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Development of a Conceptual Critical Success Factors Model for Construction Projects: a Case of Lithuania

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Abstract

This paper aims to develop a conceptual critical success factors model for construction projects in Lithuania. The concept of success of construction projects and literature review of critical success factors is discussed in the first part. Conceptual model adapted to Lithuania is developed and its elements are described in the second part. Grouped decision-making matrix for the multiple criteria analysis of critical success factors of construction projects is presented at the end of paper.

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Keywords: construction projects, project success, critical success factors, criteria system.

1. Introduction

Success in construction projects is dependent on the effective organization of multiple, specialized teams, each of which brings its own ability, experience, knowledge and skill towards completing the joint project, but which also bring their own objectives, goals and management styles, which may not be entirely complimentary [1].

According to Lehtiranta *et al.* [2], construction project success depends on the multi-firm project organizations involved working together satisfactorily. Project success, therefore, should be examined from a more holistic perspective than the traditional measures in terms of budget, schedule and specifications.

The success of construction projects is a fundamental issue for most governments, users and communities. In the literature that deals with construction project success and causes of time and cost overruns in the construction industry, there is some literature that highlights the role of the contractors in project success. Construction projects and their success are closely related to contractors [3].

Project success can be achieved through the good performance of project managers in the project. Various researchers have all mentioned that human factors played an important role in determining the success of a project [4–8].

There is considerable debate in project management research practice about what determines project success. While the topic has been discussed for a long period of time, an agreement has not been reached. In addition, when it comes to a definition of project success, there is no single list that is totally comprehensive. However, the concept of critical success factors (CSFs) presents a smarter way to identify certain factors which when present or absent in a project are likely to make the project successful [3].

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Critical Success Factors is known as a tool for measuring performance in an organisation to achieve their mission [9]. In building maintenance, CSF is becoming very important as it could identify the cause of failure as well as improving the system. The success of maintenance management initiatives depends on many factors. The authors categorized critical success factors into five primary categories: leadership, culture, structure, roles and responsibilities, system infrastructure, measurement. These five categories were based on the objective of the organization. According to the researchers, it is also essential to identify the constraint of the critical success factors. In understanding the constraints, critical success factors defense measures can be derived. Knowing the constraints will eliminate predicted work which can bring about greater risks to the company's success. Knowing critical success factors in the operation of the business can strengthen management strategy. Risk management process can be more focused and many issues will be corrected and probability of failure is greatly reduced. Every single activity within the organization will be directed towards achieving the overall success of the company [9].

Chen *et al.* [1] explored success variables in construction partnering. They identified 19 success variables. Research results showed that four successful factors (collaborative team culture, long-term quality perspective, consistent objectives, and resource sharing) have a significant influence on the success of construction partnering. Partnering creates both a win-win situation and more synergy in team work [10]. However, not all projects are successful. The increasing complexity of construction projects has plagued the construction industry substantially. Project partnering (PP), therefore, has become the critical factor in project success. Two parameters should be considered in PP – project management performance (PMP) and participant satisfaction (PS). There are also many possible PP factors that could influence a project's success or failure and these factors should be incorporated during evaluation.

Ng *et al.* [11] and Abdul-Aziz *et al.* [12] explored critical success factors of Public Private Partnerships (PPP) projects. The initial feasibility of a PPP project contributes directly to the overall success of the project. Since PPP is a tripartite partnership which involves three parties of stakeholders including the public sector, private consortium as well as the general community (end-users), the authors identified critical success factors in all parties [11].

Hwang *et al.* [13] in their study identified 18 critical factors affecting schedule performance of public housing projects in Singapore, compared the factors affecting schedule performance of public housing projects and other building projects in Singapore, and provided recommendations to respond to these factors. The analysis results indicated that "site management", "coordination among various parties", "design changes by owner during construction", "availability of laborers on site", "availability of material", and "availability of staff to manage projects" were the six most critical factors that affect schedule performance of public housing projects in Singapore [13].

Alzahrani and Emsley [3] studied the impact of contractors' attributes on project success from a post construction evaluation perspective and identified what critical success factors (CSFs) have greatly impact to the success of project. Authors selected 35 CSFs, which were categorized into nine groups: safety and quality; past performance; environment; management and technical aspects; resource; organization; experience; size/type of pervious projects; finance. Factors such as turnover history, quality policy and adequacy of labor and plant resources, waste disposal and size of past projects completed, and company image are the most significant factors affecting projects success [3].

