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RESEARCH ARTICLE

Critical Factors Affecting the Success of a Construction Project: A Review

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ABSTRACT

Many researchers have tried to determine the factors for a successful construction project for a long time. However, only a few studies in the project management literature concentrate on the critical factors that affect project success or failure. Whereas many of these studies generate lists of critical success factors, each list varies in its scope and purpose. The success factors are usually listed as either very general factors or very specific factors affecting only a particular project. Hence a comprehensive list is not available which makes it difficult not only for project managers but also for researchers to evaluate projects based on these factors. In this study, Papers from major journals in the construction field are chosen to review the previous works for identification of project success factors. Number of variables influencing the success of project were identified following a thorough literature review .The aim of this paper is highlighting the critical success factors and also show the interaction between them.

Key Words: *Construction industry, Project management, critical factors*

INTRODUCTION

In most of the studies, this is assumed that the development of better scheduling techniques would result in better management and thus the successful completion of projects. However, there are many factors outside the control of management which could determine the success of a project. In the literature, these factors are referred to as critical success factors and only a few studies have been done to assess, clarify, or analyses these factors. Most of the early studies in the area focused on the reasons for project failure rather than project success (Avots 1969, Balchandra *et al.*1984, Bedell *et al.*1983, Hall *et al.* 1980, Morgan *et al.* 1979). In these studies it was assumed that if a projects completion time exceeded its due date, or expenses overran the budget, or outcomes did not satisfy a company's pre- determined performance criteria, the project was assumed to be a failure. Today we know that determining whether a project is a success or a failure is far more complex. Delays in project completion times are common. Because of the delays, project managers sometimes pay penalties which increase overall project costs (Tukel 1995). Yet these projects are still considered to be successful. On the other hand, a project that is perceived as a success by a project manager and team members might be perceived as a failure by the client.

Still, there can be ambiguity in determining whether a project is a success or a failure. There are two main reasons for this ambiguity. First, as mentioned in a paper by Pinto and Slevin (1989), it is still not clear how to measure project success because the parties who are involved in projects perceive project success or failure differently. A project which is considered to be a success by the client might be considered a failure by top management, if the project outcome does not meet top management specifications, even though it might satisfy the client. In this case, both of these parties are evaluating project success differently and thus they value the outcome differently.

An empirical study is conducted to test the practicality of using such a scheme. The statistical analyses of the results demonstrate the differences between the critical success factors identified in a previous study from literature and the factors identified with the use of our scheme. Various attempts were made by different researchers to determine critical success factors in construction. A number of variables influencing project successes have been proposed. Some variables are common to more than one list, but there is no general agreement on the variables. In this paper an attempt is made to group critical success factors by through literature survey.

PROJECT SUCCESS FACTORS

Project success factors are the elements of a project that can be influenced to increase the like hood of success; these are independent variable that makes success more likely. Project success criteria are the measures by which judge the successful outcome of a project; these are dependent variable which measure project success. Primal success criteria have been an

integrated part of project management theory given that early definitions of project management included the so called, Iron Triangle' success criteria - cost, time and quality. Success factors are those inputs to the management system that lead directly or indirectly to the success of the project or business. Project success factors are not universal for all projects since different projects and different people prioritize different sets of success factors. Project success criteria also vary from project to project and what is acceptable in one project without impact on perceived success is deemed an abject failure in another project. For instance, taking a week delay in an IT project to ensure the objectives are achieved may have a minor impact for this project in terms of success.

CRITICAL SUCCESS FACTORS

A building project is completed through a combination of many events and interactions, planned and unplanned, over the life of a facility, with changing participants and processes in a constantly changing environment. Certain factors are more critical to a project success factors. These factors are called critical success factors. The term Critical success Factors in the context of the management of projects was first used by Rockart (1982) and is defined as those factors predicting success on projects.

NECESSITY OF DETERMINING CONSTRUCTION PROJECTS SUCCESS FACTORS

Increasing uncertainties in technology, budgets, and development processes create a dynamic construction industry. Building projects are now much more complex and difficult and the building project team faces unprecedented changes. The study of project success/failure and critical success factors is a means of understanding and thereby improving the effectiveness of construction projects.

LITERATURE REVIEW

In 1961 for the first time Ronald Daniel was among the first experts who offered the critical success factors as the business guidance for the first time. In his opinion there are three to six critical factors which determine the success in all industries. Among the next experts, Rockart (1982) contributed in the field of introducing the critical success factors more than other researchers.

