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CRITICAL SUCCESS FACTORS IN CONSTRUCTION PROJECTS AND MEASURING PROJECT SUCCESS

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Abstract

The building sector, which emerged with humanity's need for shelter and became increasingly complex with the increasing demands and desires of societies over time in parallel with the development of technology, has led the relevant sector stakeholders to make some changes within the framework of the elements and dynamics it contains. The ever-accelerating population growth in the world has disrupted the supply-demand balances, especially because of regional concentrations after the industrial revolution. In this regard, construction companies, which are important stakeholders of the building industry, have had to take a position to complete projects with optimum quality, cost, and time with the aim of increasing profit margins. Measuring project success in the construction industry is essential for interpreting project results. The purpose of this study is to test the usability of a standard project success measurement method, which evaluates project success objectively and subjectively, in developing countries. As a result of the study, a general evaluation of success measurement in construction projects will be made, where a construction project success measurement method can be used will be discussed, and various suggestions regarding construction project success measurement in developing countries will be included.

Keywords: *construction projects, success factors, measurement, risk JEL Classification: C51*

Introduction

Projects differ from other works in that they have certain budget, time and quality constraints, and the combination of limited human and non-human resources. Construction projects have various features that are different from other projects (Al-Hal-laq K. Mohamed, and Enshassi, S., 2006).

These can be listed as the uniqueness of each project, its complexity, its variable and risky characteristics, and its ability to combine different labor groups. The study generally focuses on the concept of project success. First, project success definitions of various researchers in the literature will be included. Then, the critical project success

factors identified by various researchers in the literature will be listed.

After the critical project success factors are listed, project success measurement approaches in the literature will be defined. Studies of various researchers regarding success measurement criteria will be examined.

Jeffrey K. Pinto is a researcher who has conducted important studies on project success. According to Pinto, project success is based on many measures including cost, work schedule and performance criteria. The cost criterion relates to the necessity of completing the project close to the specified budget. The work schedule criterion is also related to the importance of completing the project on time, within the specified time limit (Pinto, J. K., 1986).

Research methodology

In the study, two different methods serving different purposes were used which are literature review method and field research method:

Literature research method:

- *To list the critical success factors that are generally effective in projects;*
- *To establish general project success measurement criteria;*
- *To examine the critical success factors required for construction project success;*
- *Examining success measurement methods in construction projects;*
- *It served the purpose of introducing CPSS as a construction project success measurement method applied in developed countries.*

The field research method was used to test the usability of a standard project success measurement method, which evaluates project success objectively and subjectively, in developing countries. In this regard, field research method:

- *To apply the same CPSS applied in developed countries in developing countries;*
- *Evaluating the success of projects in developing countries relative to each other;*
- *It served the purpose of comparing the application results in developed and developing countries and creat-*

ing a standard measurement method in order to test the usability of a standard success measurement method such as CPSS in developing countries.

Critical Project Success Factors

Critical success factors are factors that affect the success of projects and, when taken into consideration, will increase the chance of project success (Davies and Cooke, T., 2002). Identifying these factors and revealing their importance will allow project managers to be prepared for these issues and take the necessary precautions in advance. In the literature, various researchers have determined project success factors theoretically, without basing them on specific data. In addition, there are empirical studies on critical project success factors using these theoretical studies.

Features of Construction Projects

The important features of construction projects that make them different from other projects can be listed as follows. The uniqueness of each project: Every construction project is different and unique. Each project has its own unique influencing factors, so each requires different management techniques (Beck, R., Wysocki, R. and Crane D., 2003).

Complexity characteristic: Construction projects have different phases. Various areas of expertise and organizations are active in each different phase.

