



Understanding project success through analysis of project management approach

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Abstract

Purpose – The purpose of this paper is to show that project success is dependent on the project management approach selected, relative to the challenges posed by the project, and to develop an analytical model for analyzing the performance of the project organization.

Design/methodology/approach – The research is based on literature review, model development, interviews, and case studies.

Findings – The findings define two different approaches in project management: The prescriptive approach focusses on the formal qualities of the project organization, including governing documentation and procedures. The adaptive approach focusses on the process of developing and improving a project organization, project culture and team commitment. The two approaches have been identified through studies of three different case projects. An analytical model, referred to as the Pentagon model, has been applied for analyzing the performance of the project organization and explaining the project management approach. The model focusses on five different organizational aspects: structure, technologies, culture, social relations and networks, and interaction.

Research limitations/implications – The research is limited to megaprojects and to project management success.

Practical implications – It is suggested that project teams consider and select their project management approach at project initiation, and accordingly decide on relevant success factors to focus on. The adapted Pentagon model can be applied to develop the project management organization and assess its performance in the course of project delivery.

Originality/value – The contribution of the research is the application of the analytical model, and the identification as well as illustration of the prescriptive, vs adaptive management approach.



Keywords Project management, Organizational performance, Project success, Construction megaprojects, Management approach, Megaprojects

Paper type Research paper

1. Introduction

The Boston Big Dig, completed in 2007, was one of the most expensive highway projects in the USA and notoriously famous for a 190 percent cost overrun, many years of delay, design flaws and corruption. In 2010, however, an article in the Boston Globe stated that the project in fact has proved to be a success: “For two decades, the Big Dig, with its ballooning price tag and inscrutable traffic patterns, made Boston the nation’s laughingstock. Now, the joke is on everyone else” (Gelinas, 2010). The arguments are that the new infrastructure has met the goals of improving the traffic situation and also has contributed to an increase in property values.

This ambiguity in the meaning of “success” is due to the fact that success may be measured against any one of several different sets of objectives (Rolstadås, 2008):

- project objectives – i.e. what the project organization is expected to deliver at the close of the project (scope, quality, cost, time).
- business objectives – i.e. what the project owner expect to obtain from using the project results after the project has been handed over to them from the project organization.
- social and environmental objectives – i.e. what benefits the local society expect from the project both during project execution and during the use of the project results.

The above view is supported by de Wit (1988), Cooke-Davies (2002), and others who distinguish project success (measured against the overall objectives of the project, i.e. the business objectives) from project management success (measured against the widespread and traditional measures of performance against scope, quality, cost, and time, i.e. the project objectives). Belassi and Tukel (1996) also discuss this ambiguity and propose a framework classifying the success factors into four groups: related to project, related to project manager and team members, related to organization, and related to external environment). Shenhar *et al.* (2001, 2002) describe a multidimensional concept with four success dimensions: project efficiency, impact on the customer, direct business and organizational success, and preparing for the future. The first dimension is connected to fulfilling the project objectives (project management success), whereas the last three are connected to fulfilling different business objectives for different stakeholders (project success). Cooke-Davies (2002, p. 185) claims that the question “Which factors are critical to project success?” differs considerably dependent on which of the following three questions are asked:

- (1) What factors are critical to project management success?
- (2) What factors are critical to success on an individual project?
- (3) What factors lead to consistently successful projects?

Early research on success factors such as Pinto and Slevin’s (1987) list of ten factors did not distinguish between different success dimensions as is the case with later works referenced above. The Boston Big Dig example illustrates it is important to distinguish whether the project outcome is perceived as a success (measured against the business

objectives) from whether the project team is successful in managing the project (measured against the project objectives). A project result can be successful even though the project was unsuccessfully managed. The opposite may also be the case. A project may be perfectly managed, but still come out as a business disaster, e.g. due to changing markets. In this paper we address the performance of the project management organization, and thus concentrate on project management success.