The success and failure factors were then discussed by Rubin and Seeling (1967). They investigated the impact of a project manager's experience on the project's success or failure. Technical performance was used as a measure of success. It was concluded that a project manager's previous experience has minimal impact on the project's performance, whereas the size of the previously managed project does affect the manager's performance. Rubin and Seeling's study was followed by a theoretical study by Avots. He identified reasons for project failure and concluded that the wrong choice of project manager, the unplanned project termination and unsupportive top management were the main reasons for failure.

In 1983 Baker, Murphy and Fisher (1983) suggested that instead of using time, cost, and performance as measures for project success, perceived performance should be the measure. Hughes (1986) conducted a survey to identify the factors that affect project performance. He concluded that projects fail because of improper basic managerial principles, such as the improper focus of the management system, by rewarding the wrong actions, and the lack of communication of goals.

In their book, Morris and Hough (1987) studied eight large, complex projects which had great potential economic impact but were poorly managed and generally failed. They identified the success and failure factors for each of them. Based on this experience, they suggested seven dimensions of project success (Table 1). They concluded that although their analysis of success factors is aimed at large, complex projects, they are also relevant to projects in general.

In 1986 Ashley (1986) identified these seven factors as the success factors: Construction activities programming, Design planning, Project manager commitment to the goals, Project team motivation, Project manager technical capabilities, Control systems, Definition of work and its field. He also identified theses six criteria as the success criteria: Budget performance, Schedule performance, Employer satisfaction, Task-orientation, Contractor satisfaction, Project manager satisfaction

It is noteworthy that the differentiation between success criteria and success factors is also important. The success criteria are the measures based on which the project success or failure is judged; while the success factors are those entered into the management systems and result in project success directly or indirectly (Cooke-Davie's 2002)

Then in 1987, Pinto and Slevin offered a project model and ten determining factors as: Project mission, scheduling, technical tasks, user consultant, user reception, feedbacks and reports, communications, fault detection, senior manager support, personnel (requirement, employment, and training).

Table 1: Seven lists of critical success factors developed in the literature

Martin (1976)	Locke (1984)	Cleland and King (1983)	Sayles and Chandler (1971)	Baker, Murphy and Fisher (1983)	Pinto and Slevin (1989)	Morris and Hough (1987)
Define Goals	Make project	Project summary	Project manager's competence	Clear goals	Top management	Project objectives
Select project organizational philosophy	Project authority from the top	Operational concept	Scheduling	Goal commitment of project team	Client consultation	Technical uncertainty innovation.
General management support	Appoint competent project manager	Top management support	Control systems and responsibilities	On-site project managment support project manager support manager	Personnel recruitment	Politics
Organize and delegate authority feedback	Set up communications and procedures	Financial support	Monitoring and feedbacks	Adequate funding and procedures to completion	Technical tasks	Community Involvement
Select project team	Set up control mechanisms	Logistic requirements	Continuing involvement in the project	Adequate project, team capability	Client acceptance	Schedule duration Urgency
Allocate sufficient resources	Progress meetings	Facility support		Accurate initial cost	Monitoring and feedback	Financial contract legal problems
Provide for control and information mechanism		Market intelligence		Minimum start-u difficulties	Communication	Implement problems
Require planning and Review			Project schedule	Planning and control techniques	Trouble-shooting	
			Executive development training	Task (vs. social orientation)	Characteristics of the project team leader	
			Manpower and organisation	Absence of bureaucracy	Power and politics	

(Source: 'The Anatomy of Major Projects' Book by Morris and Hough)

In 1996 Walid Belassi and Tukel Oya Icmeli also divided the critical success factors into four main groups in a new format: Project dependent factors, Team members and project manager dependent factors, Organizational structure dependent factors, External environment dependent factors.

In addition to the literature described above the reader is referred to project management books by Locke (1984), by Meredith and Mantel *et al.* (1989) and by Martin (1976) for further discussions on critical success/failure factor.

Just from the beginning of 21st century, numbers of researchers are intent on enhancing the use of critical sucess factorss for construction projects.