Lehtiranta *et al.* [2] explored a new dimension of the determinants for construction project success, i.e. the relationship between success and multi-firm project participants' satisfaction with each other. The results showed that correlations can be found between certain project participants' satisfaction with each other's performance and the owner's perception of project success. More specifically, satisfaction with performance factors within the relationships between the owner and any other participant (i.e. the contractor, designer or project consultant), within the relationship between project consultants and designers and within the relationship between project consultants and contractors were reflected in the owner's perception of project success [2].

Tabish and Jha [14] studied success factors for public construction projects. Achieving success in public construction projects is difficult because it requires economy, efficiency, quality, fairness and transparency. Such projects are taken up on the requisition of owners/clients and almost always involve multiple entities and are also accountable to external financial audit and vigilance agencies. Identification of the success factors is considered the key to achieving success in these projects. Authors identified 36 success attributes. Four success factors, viz. 'awareness of and compliance with rules and regulations', 'effective partnering among project participants', 'pre-project planning and clarity in scope', and 'external monitoring and control' were extracted by the application of factor analysis on 36 attributes developed through a synthesis of empirical studies and opinions from industry practitioners on public construction projects. The most important factor for overall performance is found to be 'awareness of and compliance with rules and regulations'.

The above examples demonstrate that there is a plenty of factors with the potential to affect the project success. This paper aims to present a conceptual critical success factors model based on identified comprehensive list of critical success factors of construction projects in Lithuania [15].

2. Conceptual critical success factors model for construction projects

The critical success factors model for Lithuania construction projects is given in Fig. 1. The model consists of seven groups of critical success factors: external factors, institutional factors, projects related factors, project management/team members related factors, project manager related factors, client related factors, contractor related factors. The variables within each group are interrelated. A variable in one group can influence a variable in the others. The elements of the proposed model are discussed below.

2.1. Elements of critical success factors model of construction projects

External factors. External factors are those impacting business which is beyond the control of a company's management. In general, they do not depend on company's performance, but could directly affect the success of a company or even their survival. Since some of these external factors could be triggered by the society, their influence may vary from time to time depending upon the change in public interests, market fluctuations, policy changes, etc. [16]. External factors are attributed to the macro environment. In this level construction project performance is influenced by economic, social, technological, legal, physical, political, nature ecological and cultural factors. The economic environment is a totality of various economic factors, such taxes, competitiveness, credit, interest rate, inflation. These factors influence the successful implementation of construction projects. The social environment, or social conditions in which people live and work, have a major influence on the effectiveness of construction projects. It also includes factors such as demographics, ethnic hostility, religious and social values. Culture (values, attitudes, norms of behavior) directly influences stakeholders` requirements to the implementation of construction projects and their aims. Technologies also influence the efficiency of project process and state requirements to its participants. Technological change and development enable more efficient management of projects. Legal and political environment (change in the law, ownership, restrictions on imports) is usually complicated and it directly influences construction projects. It is important to know what is prohibited and what is allowed and even encouraged and supported. Physical environment is a part of the human environment that includes purely physical factors (natural disasters, weather, pollution, noise). It affects project participants, their working conditions and successful implementation of the projects. Natural and ecological environment provide raw materials and resources for the construction sector.

Institutional factors. Institutional factors (construction regulations, product and service certification, standards, construction permits) are attributed to the meso environment. It is a system of state and financial institutions, public authorities and institutions, which determines the volume of construction and building permit review. These factors have a huge influence on the success of construction projects.

The internal factors are those within the control of an organization's management. Such factors reflect the organization's present status and performance capability on a project [16].

Project related factors. This group includes such factors as project value, size, type, complexity, goals, risk and etc. Project characteristics are important factors and the influence the project success of any project.

Project management/team members related factors. The appropriate selection of team members also influences the success of construction projects. A good coordination between all parties in management factors plays the main role [17]. This group includes such factors as competence, experience, decision making effectiveness, motivation, technical capability, personnel issues.

Projects manager related factors. A number of researches identified the importance of projects manager factors [18–19]. The success of a project can be achieved by a good work of a project manager. His competence is a critical factor affecting a project's planning and implementation. The factors related to the performance of a project manager consist of leadership, organizational, coordinating skills of project managers, their experience, authority and trust.