Well-developed tools are available to support project management. For example, the PMI Guide to the Body of Knowledge (PMI, 2013) defines suitable practices widely applied. Chapman and Ward (2003) and Raz and Michael (2001) among others offered tools for project risk management. Williams (1995) developed a classified bibliography on project risk management research. Jugdev and Thomas (2002), Ibbs and Kwak (2000), and Yazici (2009) showed how maturity of the project organization can be measured. Despite excellent competence in project management, however, overruns and delays still occur.

A common description of what influences project success relies on critical success factors (CSF) which Müller and Jugdev (2012, p. 758) defines as “elements of a project which, when influenced, increase the likelihood of success” in their overview of the historical development and state of the art on CSF.

Many authors have studied success factors (e.g. Rockart, 1979; Pinto and Slevin, 1987; de Wit, 1988; Belassi and Tukel, 1996; Shenhar *et al.*, 2001; Cooke-Davies, 2002; Fortune and White, 2006; Müller and Jugdev, 2012). Most of the factors identified tend to be rather generic and as such may look obvious to an experienced project manager. We believe that to fully understand what leads to project management success it is also necessary to look at the project management approach applied. This view is supported by some of the recent research on different schools of thought in project management. Would an approach based on a particular school have a better chance of leading to success than other schools? Our starting point is that there is no generic answer to this question. On the contrary, what kind of management approach which will lead to success depends on the actual project and the actual project organization.

Our research question was:

RQ1. How can the project management approach influence the probability of success?

And the purpose of this paper is to demonstrate that project success correlate to the project management approach selected. In this effort we use an analytical model (the Pentagon model) for categorizing factors influencing the performance of the project organization. As indicated, we limit our study to success measured against the project objectives. We also limit our study to megaprojects.

The results from the analysis reveal two different project management approaches, named, respectively, the prescriptive and the adaptive approach. Our findings are in line with Shenhar and Dvir's (2007) discussion on reinventing project management, distinguishing between traditional project management and adaptive project management. In later works they refer to adaptive project management as strategic project management (Patanakul and Shenhar, 2012).

2. Literature review

2.1 Success factors

Within the field of project management, the search for CSFs began in the 1960s. Daniel (1961, p. 116) introduced the term success factor in relation to the “management

information crisis” that was being brought about “by too rapid organizational change.” In the 1970s studies on project success focussed on measuring time, cost and functionality improvements, implementation, and delivery systems. Academic discussions on “What leads to project success?” started in the 1980s. This was a period with intense research allowing factors beyond time, cost, and functionality to be considered. Many authors began producing lists of CSFs. Pinto and Slevin’s (1987) list of ten success factors is now a classic piece of work. Müller and Jugdev (2012) recently published a review of the research on CSF and, while underscoring the significance of the early works, claim that success is now more broadly viewed.

An author that early broadened the view on CSF is Turner (1999) who published the seven forces model for project success: context, attitude, sponsorship, definition, people, systems, and organization. Christenson and Walker (2008) add that a well-communicated and convincing project vision make a strong impact upon perceived project success.

Shenhav *et al.* (2002) argue that different factors influence different kinds of projects and that we must adapt a more project-specific approach to identify the causes of project success or failure. They studied 127 projects in Israel and recorded 360 managerial variables. They were and presented these in a list of 22 factors critical for project success independent of the project’s characteristics. Their conclusion is that success factors are dependent on contextual influence. This view is supported by Müller and Turner (2007) who observed that the importance attached to project success criteria and project success rates differ by industry, project complexity, and the age and nationality of the project manager.

Fortune and White (2006) reviewed 63 publications focussing on CSFs. In addition, they also reviewed the criticisms, and then tried to show how their formal systems model can be used to “solve” the problems connected to measuring/discovering CSFs. Table I shows their top ten CSFs and the number of corresponding citations. Totally, 81 percent of the publications include one or more of the following three factors: “support from senior management”; “clear and realistic objectives”; and “strong/detailed plan kept up to date.”