In 2003 Belout *et al.* considered the following four dimensions as the success factors, they are Project Result, Customers effects, Commercial success and conduction and preparation for the future, Identifying the beneficiary groups (stockholders, managers, customers and personnel); which are significant as well as critical success factors until different people wants to see success in different ways. In 2004 Nguyen *et al.* identified five critical success factors among the twenty factors of projects success:

1. Competent project manager
2. Providing adequate financial resources to the end of the project
3. Competent and multidisciplinary project team
4. Commitment to the project
5. Access to resources

Chan *et al.* (2004) identified five primary critical success factors from 44 identified factors, which are; project-related factors, project procedures, project management actions, human-related factors and external environment. Iyer *et al.* (2005) established attributes that related to schedule and performance, listing 55 attributes that were subsequently grouped into six critical success factors and seven critical failure successes. Those factors are project managers' competence, supportive owners, top management monitoring, feedback, and coordination. Li (2005) identified 55 attributes and grouped them into five critical success factors for public-private partnership projects in the United Kingdom (UK). Those five categories were: effective procurement, project implementation ability, government guarantees, favorable economic conditions, and the available financial market. Abraham (2004) identified seven critical success factors that influence the success of construction projects: competitive strategy, market analysis, political environment, economic environment, technical application, employee/organizational enhancement and process benchmarking. Saqib (2008) listed the top five critical success factors affecting Pakistan's construction industry, developed from 77 identified factors: contractor-related factors, project management factors, procurement-related factors, design team-related factors and project management factors.

The above studies can be classified in two major groups they are theoretical and empirical studies. Table 1 summarizes the literature on critical success/failure factors. The theoretical and empirical studies are grouped chronologically.

Further Studying the results proves that the project manager the success factors can be classified as: organization's critical success factors and the specific construction project factors, management skills, team members, teamwork, their technical filed, project properties, viable environmental factors could be considered as the organization's critical success factors; although the degree of these factors' significance varies from one industry to another one. While in the information system of management and construction projects, project managers, management skills are the most important key factors and the environmental factors influence and conduct the construction tasks.

One of the efforts to classify critical factors was carried out by Schultz, Slevin and Pinto (1987). They classified factors as strategic or tactical. These two groups of factors affect project performance at different phases of implementation.

Table 2: Classification of literature on success factors

Theoretical studies	Empirical studies
Avot (1969)	Baker, Murphy and Fisher (1983)
Jonason (1971)	Pinto and Slevin (1987)
Archibald (1976)	Morris and Hough (1987)
Martin (1976)	Pinto and Prescott (1988)
Markus (1981)	Magal, Carr and Watson (1988)
Hughes (1986)	Nutt (1989)
Schultz, Slevin and Pinto (1987)	Pinto and Slevin (1989)
Adnane Belout and Clothilde Gauvereau (2003)	Pinto and Prescott (1990)
	Li (2005)
	Abraham (2004)
	Saqib (2008)

Table 3: classification of the success factors in two groups

The strategic group	Tactical group
Project mission	Client consultation
Top management support	Personnel selection
Project scheduling	Training

In their follow-up work, Pinto and Slevin identified success factors, and their relative importance, for each stage of a research and development project life-cycle. Finally, in a similar study by Pinto and Prescott, the relative importance of each group (tactical vs. strategic) over the project life-cycle was analysed. It was found that the relative importance of success factors varies at different stages of the project's life-cycle, depending on the

success measure used. When external success measures are employed, planning factors dominate tactical factors throughout the project life-cycle.

GROUPING OF CRITICAL FACTORS AFFECTING PROJECT SUCCESS:

A number of variables influencing the success of project were identified following a thorough literature review. The term CSFs in the context of the management of projects was first used by Rockart in 1982 and is defined as those factors predicting success on projects (Sanvido *et al.* 1992). A careful study of previous literature suggests that CSFs can be grouped under six main categories. These include Project planning related factors, project-related factors, project procedures, project management actions, Project Participants-Related Factors and external environment.

PROJECT PLANNING RELATED FACTORS

In an empirical survey on the relationship between project planning and project success, Dov Dvir declared that there is a certain and positive relationship between the amount of effort in determining the project's goals, job requirements and product's technical features on one hand and project success on the other hand and no effort should be spared in the first stage of the project to define the receivable requirements and goals, and this demand is not met without involving the customer or the final beneficiary in the processes.

