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## The influence of project characteristics on project success factors. Insights from 21 real life project cases from Norway

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### Abstract

Although there are many studies that have identified individual critical success factors in projects the number of studies that have examined how project characteristics such as organizational complexity, transformation, impact on business, constraints, and uncertainty should influence the choice and implantation of project success factors. The study is based on analyzing 21 project cases from a wide spectrum of applications and industries in Norway. In total, c.120 business professionals contributed to the analysis of the cases in order to establish the framework through group work, individual assignments, and group discussions under supervision of the author. For each project characteristic we have identified a set of context dependent success factors that must be adhered to in order to increase the likelihood of success using the 21 projects as an empirical foundation for the analysis. In addition, the findings suggest that there are success factors that are independent of the project characteristics. For instance, having a good working environment that is characterized by openness, respect, loyalty, trust and dedication has considerable influence on motivation, creativity, cooperation, unity, sense of ownership, and knowledge sharing.

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**Keywords:** Project success factors; complexity; uncertainty; project management; project characteristics

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## 1. INTRODUCTION

A substantial body of research in project management have been concerned with critical success factors (CSFs) in projects [1]. A number of studies have examined the effects of specific factors on project success, regardless of the type of project. For example, Müller and Turner [2] examined the relevance of management skills and attitudes for project success. Gemünden, et al. [3] examined the influence of autonomy on project success in new product development. Other studies have focused on generic success factors in projects, such as the one conducted by Murphy, et al. [4], Pinto and Slevin [5] and Cooke-Davies [6]. In recent years, there has been a growing tendency to consider the factors that represent important values in projects such as trust, commitment, loyalty and openness [7-14]. Fortune and White [15] have reviewed 63 publications that focus on critical success factors in project management literature in order to examine the agreement between these publications regarding project success. Fortune and White [15] concluded that there is only limited agreement in literature on the factors that influence project success. This lack of concurrence has also been identified earlier by Wateridge [16]. The lack of concurrence on the factors that influence project success has led researchers to focus attention on applying contingent approach to determine success factors in projects [17]. For instance, Shenhar, et al. [18] distinguish between general and project specific success factors. Recent work by Rolstadås, et al. [19] and Shenhar and Dvir [20] has shown that in order to succeed it is necessary to adjust the way in which the project is managed to adapt it to the project context.

### Justification of the Study

An important conclusion from the recent studies on project success suggest that projects are not always unique and can have different contextual factors and different degrees of these contextual factors at different stages of the implementation process Larsen and Myers [21]. Each project therefore requires a different approach depending on the extent of each project characteristic and on the implementation stage. The purpose of this paper is to contribute to the project management body of knowledge on project success using insights gained from collecting and analysing 21 real life project cases from Norway[22]. Our aim is to establish a contingent framework that identify the interrelationship between critical success factors and the identifying characteristics of the project effort.

The empirical foundation of this study is real life project cases that has been collected during a series of continuing education courses in project management for business professionals held by the author at the Norwegian University of Science and Technology (NTNU) in the period 2009-2014.

The real-life cases were collected using a questionnaire that consisted of open questions that the participants were asked to answer in writing. In these questionnaires, the participants were asked to describe in detail a project that they had contributed to as either project team members or a project manager. The participants were also asked to identify the challenges that had been encountered, the means that were used to respond to the challenges, as well as to provide information about project context, and explain how the project was organized, planned, and executed.

In the period 2009–2014, the author collected c.400 project cases from different types of industries and applications. The size of each delivered case description was c.4–8 A4 pages (2000–4000) words). As the size of the database increased, and from in-class discussions with course participants, it became apparent that a number of factors had contributed to challenges and problems in the reported cases. One important group of factors that contributed to the challenges was lack of full awareness about both the project and its operational context. In many cases, a project was treated as *an effort* that should be completed within agreed upon constraints of time, budget, and scope, regardless of the context. This view of projects does not capture the full reality of the project life cycle and its context. Failure to acknowledge other important characteristics such as uncertainty, complexity, constraints and transformations of the project effort had given rise to problems and challenges in the reported cases. However, there was enough evidence in the cases to support the hypothesis that implementing suitable measures to address different project characteristics contributed to success or at least reduced the level and scope of the reported challenges. A detailed study was therefore initiated by the author to examine these observations closely. The study had the following tasks:

1. To identify a list of all measures that had been applied in the reported cases in order to deliver the projects and achieve their objectives
2. To identify the most important project characteristics embodied in the reported projects and compare the findings with reported findings in project literature
3. To establish a correlation between success factors and the most important project characteristics
4. To develop a conceptual model of project success based on the insights gained from the study