2.2 Project management schools of thought

A comprehensive amount of research has been published on success factors as shown by Müller and Jugdev (2012, p. 758). They argue that the interest in project success is evident from the streams of research identifying different “schools” or “perspectives”

Critical factor	Count of citations
Support from senior management	39
Clear realistic objectives	31
Strong/detailed plan kept up to date	29
Good communication/feedback	27
User/client involvement	24
Skilled/suitably qualified/sufficient staff/team	20
Effective change management	19
Competent project manager	19
Strong business case/sound basis for project	16
Sufficient/well allocated resources	16

Source: From Fortune and White (2006)

Table I.
Major success factors

in the field. A project management approach could be associated with a school of thought or a perspective. Bredillet (2007) identified nine such schools of thought. He claims that it is common to assume that projects are fairly homogeneous, but that there is a growing understanding that projects are different, that success can be judged in different ways, and that different projects require different competence profiles.

This viewpoint corresponds with Söderlund's (2010) study of pluralism in project management where he discusses the balance between unification and specialization and argues that a too strong focus on unification may hinder the advancement of ingenious thinking and creative tensions, and that a more diversified view is necessary to explore and explain the difficulties of generating, forming, managing, and (eventually) killing projects. He sums up by defining seven schools of thought as shown in Table II.

Andersen (2005) discusses different project perspectives where a perspective can be regarded as a school of thought. Two such perspectives are highlighted: the task perspective with main focus on the task to be accomplished, and the organizational perspective with main focus on the temporary organization. Rolstadås (2008) similarly distinguishes two different schools: one that emphasizes planning and control techniques, and one that emphasizes organization and human relationships. He argues that both are equally important and necessary.

The task perspective corresponds to what we in this paper characterize as a prescriptive project management approach, whereas the organizational perspective equals a more adaptive approach. This distinction between prescriptive and adaptive project management approach is also claimed by Shenhar and Dvir (2007) when they distinguish between traditional and adaptive approach.

It should be noted that the two different approaches are theoretical constructs which we use to understand the performance of the project organization. In a real situation these approaches are not mutually exclusive, but may be combined in different ways.

3. The Pentagon model

In order to assess the performance of a project organization executing a megaproject, we need an assessment tool. Several such tools are available for business processes in general, but we have not come across many tools that are applicable for evaluating the effect of different project management approaches.

The Pentagon model, originally developed by Schiefloe (2011), is, however, such a model for analyzing the performance of complex organizations. It was developed and applied in connection with the causal analysis after the gas blow-out at Statoil's Snorre A platform in the North Sea in 2004 (Schiefloe and Vikland, 2006, 2009). The analysis is based on a system-oriented approach. To understand the working situation for the different actors involved, it combines a system perspective with a social constructivist

Table II.
Söderlund's (2010) seven
schools of project
management research

School	Main focus of analysis
Optimization	Planning, breakdown techniques, and scheduling of complex tasks
Factor	Success factors and project outcomes/project performance
Contingency	Project organization design/structure
Behavior	Project organization processes
Governance	Governance of project organizations/transactions
Relationship	Management of the formation and development phase of projects
Decision	The interplay among decision makers in the early stages of projects

theoretical approach, characterized by keywords such as interpretations, sense making, and interests.

The Pentagon model takes both formal and informal aspects into account. As the name Pentagon indicates, it analyses five different aspects:

- structure;
- technologies;
- culture;
- interaction; and
- social relations and networks.

For our purpose, we had to make several adaption to the model. We needed to distinguish clearly between formal and informal qualities of the project organization, and also to include relationships to external contexts and stakeholders (as the Pentagon model itself focusses on the internal project organization). For each of the five aspects we set up a list of questions in order to develop a suitable interview guide for the application. In developing the interview guide we also took into account the industrial practice within oil and gas and within commercial building construction. Accordingly, we had to adapt the model to a project organization working with the principles of lean construction and integrated project delivery. It is beyond the scope of this paper to describe these principles, but an overview can be obtained from Ballard *et al.* (2002), Koskela *et al.* (2002), Thomson *et al.* (2009), and Smith *et al.* (2011).