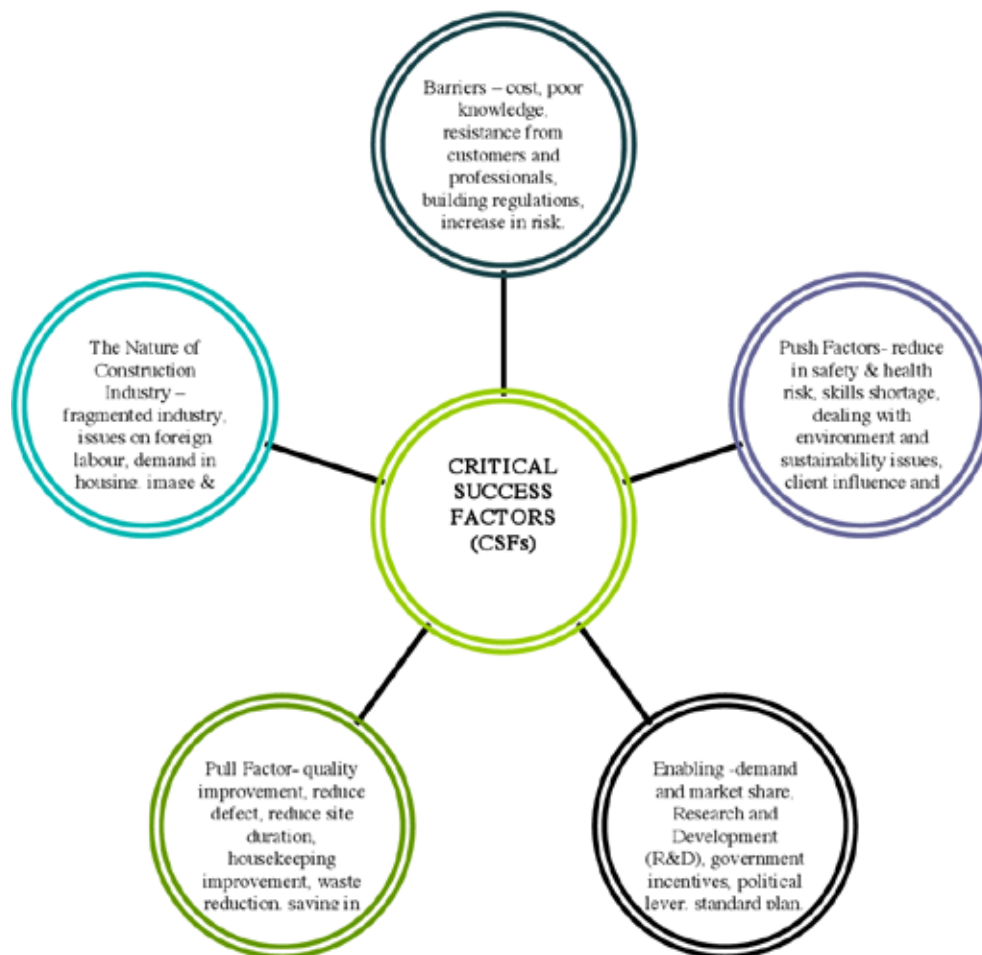
These phases from project planning to project completion and the participants in these phases constitute the complexity of construction projects (Sears, G. A., and Clough, R. H., 1991). Variable and risky features: Construction projects involve more risks than other sectors. There are variable and unpredictable factors at every stage of the project (Joyce, N. E. and Gould, F. E., 2000). Uniting feature of different labor groups: Construction projects bring together groups with different skills and areas of expertise. These groups work together towards a single goal (Halpin, D., 2006). The most important feature of construction projects is that they consist of different labor groups coming together for a specific purpose. Therefore, human quality in construction projects is of great importance in project success and failure.

Critical Success Factors in Construction Projects:

In the previous sections of the study, project critical success factors were briefly defined. Here, studies carried out by different researchers and determining critical success factors in construction projects are included. The first of these studies is the study

conducted by Jolivet et al. in 1986 (Haynes, N.S., Love, P.D.E., and Irani, Z., 2001). Researchers have examined the characteristics of successful and unsuccessful construction projects. As a result of their studies, they identified criteria that were found in successful construction projects but not in unsuccessful ones.