## 2. LITERATURE REVIEW

Because of the multiplicity of forms and purposes of projects, there are a number of different definitions of what constitutes a project. Common to all definitions is that a project is regarded as a temporary assignment that has a defined purpose and a set of characteristics that distinguish project assignment from repetitive tasks [23-26]. Grasping the scope and extent of project characteristics is necessary in order to comprehend the challenges that these characteristics contribute to project execution. This understanding is also crucial for the choice of how information should be shared and managed, for the choice of execution model, and for the selection of project organization structure and authority level to name a few. The most common project characteristics defined in the project management literature include:

**Organizational complexity.** Organizational complexity is one of several dimensions that cause complexity or complications in projects [27-30]. Organizational complexity arises because of the magnitude and diversity with regard to the suppliers, the internal and external resources, and the skills needed in order to achieve the project objectives. This notion of diversity corresponds with the concept of differentiation described by [27]. Clearly, the extent of this organizational complexity will vary depending on the complexity of the project's end product.

**Projects contribute to transformation.** Transformation or change is a broad and abstract concept, and is emphasized by many researchers as a key attribute of project assignments [23]. Change is about altering all or parts of the 'now situation' to a new desired state using the product, service, or result that the project was initiated to deliver [31]. The need for transformation or change is not evident in all types of projects but it is a fundamental concept in restructuring projects and in IT projects initiated to improve existing working processes. In this context, change may mean changing the way employees work to rationalize existing operational processes.

**Projects have impact on business or strategy.** The concept of transformation is not limited to the changes concerning the way employees work to rationalize existing operational processes. In a wider perspective, transformation means that projects are a means to realize business objectives or strategies [32-38]. The business or strategic perspective therefore plays a key role in the selection, allocation, and prioritization of resources to various projects an organization operates [39, 40]. The importance of a project in an organization may therefore vary depending on the impact the project has on the business or strategy. Cooke-Davies [6] goes even further and suggests that one of the most important conditions for organizational success is to link project success to business objectives or strategy.

**Projects are executed under one or more types of constraints.** Another important feature of project assignments is that they are accomplished within one or several constraints, such as time constraints, budget constraints, specifications or resource constraints [26]. A time-constrained project implies that the project must be completed within a specified time or deliver to the market on a certain date to achieve a benefit [24]. Other constraints may include compliance with strict quality standards from a client.

**Uncertainty.** Uncertainty is an inevitable aspect of most projects, but even the most proficient managers have difficulty handling it [41]. Novelty is considered to be a major source of uncertainty in projects [42, 43]. There are many facets of uncertainties in projects and there are many causes of uncertainty. However, there is a common consensus that uncertainty is affected by many factors but can be perceived differently by different people working on the same project. According to Geraldi and Adlbrecht [44] some aspects of uncertainties are more about faith than facts. Cleden [45] argue that in order to manage uncertainty the project manager must ask the right questions, be continually skeptical of the answers received and act where possible only on the basis of impartial evidence.

The above types of uncertainties are classified by Ramasesh and Browning [46] as the Known-Unknown uncertainties and can be addressed through the conventional techniques of risk and opportunity management. Ramasesh and Browning [46] have also studied the unrecognized uncertainties known as (Unknown Unknown). They argue that the driving factors for failing to recognize the unrecognized uncertainties could be attributed to, among other things, behavioral issues such as overreliance on past experiences, biases, heuristics and dysfunctional project culture.

## 3. RESEARCH APPROACH

In this study, qualitative case study research has been used to develop insights into the correlation between project success and project characteristics. Baxter and Jack [47] suggest that case study research fits within the constructivist

paradigm. This paradigm recognizes the importance of the subjective human creation of meaning, but does not reject outright any notions of objectivity. One of the advantages of case study research approach is the close collaboration between the researcher and the respondents or participants, while enabling them to tell their stories. Through their stories, the participants are able to describe their views of reality and this enables the researcher to gain a better understanding the participant's actions. According to Yin [48], a case study approach should be considered when: (1) the focus of the study is to answer 'how' and 'why' questions; (2) the behavior of those involved in the study should not be manipulated; (3) the aim is to cover contextual conditions because they are believed to be relevant to the phenomenon under study; or (4) the boundaries between the phenomenon and context are unclear.