In complying with the lean principles, it was important to take into account the dynamic situation arriving from the application of the Plan – Do – Act – Check cycle. A large project is an ad-hoc organization, comprising a number of actors who join and leave the project team as the project progresses. These actors operate under tight constraints, often coping with complex external conditions. Organizing and managing this kind of open system is demanding, and success depends on the management of a set of organizational processes matching the Plan – Do – Act – Check cycle (Figure 1).

Challenges a project management team encounters grow as the number and diversity of stakeholders (both internal and external) increases, as more differentiated cultures are involved, and as communication distance increases.

Our version of the Pentagon model is illustrated in Figure 2. We used this model successfully to study the performance of the project management of megaprojects as well as smaller construction projects.

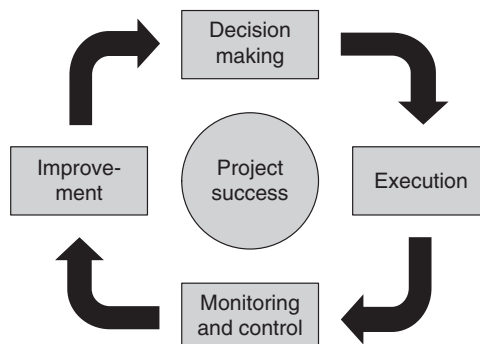


Figure 1.
Organizational processes
in project execution

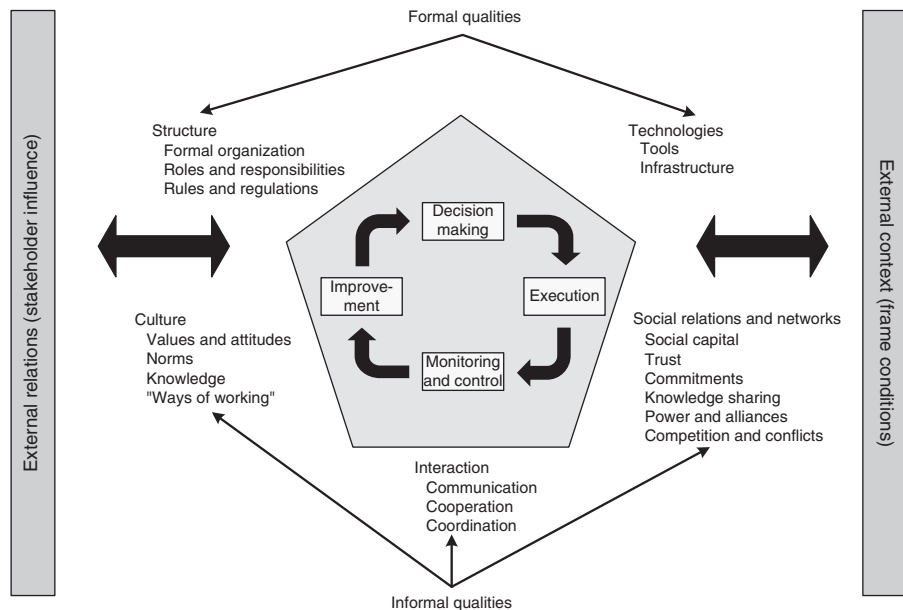


Figure 2.
The extended
Pentagon model

Source: Based on Schiefloe (2011)

Structure covers defined roles, responsibilities, and authority in the formal organization, but also includes defined procedures, regulations, and working requirements.

Technologies refer to the different tools and infrastructures the members of the organization are dependent on or use to perform their activities. In a project organization this will include project control systems, communication and collaboration technologies, office lay-out, etc.

Culture covers elements such as language/concepts, values, attitudes, norms, knowledge, and established expectations concerning “ways of working.”