Figure 1. Critical Success Factors (CSFs)



The critical success factors revealed by Jolivet and others for construction projects as a result of their research are as follows (Jaselskis, E.J., 1988):

- Appointment of a project manager;
- The project is divided into subsections;
- The project organization has been determined by the project manager;
- Having set goals;
- Activities are determined by written procedures;
- Contract management;
- Program management;
- Cost management;

- Quality management;
- Administrative and financial management;
- Staff management;
- Design management;
- Purchasing and subcontractor management;
- Construction management;
- Job completion procedure;
- Documentation.

As seen above, the management function has an important place among Jolivet's critical success factors. When the factors are examined, it is seen that they include issues related to project management, from de-

termining the goals to the work completion procedure. According to these factors, it follows that the success of a construction project is directly related to project management. Therefore, it can be interpreted that effective project management is an important tool to achieve success in construction projects. The second study on critical success factors in construction projects was conducted in 1987 (Samuel, J. and Meredith, J. R., 1995).

In Ashley's study, data obtained from 16 construction projects, 8 of which were at medium level and 8 of which were at good level, were used. Data was obtained by interviewing project managers belonging to the owner and contractor organization. In the research, hypotheses were put forward to determine the difference between the success factors and success evaluation criteria of good and medium level construction projects. According to the results, there are significant differences in the areas of key success factors of good and medium projects. These areas are:

- *Planning activities;*
- *Target responsibilities of the project manager;*
- *Project team motivation;*
- *Project manager technical capacity;*
- *Field of activity and job description;*
- *Control systems.*

As noted above, Ashley's study interviewed project managers to determine construction project success factors. This shows that the researcher argues that project managers are the right people to determine success factors (Raz, T., Dvir, D., and Shendar, A.J., 2003). Thus, it demonstrated the importance of project management in the success of construction projects such as Jolivet. When we look at the factors that emerged as a result of Ashley's study, it is seen that they are related to project management activities, similar to Jolivet's study. The success factor groups that emerged as a result of both studies include factors related to project manager characteristics.

Jaselskis' Critical Success Factors

In his study in 1988, Jaselskis investigated the inputs related to project management required to achieve construction project success, collected the necessary information about these factors and developed different selection models to estimate

the probability of construction project success. In the study, Ashley's 1987 study was used to determine the critical success factors of construction projects. This study focuses on success from a project management perspective due to its effective role in the planning, management and coordination of construction projects such as budget, work schedule, quality and occupational safety. According to the information obtained from 28 construction projects, 14 of which were medium and 14 were good, the factors were grouped under 4 groups (Lilliesköld, and J., Taxen, L., 2008):

- *Project manager;*
- *Project team;*
- *Planning;*
- *Control and external factors.*

In the continuation of the study, it was suggested that these factors not only affect project success independently, but also that there is a relationship between the factors. (Kerzner, H., 2001) This interaction has been investigated with the models put forward. Models can be used for the project manager to balance resources most efficiently to achieve a high probability of project success and for the owner to evaluate contractors at the tender stage (Beck, R., Wysocki, R. and Crane D., 2003). They were developed to support owners and contractors in balancing resources and improving construction project performance. These models, which are used to estimate the probability of success of construction projects, use the logistic regression technique. Models have been developed for good project performance, better-than-expected budget performance, and better-than-expected schedule performance. The first model estimates the probability of achieving good project performance, the second model estimates the probability of achieving better than expected budget performance, and the third model estimates the probability of achieving better than expected work schedule performance.