#### 4. FINDINGS

The analysis was conducted in three rounds. The goal of the first round of the analysis was to identify the factors that contributed to success or challenges or failure in each project case and to assess the extent of each project characteristics described in the literature review section. This round was completed for each project case and yielded a complete description of project characteristics and a detailed description of the factors that have contributed to success or failure in the project. A sample example of the results of the first round is shown in Table 1 for one of the project cases that was analyzed Fast track joint replacement surgery project in a Norwegian Hospital.

Table 1. characteristics and most important success factors of Fast track joint replacement surgery project.

Summary	The purpose of the project was to improve the existing work flow in joint-replacement surgery in a regional hospital in Norway. The goal was to increase the number of surgeries pr. day without affecting the safety of the patients. Other expected benefits include reducing number of days a patient has to stay at the hospital before returning home. The project organization consisted of large number of stakeholders (Several departments were involved in the project). This diversity of stakeholders was the source of diversity of expectations (what is important for stakeholders) to the project.
Characteristics	High level of organizational complexity. Several organizational units were involved. High level of transformation compared to now situation. The objectives of the project were to streamline and improve current practices, this requires significant changes to existing attitudes and practices. The project will also contribute to reduction of operational costs of hospital and therefore it had considerable impact on business model.
Most important success	<ul style="list-style-type: none"> <li>• Interdisciplinary cooperation and involvement of all the units that will be affected by the fast-track project.</li> <li>• Close follow-up and support by line management.</li> <li>• Adequate and timely information flow to various stakeholders.</li> <li>• Close follow up of the suggested measures and making necessary changes as the project developed.</li> <li>• Emphasizing loyalty to the decisions taken in the project group.</li> <li>• Project manager with adequate authority and was supported by line management.</li> </ul>

In the second round of analysis, the author systematically went through and reviewed all the submitted responses, coded and consolidated all failure and success factors identified by the participants. The findings also suggest that we can distinguish 3 categories of success factors: 1) Case-specific factors that are relevant to a specific situation and cannot be generalized to other contexts. Examples include the execution style, relationship to vendors, type of contract selected and use of specific methods. 2)Context-dependent factors. An overview of these factors is shown in commitment.

Table 2. 3) Cultural factors that represent important shared values such as trust, openness, respect, loyalty, and commitment.

Table 2. Summary of the context dependent factors from the examined project cases

Clarity of roles and responsibilities for those involved in the project	Adequate early planning
Clarity of project priorities (what is important to consider) and structured requirements process	Oversight / follow up by top management/ project manager. Adequate documentation and reporting
Project manager / management has adequate business insights (understand the needs of various group, understand the impact of the project on the users, inclusive)	Project manager with adequate decision-making authority / appropriate project organization structure. Stability / continuity of project organization

Mobilization and provision of support from project owner / line management / top management	Experience, skills, knowledge and competence (project manager/ contractor, and project group)
Clarity of purpose and objectives	Structured risk management process. / Use of lessons learned from previous projects
Mindfulness about biases, heuristics such as overoptimism, narrow focus and assumptions	Alignment of organization to project purpose/ Communicate the importance of the project to the entire organization
Collaboration between stakeholders/ contractors / line management and project (one-team)	Use of appropriate project execution model (agile, adaptive, plan driven)
Established routines for deviation / change control	End-user/ client/stakeholders involvement. Balanced project group that represent the interests of all the units/ stakeholders that will be affected by the project
Flexibility (adaptability, providing autonomy, address problems as they arise )	Adequate and timely information flow between project and stakeholders

#### 4.1. Correlation between success factors and project characteristics

The third round of analysis focused on matching the success factors with the 5 project characteristics outlined in the literature review section. In this round of analysis, the cases were grouped into five categories:

1. Project cases with high degree of organizational complexities
2. Project cases with high degree of transformation
3. Project cases with high degree of impact on business
4. Projects cases with high degree of constraints
5. Project cases with high degree of uncertainty

For each group, the participants were then instructed to apply their expert judgment and select up to 5 critical success factors that they believe important in order to address each characteristic using the factors listed in Table 2. The responses were then collected, grouped and presented to the participants to obtain their comments and feedback. The comments and feedback from the participants were then used to modify the suggested classification. The process was then repeated for another group of course participants. The result from these classification exercises is shown in Table 2.