Interaction covers communication, cooperation, and coordination, and also points to the fact that individual and collective behavior never occurs in a vacuum. People interact with, adjust to, and are influenced by others; colleagues as well as subordinates and leaders. Management practices, work processes and flows of information are included in this aspect.

Social relations and networks are important ingredients in all kinds of work situations. It represents the informal structure and the social capital of the organization. Keywords are trust, friendship, access to knowledge and experiences, informal power, alliances, competition, and conflicts.

The five aspects of the Pentagon model can be applied to analyze factors which influence the performance of the project organization as they cover both formal and informal internal qualities in a systematic way. However, the organization is also exposed to external aspects. We have denoted these external context and external relations.

The external context represents frame conditions, which are those characteristics of a project that cannot be changed by project management, and are rooted in the project’s desired results, location geographically and culturally, and location in time. For example, a company that has developed a project governing system to be applied

for all of their projects, sets certain limitations on how the project organization can work. This means that the flexibility in the Pentagon aspect “structure” is limited.

External relations represent input from external stakeholders such as contractors, authorities, and the society at large. These stakeholders influence the project organization both directly and indirectly and may be crucial for the operation of the project delivery system and thus also for the success or failure of the project.

We applied the Pentagon model to three different cases, analyzing the five aspects while taking the external context and relations into account. The analysis has resulted in a list of contributors to success.

4. Research approach

Our research question is:

RQ1. How can project management approach influence the probability of success?

We limit ourselves to looking at megaprojects and to studying project management success.

The research approach involves four steps:

- (1) a literature review;
- (2) development of an analytical model;
- (3) case studies; and
- (4) analysis of the case studies using the model, and conclusions.

Through literature review on project and project management success, focussing on success factors, we found the published success factors to be rather generic and in many cases quite obvious to an experienced project manager. We therefore studied the underlying thinking applied in managing different projects and found interesting publications describing different schools of thought. We asked ourselves whether one school was more successful than others, but found no conclusive proof for this. This has led us to look at different management approaches that could be applied across different schools of thought.

Analyzing three different cases, we used the Pentagon model to identify main factors that contributed to successful project management. The projects represent different application areas and geographical regions, but are all large and complex. Two of them are completed, while one is still in progress.

For case A we used semi-structured face-to-face or telephone interviews. A detailed interview guide was developed to ensure that all the aspects of the Pentagon model were appropriately addressed. Each interview was done by three researchers. The interviewers took notes during the sessions which in addition were fully recorded. Before doing the interviews, technical documentation, and other relevant project information was made available to the researchers and studied. During the interviews supplementary documentation was in a number of cases requested. All interview objects were guaranteed full anonymity.

The informants were selected in interactive dialogue with representatives of the owner organization and also soliciting proposals from some of project managers. We required that different levels of the project organization should be independently interviewed, including top management. Each interview lasted between one and two hours. A total of ten persons were interviewed.

Each interview was analyzed by the research team. Supplementary documentation requested during the interviews was assessed, and the viewpoints of the interview objects were grouped according to the dimensions in the Pentagon model. Viewpoints expressed by several interview objects were assessed as success contributors and mapped according to the five Pentagon aspects. In several cases information was cross-checked with other interview objects or verified by the actual interview object.

For case B two of the authors have been involved in the project as advisors and action researchers. Their role has been twofold. First, they provided the owner and the project organization with available research results that could be applied to meet the challenges of designing a project using lean construction principles. This supported the team's development of a project management approach based on the "no-business-as-usual" philosophy adopted. Second, they helped to evaluate the alternatives considered and the design of the project management system. The researchers have had full access to all relevant documents for the project. Some of the researchers participated weekly in meetings over the course of more than two years. Others conducted interviews and surveys on site as appropriate for their research.