Contractor related factors. Contractor's expertise and performance play a significant role in successful delivery of a project [20]. They start their main duties when a project reaches the construction or execution stage where the actual work of the project is accomplished [3]. The group includes these factors: company characteristics, technical and professional capability, experience, economic and financial situation, quality issues, health and safety conditions, work conditions.

Client related factors. The success of construction projects depends on client's experience, type (private or public), size, influence, ability to make timely decision, clear and precise goals, risk attitude, ability to participate in different phases of project.

Stakeholders. A project stakeholder is a person or group of people who have a vested interest in the success of a project and the environment within which the project operates. There are many stakeholders participating in the implementation process of construction projects: initiators, planners, designers, contractors, clients, projects managers, institutions. An important issue for a project management team is to identify those stakeholders who can affect the project, and then manage their differing demands through good communication in the early stages of a project.

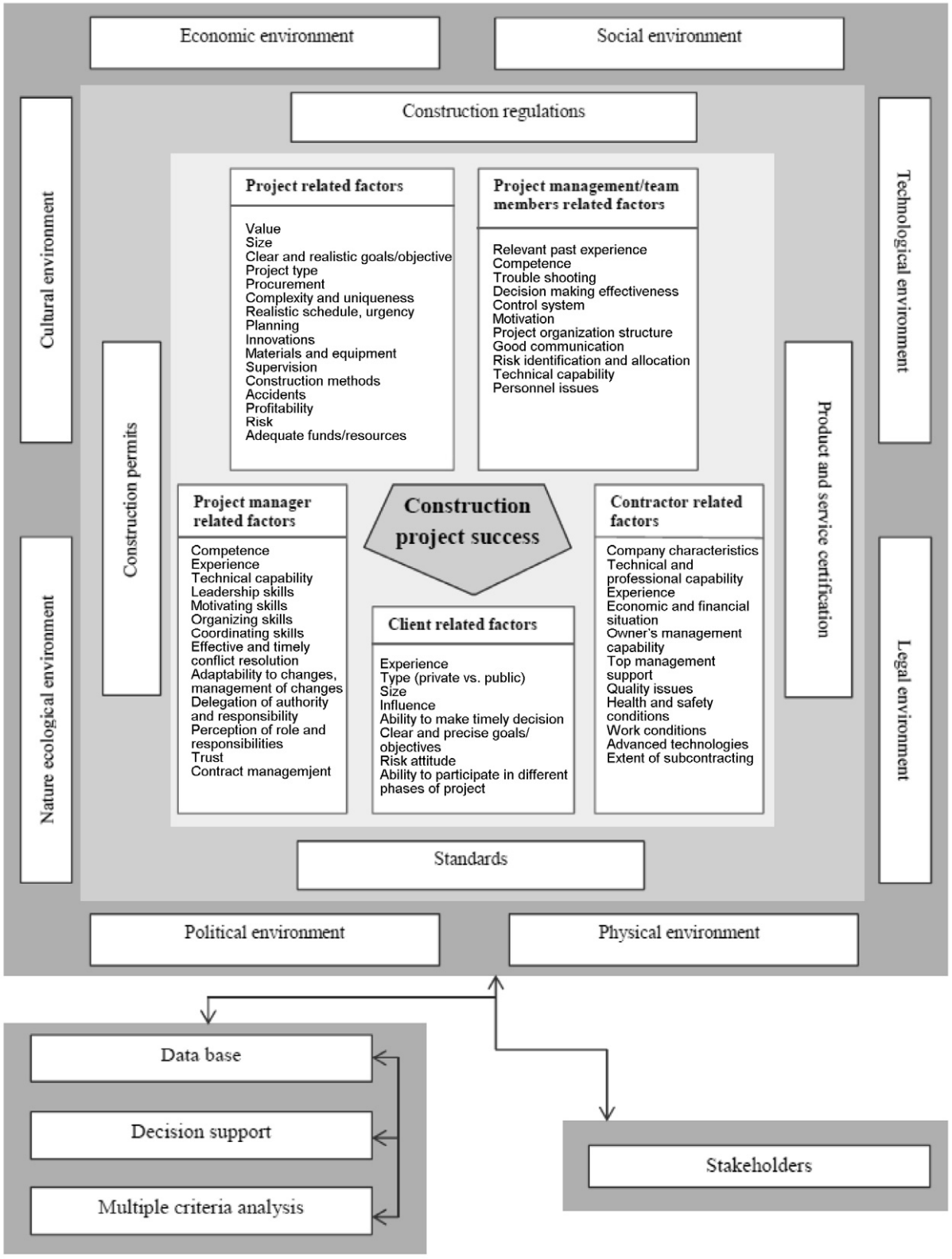

Fig. 1. Conceptual critical success factors model for construction project

2.2. Multiple criteria approach

In order to select the most successful project a decision-making matrix and a multiple criteria analysis of alternatives are required [21]. This is done by comparing the alternative criteria values and weights as well as analyzing the conceptual information. The project implementation process can be described as a system of criteria consisting of many different meanings and dimensions. The concept of criteria system matrix is shown in Table 1.