Table 3. Classification of success factors according to project characteristics

Characteristic	Critical Success Factors
Organizational complexity (The project requires contribution from large number of organizational units/ individuals)	<ul style="list-style-type: none"> <li>• Timely and purposeful information flow to various stakeholders.</li> <li>• Clarity of roles and responsibilities.</li> <li>• Project manager with adequate decision-making authority / appropriate project organization structure.</li> <li>• Stability / continuity of project organization</li> </ul>
Transformation (purpose of the project is to introduce substantial changes to existing work processes, systems or procedures)	<ul style="list-style-type: none"> <li>• Clarity of purpose and objectives</li> <li>• End-user/ client/stakeholders involvement</li> <li>• Balanced project group that represent the interests of all the units/ that will be affected by the project</li> <li>• Project manager / management has adequate business insights (understand the needs of various group, understand the impact of the project on the users, inclusive)</li> </ul>
Impact on business (the project has substantial impact on the business or on corporate strategy)	<ul style="list-style-type: none"> <li>• Alignment of the organization to project purpose/ Communicate the importance of the project to the entire organization.</li> <li>• Mobilization and provision of support from project owner / management.</li> <li>• Oversight / follow up by project owner / management</li> </ul>

Constraints (the project should be completed under one or several types of constraints, such as time, resources, requirements from authorities or other stakeholders)	<ul style="list-style-type: none"> <li>• Adequate early planning. Established routines for deviation / change control.</li> <li>• Collaboration within the project organization.</li> <li>• Collaboration between project/contractors/ (One team)</li> <li>• Clarity of priorities and structured requirements process</li> </ul>
Uncertainty (the project has considerable level of uncertainty regarding the scope of work, impact, methods or the outcome)	<ul style="list-style-type: none"> <li>• Flexibility</li> <li>• Structured risk management process</li> <li>• Use of lessons learned from previous projects</li> <li>• Experience, skills, knowledge and competence (project manager/ contractor, and project group)</li> <li>• Mindfulness about biases, heuristics such as overoptimism, narrow focus and assumption</li> </ul>

## 5. CONCLUSIONS

The main purpose of this paper was to develop a framework that categorize project success factors according to the characteristics of the project using insights from real life project cases. The findings strongly suggest that success factors are not universal to all types of projects. Categorisation of success factors could therefore be more helpful for project managers and project practitioners than the generic view of success factors. Needless to say, a project that is characterized by high extent of constraints and low extent of transformation should be managed differently than a project that has low extent of constraints but has high extent of transformations. The framework shown in table 3 is helpful to the project manager because it shows what are the most relevant and critical factors that must be adhered to in order to increase the likelihood of success. The paper presents and classify 18 success factors depending on the context of the project. The project context is presented using 5 characteristics that has been identified from project management literature. The project characteristics include:

**Organizational complexity.** The extent of this organizational complexity will vary depending on the complexity of the project's end product. Findings suggest that the following factors are all critical to adhere if the project is organizationally complex:

- Timely and purposeful information flow to various stakeholders
- Clarity of roles and responsibilities
- Project manager with adequate decision-making authority / appropriate project organization structure.

**Transformation:** Findings suggest that the following factors are critical to adhere if the purpose of the project is to introduce substantial changes to existing work processes, systems or procedures:

- Clarity of purpose and objectives
- End-user/ client/stakeholders involvement
- Balanced project group that represent the interests of all the units/ that will be affected by the project
- Project manager / management has adequate business insights (understand the needs of various group, understand the impact of the project on the users, inclusive)

**Business or strategy.** Findings suggest that the following factors are critical to adhere to if the project has substantial impact on the business or on corporate strategy:

- Alignment of the organization to project purpose/ Communicate the importance of the project to the entire organization
- Mobilization and provision of support from project owner / management
- Oversight / follow up by project owner / management

**Constraints.** Findings suggest that the following factors are critical if the project should be completed under one or several types of constraints:



- Adequate early planning
- Established routines for deviation control
- Collaboration within the project organization. Collaboration between project/contractors/ (One team).
- Clarity of priorities and structured requirements process

**Uncertainty.** Findings suggest that the following factors are critical to adhere to if the project has considerable level of uncertainty regarding the scope of work, impact, methods or the outcome:

- Flexibility
- Structured risk management process. / Use of lessons learned from previous projects
- Experience, skills, knowledge and competence (project manager/ contractor, and project group)
- Mindfulness about biases, heuristics such as overoptimism, narrow focus and assumptions

In addition, the empirical findings from this study suggest that trust, openness, respect, loyalty, and commitment are important shared values. These shared values are not correlated with project characteristics but are important to create a good working environment in which project team members improve their tasks continually. In addition, these values have considerable influence on motivation, creativity, cooperation, unity, sense of ownership, and knowledge sharing. Lack of these values could cause power struggles, resistance, indifference, and ultimately failure in projects. Unlike previous studies which are based on statistical methods in order to determine critical success factors this study is based entirely on qualitative methods using factual data project and project management professionals who are attending project management courses.

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