According to the results, the critical success factors affecting the possibility of achieving a good project performance are determined as follows, according to the previously determined success groups:

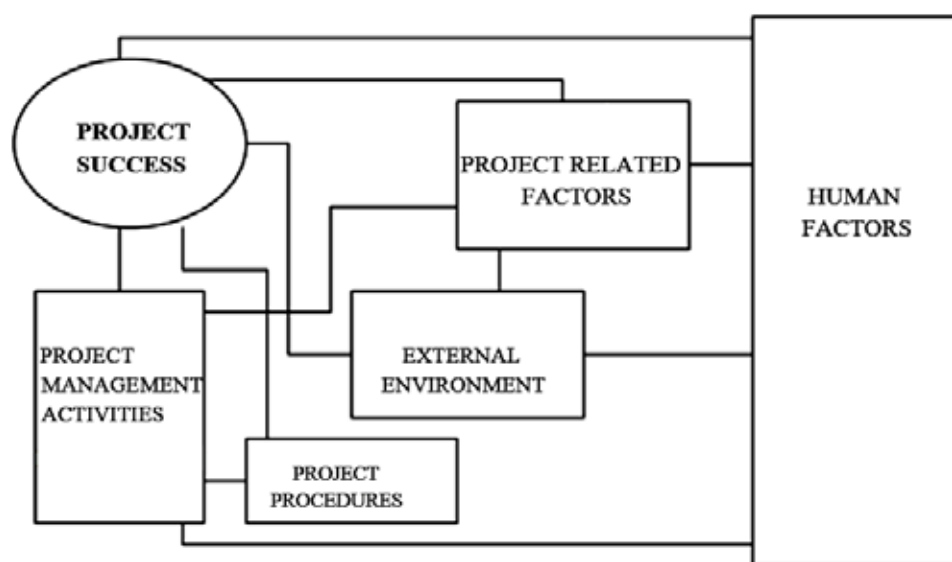
- *Project Manager Experience as a project manager (years);*

- Total experience of the project manager in the construction industry (years);
- Number of levels between project manager and workers;
- Project Team Project team variability rate (%);
- Control Systems Control systems costs (% of total project cost);
- Frequency of budget updates (annual) Planning Modularization (% of total budget).

When determining construction project success factors, Jaselskis focuses on success di-

rectly from a project management perspective (Jaselskis, E.J., 1988). He explained the reason for this as the effective role of project management in budget, work schedule, quality, and occupational safety. From this comment of the researcher, it can be concluded that to evaluate whether a construction project is successful or not, it is necessary to measure its performance in terms of budget, work schedule, quality and occupational safety. In addition, the fact that the researcher develops models regarding budget and work program success is an indication that these criteria are included in the project success measurement criteria.

Figure 1. Relationship of Factors Affecting Construction Project Success



Unlike other researchers, Chan and Scott talked about human-related, project-related, project procedures and external factors in addition to project management activities that are effective in construction project success. Project manager characteristics are also included within the human-related factors. Therefore, the difference of the factors mentioned in this group from previous studies is that they include customer characteristics. Among the factors put forward by Jaselskis, factors related to the external environment under the name of control and external environment are included in the critical success factors (Jaselskis, E.J., 1988). Project procedures, one of Chan and Scott's factor groups, are related to the selection of people who will take part in the project design and construction. "Design management" and "construction management", which are among

the critical success factors determined by Jolivet, include these factors (Hikle V., and Eldin N., 2003). Project-related factors have not been clearly established in other studies as critical success factors in construction project success (Holt, G.D., Proverbs, D.G. and Cheok, H. Y., 2000). In the light of these evaluations, it can be concluded that Chan and Scott's study is a collection of other studies on construction project critical success factors. It is an important study in which the factors affecting the success of the construction project are grouped and listed.

CPSS as a Success Measurement Tool for Construction Projects

CPSS (Construction Project Success Survey) is a construction project success measurement method that also includes subjective criteria within the framework of existing

objective project success measurement criteria (Perrier, N., and Pellerin, R., 2018). It allows evaluating project results both qualitatively and quantitatively within the framework of measurement criteria determined by CII. It also paves the way for better planning by allowing the identification of important success characteristics at the beginning of the project (Lopes, J. and Ruddock, L., 2006).

In this part of the research, this measurement method will be introduced with the help of the sections on the emergence of the CPSS

requirement, its development, and calculation of its scores. In the section on the implementation of CPSS, the CPSS application and results in America will be included. In this part of the paper, CPSS scores of three housing projects to which CPSS was applied in the field research will be compared and evaluated. Table 1 summarizes the CPSS scores of projects 1, 2, and 3. The table includes the average scores, importance percentages and resultant CPSS scores of the success measurement groups of each project.

