in delivering green project: A review. In *Proceedings of the International Conference of Global Network for Innovative Technology and Awam International Conference in Civil Engineering (Ignite-Aicce'17): Sustainable Technology and Practice for Infrastructure and Community Resilience*, AIP Publishing, Penang, Malaysia, 1892(1): 160009.  
<https://doi.org/10.1063/1.5005776>
- Rehacek P (2017). Risk management standards for project management. *International Journal of Advanced and Applied Sciences*, 4(6): 1-13.  
<https://doi.org/10.21833/ijaas.2017.06.001>
- Sachs JD, Warner A, Åslund A, and Fischer S (1995). Economic reform and the process of global integration. *Brookings Papers on Economic Activity*, 1995(1): 1-118.  
<https://doi.org/10.2307/2534573>
- Setiawan H, Erdogan B, and Ogunlana SO (2015). Competitive aggressiveness of contractors: A study of Indonesia. *Procedia Engineering*, 125: 68-74.  
<https://doi.org/10.1016/j.proeng.2015.11.011>
- Shen LY, Lu WS, and Yam MC (2006). Contractor key competitiveness indicators: A China study. *Journal of Construction Engineering and Management*, 132(4): 416-424.  
[https://doi.org/10.1061/\(ASCE\)0733-9364\(2006\)132:4\(416\)](https://doi.org/10.1061/(ASCE)0733-9364(2006)132:4(416))
- Sohu S, Ullah K, Jhatial AA, Jaffar M, and Lakhari MT (2018). Factors adversely affecting quality in highway projects of Pakistan. *International Journal of Advanced and Applied Sciences*, 5(10): 62-66.  
<https://doi.org/10.21833/ijaas.2018.10.009>
- Tan Y, Shen L, and Yao H (2011). Sustainable construction practice and contractors' competitiveness: A preliminary study. *Habitat International*, 35(2): 225-230.  
<https://doi.org/10.1016/j.habitatint.2010.09.008>
- Tan YT, Shen LY, Yam MC, and Lo AA (2007). Contractor key competitiveness indicators (KCIIs): A Hong Kong study. *Surveying and Built Environment*, 18(2): 33-46.