Based on their insight from following the project closely, the action research team extracted what they believed to be the main contributors to success. These were cross-checked with the project management, and then grouped and mapped according to the dimensions of the Pentagon model. A full day seminar was organized where the project management and representatives of the main contractors presented their view on what they thought had contributed to success or failure. This was followed by a discussion and questions from the whole research team.

As case B only had completed the design and planning phase, we used a third case (C) to verify the findings from case B. One of the researchers has been closely involved in the project as an advisor on the lean construction principles and the design of the project management operating system, specifically for the civil works part of the project. Our analysis of case C has been based on the insight of the researcher in project execution and from studying extensive documentation on the selected strategies and plans for the project. As for case B, the research team extracted the success contributors based on the documentation and the insight in the project obtained from acting as an advisor. They were then grouped and mapped onto the Pentagon model. A full day seminar with all the researchers, the management team, and representatives of the main contractors was organized. At this seminar they presented their view on what was successful or not, and participants responded to our questions.

5. Case studies

5.1 Selection of cases

The Pentagon model distinguishes the formal from the informal qualities of the project organization. Our assumption is that these represent two different project management approaches dependent on which of these qualities that has the main focus at the establishment of the project management team. This implies that the focus of our study should be at the early phase of the projects when the approach is decided. Megaprojects normally have long duration which sometimes results in significant changes in the project management team. By focussing on the early phase, we obtain consistent data in the respect that the management team is the same.

Our strategy was to find two cases that could illustrate to two different project management approaches. We looked for a project that was well executed according to

established best practice and one where the organization was significantly challenged in developing a feasible project.

Case A is from the oil and gas sector and has been executed according to best practice in this industry by experienced project owners and contractors. Case B is from the construction industry. For this case an initial team was established that failed in developing a project design meeting the owner's requirement within an acceptable cost frame. A new team was launched which was then facing the need for a "nontraditional" solution. This project is now awaiting the governmental approval for construction start up. It is thus not finished, but since we address the early phase, we expect that we can draw good conclusions from the work done so far. However, to compensate for the fact that the case B project is not finished, we decided to make a brief assessment of a third project which is similar to case B. This case C is also a land-based construction project. The approach applied is similar to the one applied in case B. Case C is only used to verify the findings from case B.

All the cases are megaprojects, commonly defined as projects with a budget of more than one billion USD. Such projects where the organization is challenged to meet project demands attract a lot of public attention because of substantial impacts on communities, environment, and budgets.

For each case we listed the frame conditions that we found. Then we identified a number of contributors to success based on the data collected. We categorized these according to the Pentagon model. These contributors to success can be regarded as success factors. However, the contributors can also be further grouped to comprise an overall success factor for each Pentagon aspect. Figures 3-5 corresponding to each of the three cases show the success factors at both levels.