Table 1. Comparison of CPSS Scores of Projects 1, 2 and 3

SUCCESS MEASUREMENT CRITERION GROUPS		Project 1	Project 2	Project 3
COST	AVERAGE SCORE	2.20	0.87	2.60
	IMPORTANCE PERCENTAGE	30%	20%	25%
WORK SCHEDULE	AVERAGE SCORE	2.69	2.46	-0.08
	IMPORTANCE PERCENTAGE	20%	20%	15%
QUALITY	AVERAGE SCORE	2.81	2.25	2.20
	IMPORTANCE PERCENTAGE	20%	25%	25%
PERFORMANCE	AVERAGE SCORE	2.66	1.70	2.09
	IMPORTANCE PERCENTAGE	15%	20%	15%
	AVERAGE SCORE	2.69	3.00	2.40
SECURITY	IMPORTANCE PERCENTAGE	10%	10%	10%
BUSINESS ENVIRONMENT	AVERAGE SCORE	2.56	1.57	1.50
	IMPORTANCE PERCENTAGE	5%	5%	10%
	RESULT CPSS SCORE	+2.52	+1.93	+1.89

As seen in Table 1, the project with the highest average cost score is Project 3 with 2.60. Therefore, Project 3 can be interpreted as the project that showed the highest success in the cost group. However, Project 1 is the project with the highest importance percentage in the cost group with 30%.

- Among these three projects, Project 1 can be considered the most successful in the work program group. Because Project 1 is the project with the highest score for this group with 2.69. Among all projects, the work program group of Project 3 has the only negative average score with -0.08. Therefore, the work program group of Project 3 is the only group that can be described as unsuccessful among all projects. The highest importance percentage for the work

program group is 20%. The weighted importance of the work program group for Project 1 and Project 2 was determined as 20%.

- The most successful project with a score of 2.81 in the quality group can be evaluated as Project 1. However, the highest level of importance determined in projects for the quality group is 25%. This importance percentage applies to Projects 2 and 3.
- The project with the highest average score in the performance group is Project1 with 2.66. However, the project with the highest degree of importance in this group is Project 2 with 20%. Managers of Project 1 and Project 3 determined the same importance percentage for the performance group; 15%

- For all three projects, the importance percentage of the security group was determined as 10%. Project 2 has the highest score in this group with 3.00. This score is also the highest group score among all projects. The average security scores of other projects are also above 2. Therefore, all three projects can be described as very successful in security groups. However, a 10% importance percentage can be considered as an indication that the security issue is not very effective in the success of the project.

Conclusion

Success measurement in construction projects is used to interpret project results and compare them with the success of other projects. Success measurement is important in determining risk factors affecting success (Tippett, D.D., Hughes, S.W. and Thomas, W.K., 2004). After success measurement, critical success factors that affect project success can be put there. These factors are important in terms of being prepared for the issues that will be encountered in subsequent projects and taking precautions in advance. Success measurement can also be used as an indicator in which direction updates on planning and management issues related to projects should be carried out. In the construction industry of developing countries, there is no standard measurement method used to numerically measure project success. For this reason, a thesis study was carried out aiming to test the applicability of a standard measurement approach that evaluates project success objectively and subjectively in developing countries. In this study, two different methods that serve different purposes

were used: literature research method and field research method.

The literature research served the purposes of identifying critical project success factors and establishing various project success measurement criteria (Salleh, R., 2009). With the help of literature research, the concept of project success in the literature was examined primarily in terms of general projects. The concept of success in construction projects is discussed in the following sections. The field research method was used to evaluate the success of three recently completed important housing projects in order to test the usability of developing countries in a project success measurement method that uses not only objective but also subjective evaluations for project success.