Table 1. Grouped decision-making matrix for the multiple criteria analysis of construction project alternatives based on critical success factors

	Critical Success Factors	Measuring units	Weight	Alternatives				
				A_1	A_2	A_3	A_4	A_5
External factors								
1	Economic environment	m_1	q_1	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}
2	Social environment	m_2	q_2	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}
3	Political environment	m_3	q_3	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}
…	…	…	…	…	…	…	…	…
6	Legal environment	m_6	q_6	x_{61}	x_{62}	x_{63}	x_{64}	x_{65}
7	Cultural environment	m_7	q_7	x_{71}	x_{72}	x_{73}	x_{74}	x_{75}
8	Nature ecological environment	m_8	q_8	x_{81}	x_{82}	x_{83}	x_{84}	x_{85}
Institutional factors								
9	Construction permits	m_9	q_9	x_{91}	x_{92}	x_{93}	x_{94}	x_{95}
10	Construction regulations	m_{10}	q_{10}	$x_{10\,1}$	$x_{10\,2}$	$x_{10\,3}$	$x_{10\,4}$	$x_{10\,5}$
11	Product and service certification	m_{11}	q_{11}	$x_{11\,1}$	$x_{11\,2}$	$x_{11\,3}$	$x_{11\,4}$	$x_{11\,5}$
12	Standards	m_{12}	q_{12}	$x_{12\,1}$	$x_{12\,2}$	$x_{12\,3}$	$x_{12\,4}$	$x_{12\,5}$
Project related factors								
13	Value	m_{13}	q_{13}	$x_{13\,1}$	$x_{13\,2}$	$x_{13\,3}$	$x_{13\,4}$	$x_{13\,5}$
14	Size	m_{14}	q_{14}	$x_{14\,1}$	$x_{14\,2}$	$x_{14\,3}$	$x_{14\,4}$	$x_{14\,5}$
15	Clear and realistic goals/objectives	m_{15}	q_{15}	$x_{15\,1}$	$x_{15\,2}$	$x_{15\,3}$	$x_{15\,4}$	$x_{15\,5}$
…	...	…	…	…	…	…	…	…
26	Profitability	m_{26}	q_{26}	$x_{26\,1}$	$x_{26\,2}$	$x_{26\,3}$	$x_{26\,4}$	$x_{26\,5}$
27	Risk	m_{27}	q_{27}	$x_{27\,1}$	$x_{27\,2}$	$x_{27\,3}$	$x_{27\,4}$	$x_{27\,5}$
28	Adequate funds/ resources	m_{28}	q_{28}	$x_{28\,1}$	$x_{28\,2}$	$x_{28\,3}$	$x_{28\,4}$	$x_{28\,5}$
Project management/team members related factors								
29	Relevant past experience	m_{29}	q_{29}	$x_{29\,1}$	$x_{29\,2}$	$x_{29\,3}$	$x_{29\,4}$	$x_{29\,5}$
30	Competence	m_{30}	q_{30}	$x_{30\,1}$	$x_{30\,2}$	$x_{30\,3}$	$x_{30\,4}$	$x_{30\,5}$
31	Trouble shooting	m_{31}	q_{31}	$x_{31\,1}$	$x_{31\,2}$	$x_{31\,3}$	$x_{31\,4}$	$x_{31\,5}$
…	…	…	…	…	…	…	…	…
37	Risk identification and allocation	m_{37}	q_{37}	$x_{37\,1}$	$x_{37\,2}$	$x_{37\,3}$	$x_{37\,4}$	$x_{37\,5}$
38	Technical capability	m_{38}	q_{38}	$x_{38\,1}$	$x_{38\,2}$	$x_{38\,3}$	$x_{38\,4}$	$x_{38\,5}$
39	Personnel issues	m_{39}	q_{39}	$x_{39\,1}$	$x_{39\,2}$	$x_{39\,3}$	$x_{39\,4}$	$x_{39\,5}$
Projects manager related factors								
40	Competence	m_{40}	q_{40}	$x_{40\,1}$	$x_{40\,2}$	$x_{40\,3}$	$x_{40\,4}$	$x_{40\,5}$
41	Experience	m_{41}	q_{41}	$x_{41\,1}$	$x_{41\,2}$	$x_{41\,3}$	$x_{41\,4}$	$x_{41\,5}$