PROJECT-RELATED FACTORS

Walker (1995) postulated project scope as a useful predictor for construction time. The importance of project scope factors is echoed by other researchers (Akinsola *et al.* 1997; Songer andMolenaar 1997; Belout 1998; Chua *et al.* 1999; Dissaanayaka and Kumaraswamy 1999; Kumaraswamy and Chan 1999). The attributes used to measure this factor are type of project, nature of project, number of floors of the project, complexity of project, and size of project.

PROCUREMENT RELATED FACTORS

A number of researcher identified the importance of procurement factors (Pocock *et al.* 1997a, 1997b; Walker 1997; Kumaraswamy and Chan 1999; Walker and Vines 2000). Dissanayaka and Kumaraswamy (1999), defined the scope of procurement as the framework within construction is brought about, acquired or obtained. Therefore, two attributes are used to measure this factor; they are procurement method (selection of the organization for the design and construction of the project) and tendering method (procedures adopted for the selection of the project team and in particular the main contractor).

PROJECT MANAGEMENT FACTORS

Project management action is a key for project success (Hubbard 1990). Jaselskis and Ashley (1991) suggested that by using the management tools, the project managers would be able to plan and execute their construction projects to maximize the project's chances of success. Then, the variables in project management include adequate communication, control mechanisms, feedback capabilities, troubleshooting, coordination effectiveness, decision making effectiveness, monitoring, project organization structure, plan and schedule followed, and related previous management experience (Belout 1998; Chua *et al.* 1999; Walker and Vines 2000). A number of attributes will affect this factor, including the communication system, control mechanism, feedback capabilities, planning effort, organization structure, safety and quality assurance program, control of subcontractors' works, and finally the overall managerial actions.

PROJECT PARTICIPANTS RELATED FACTORS

Chua *et al.* (1999) defined project participants as the key players, including project manager, client, contractor, consultants, subcontractor, supplier, and manufacturers. Walker (1995) considered influence of client and client's representative as a significant factor on construction time performance. The client-related factors concerned with client characteristics, client type and experience, knowledge of construction project organization, project financing, client confidence in the construction team, owner's construction sophistication, well-defined scope, owner's risk aversion, client project management (Chan and Kumaraswamy 1997, Songer and Molenaar 1997, Dissanayaka and Kumaraswamy 1999).

Designers play a vital role as their work involves from inception to completion on a project. Chan and Kumaraswamy (1997) considered that design team-related factors consist of design team experience, project design complexity, and mistakes/delays in producing design documents. The main contractor and subcontractors start their main duties when the project reaches the construction stage. The variables include contractor experience, site management, supervision, and involvement of subcontracting, contractor's cash flow, effectiveness of cost control system, and speed of information flow (Chan and Kumaraswamy 1997, Dissanayaka and Kumaraswamy 1999).

The project manager is another key stakeholder in a construction project and his competence is a critical factor affecting project planning, scheduling, and communication (Belassi and Tukel 1996). Variables under this factor consist of the skills and characteristics of project managers, their commitment, competence, experience, and authority (Chua *et al.* 1999). A construction project requires team spirit; therefore team building is important among different parties. Team effort by all parties to a contract- owner, architect, construction manager, contractor, and subcontractors is a crucial ingredient for the successful completion of a project (Hassan 1995).

CONCLUSION

The various variables affecting the factors are identified in the previous section. Variables within each group are interrelated and interrelated. A variable in one group can influence a variable in the others, and vice versa. To study how these factors affect project success separately and collectively, it is hypothesised that ''Project success is a function of project-related factors, project procedures, project management actions, human-related factors and external environment and they are interrelated and interrelated. It is further hypothesised that the project will be executed more successfully if the project complexity is low; if the project is of shorter duration; the overall managerial actions are effective; if the project is funded by a private and experienced client; if the client is competent on preparing project brief and making decision; if the project team leaders are competent and experienced and if the project is executed in a stable environment with developed technology together with an appropriate organization structure.

A new variable affecting project success and Hypotheses on implementing a project successfully have been developed. It can be used as a base for further detailed investigation on general construction projects, as well as a specific project, such as hospital or hotel. A more systematic way of determining project success is established. This paper focuses on the critical success factors and not on the measurement of project success, i.e., the key performance indicators. Further study should be directed to identify the key performance indicators, so that the causal relationships between Critical Success Factors and Key Performance Indicators can be identified. The causal relationships, once identified, will be a useful piece of information to implement a project successfully. It can help in selecting project team members, identifying the development needs of the project team members, and most important for forecasting the performance level of a construction project before it commences.

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