As a post-project evaluation tool, the success measurement method is a tool for management to determine objective and subjective success factors. In this way, identification and management of risk factors affecting project success can be achieved. The results can be used to update project planning and management methods. It contributes to the development of the process by evaluating the relationship of factors such as labor relations, design development and project team training to project success. Project participants can use project success measurement to evaluate the contribution of project design documents and change controls to success. In addition, a standard construction project success measurement method can be used as a tool to score project success to measure development and deficiencies in engineering and design organizations that implement a continuous improvement program. Thus, the success evaluation can be more accurate. Such a study will be very beneficial for the Azerbaijani construction industry.

References:

- Al-Hallaq K. Mohamed, and Enshassi, S. Causes of Contractor's Business Failure in Developing Countries, *Journal of Construction in Developing Countries*, 2006. – 237 p.
- Beck, R., Wysocki, R. and Crane D. *Effective Project Management*, John Wiley and Sons, 2003. – P. 79–85.
- Davies and Cooke, T. The Real Success Factors on Projects, *International Journal of Project Management*, 2002. – P. 185–190.
- Egbu C.O. Skills, knowledge, and competencies for managing construction refurbishment works. *Construction Management and Economics*, 1999. – P. 29–43.

- Halpin, D. Construction Management, 3rd edition, John Wiley and Sons, Inc., 2006.– 169 p.
- Haynes, N. S., Love, P. D. E., and Irani, Z. Construction managers' expectations and observations of graduates, *Journal of Managerial Psychology*, 2001.– P. 579–593.
- Hendrikson, C. Project Management for Construction Fundamental Concept for Owners, Engineers, Architects and Builders, USA, 1988.– 321 p.
- Hikle V., and Eldin N. Pilot Study of Quality Function Deployment in Construction Projects, *Journal of Construction Engineering and Management*, 2003.– P. 314–329.
- Holt, G. D., Proverbs, D. G. and Cheok, H. Y. Construction Industry Problems: The Views of UK Construction Directors, Glasgow Caledonian University, 2000.– P. 73–78.
- Jaselskis, E. J. Achieving construction Project success through predictive discrete choice models, University of Texas, 1988.– 451 p.
- Joyce, N. E. and Gould, F. E. Construction Project Management, New Jersey, 2000.– 206 p.
- Kerzner, H., Project Management: A System Approach to Planning, Scheduling, and Controlling, John Wiley and Sons, Inc., New York, 2001.– 315 p.
- Klemetti, A., Risk Management in Construction Project, Helsinki University of Technology, 2006.– P. 46–57.
- Lilliesköld, J., and Taxen, L. Images as action instruments in complex projects, *International Journal of Project Management*, 2008.– P. 527–536.
- Lopes, J. and Ruddock, L. The Construction Sector and Economic Development: The Bon Curve, *Construction Management and Economics*, 2006.– P. 717–723.
- Perrier, N., and Pellerin, R. A Review of Methods, Techniques and Tools for Project Planning and Control, *International Journal of Production Research*, 2018.– P. 2160–2178.
- Pinto, J. K. Project Implementation: A determination of its critical success factors, moderators, and their relative importance across the Project life cycle, University of Pittsburgh, Pittsburgh, 1986.– P. 126–134.
- Raz, T., Dvir, D., and Shendar, A. J. An Empirical Analysis of the Relationship Between Project Planning and Project Success, *International Journal of Project Management*, 2003.– P. 89–95.
- Salleh, R., Critical Success Factors of Project Management: Improving Project Performance, Queensland University of Technology, 2009.– 283 p.
- Samuel, J. and Meredith, J. R. Project Management: A Managerial Approach, John Wiley and Sons, Inc., USA, 1995.– 67 p.
- Sears, G. A., and Clough, R. H. Construction Project Management, John Wiley and Sons, Inc., USA, 1991.– 348 p.
- Tippett, D. D., Hughes, S. W. and Thomas, W. K. Measuring Project Success in the Construction Industry, *Engineering Management Journal*, 2004.– P. 31–37.

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