42	Technical capability	m_{42}	q_{42}	$x_{42\,1}$	$x_{42\,2}$	$x_{42\,3}$	$x_{42\,4}$	$x_{42\,5}$
…	…	…	…	…	…	…	…	…
49	Delegation of authority and responsibility	m_{49}	q_{49}	$x_{49\,1}$	$x_{49\,2}$	$x_{49\,3}$	$x_{49\,4}$	$x_{49\,5}$
50	Perception of role and responsibilities	m_{50}	q_{50}	$x_{50\,1}$	$x_{50\,2}$	$x_{50\,3}$	$x_{50\,4}$	$x_{50\,5}$
51	Trust	m_{51}	q_{51}	$x_{51\,1}$	$x_{51\,2}$	$x_{51\,3}$	$x_{51\,4}$	$x_{51\,5}$
52	Contract management	m_{52}	q_{52}	$x_{52\,1}$	$x_{52\,2}$	$x_{52\,3}$	$x_{52\,4}$	$x_{52\,5}$
Client related factors								
53	Experience	m_{53}	q_{53}	$x_{53\,1}$	$x_{53\,2}$	$x_{53\,3}$	$x_{53\,4}$	$x_{53\,5}$
54	Type (private vs. public)	m_{54}	q_{54}	$x_{54\,1}$	$x_{54\,2}$	$x_{54\,3}$	$x_{54\,4}$	$x_{54\,5}$
55	Size	m_{55}	q_{55}	$x_{55\,1}$	$x_{55\,2}$	$x_{55\,3}$	$x_{55\,4}$	$x_{55\,5}$
…	…	…	…	…	…	…	…	…
58	Clear and precise goals/objectives	m_{58}	q_{58}	$x_{58\,1}$	$x_{58\,2}$	$x_{58\,3}$	$x_{58\,4}$	$x_{58\,5}$
59	Risk attitude	m_{59}	q_{59}	$x_{59\,1}$	$x_{59\,2}$	$x_{59\,3}$	$x_{59\,4}$	$x_{59\,5}$
60	Ability to participate in different phases of project	m_{60}	q_{60}	$x_{60\,1}$	$x_{60\,2}$	$x_{60\,3}$	$x_{60\,4}$	$x_{60\,5}$
Contractor related factors								
61	Company characteristics	m_{61}	q_{61}	$x_{61\,1}$	$x_{61\,2}$	$x_{61\,3}$	$x_{61\,4}$	$x_{61\,5}$
62	Technical and professional capability	m_{62}	q_{62}	$x_{62\,1}$	$x_{62\,2}$	$x_{62\,3}$	$x_{62\,4}$	$x_{62\,5}$
63	Experience	m_{63}	q_{63}	$x_{63\,1}$	$x_{63\,2}$	$x_{63\,3}$	$x_{63\,4}$	$x_{63\,5}$
…	…	…	…	…	…	…	…	…
69	Work conditions	m_{69}	q_{69}	$x_{69\,1}$	$x_{69\,2}$	$x_{69\,3}$	$x_{69\,4}$	$x_{69\,5}$
70	Advanced technologies	m_{70}	q_{70}	$x_{70\,1}$	$x_{70\,2}$	$x_{70\,3}$	$x_{70\,4}$	$x_{70\,5}$
71	Extent of subcontracting	m_{71}	q_{71}	$x_{71\,1}$	$x_{71\,2}$	$x_{71\,3}$	$x_{71\,4}$	$x_{71\,5}$

3. Conclusion

Construction project is very variable and influenced by unpredictable factors. A conceptual model that includes the grouped critical success factors affecting project success was developed. It was described seven major groups of factors, namely external factors, institutional factors, projects related factors, project management/team members related factors, project manager related factors, client related factors and contractor related factors influencing the project success in Lithuania. For future research, factor analysis method could be used to investigate the underlying relationship among the identified CSFs to find out the clusters that can better represent all the CSFs and a multiple criteria analysis of alternatives in order to select the most successful project.

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