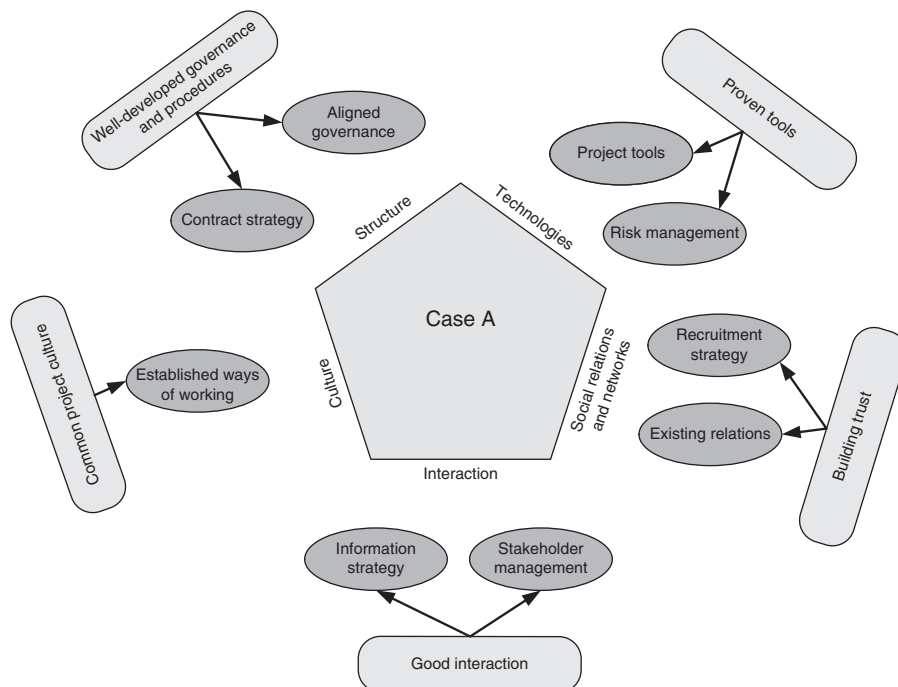


Figure 3.
Mapping of main success
factors for the case A
project



Figure 4.
Mapping of main success
factors the case B project

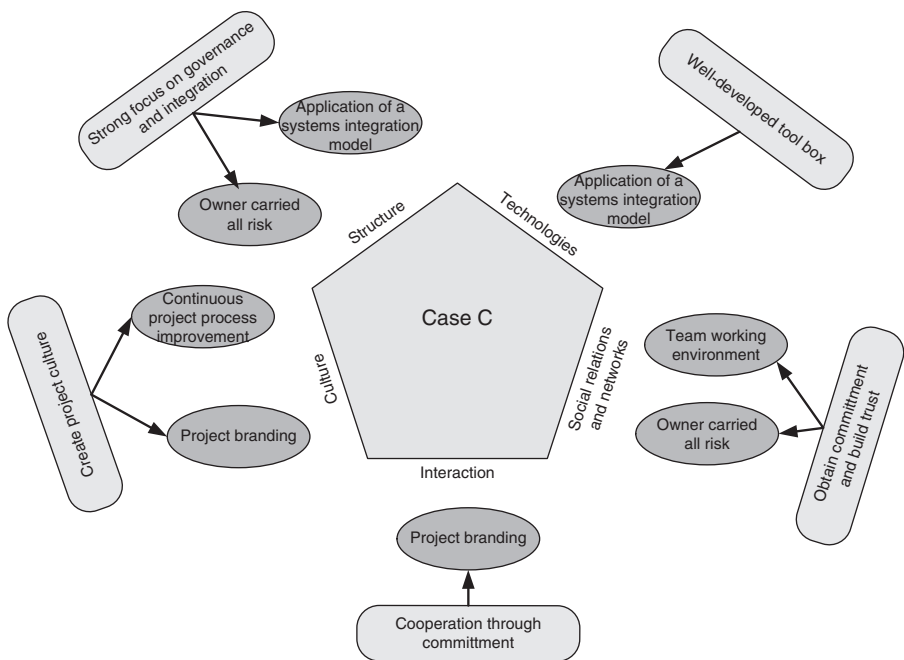


Figure 5.
Mapping of main
success factors for
the case C project

5.2 Case A

Case A is an oil and gas project in Norway comprising subsea wells with a multiphase pipeline to onshore process facilities. The basic concepts for development were decided in 2002, the main contracts were awarded in 2004, installations of offshore facilities started in 2005, and erection and assembly of the onshore plant in 2006. The facilities started operation in 2007. The project was successfully completed on time and within budget.

In order to understand the performance of the project organization, it is necessary to know what frame conditions the organization had to work under. We found three frame conditions that were significant in this respect. These were derived from project documentation that was made available to us and cross-checked with project managers during our interviews. The three frame conditions are:

- (1) Relations with partners: a common governance process for all the partners involved simplified the decision process at the partner level and avoided delays.
- (2) External stakeholders: the project management strategy for obtaining local support and assistance had openness as its basic foundation, where the stated aim was to “include the project in the community.”
- (3) Contract strategy: the contract strategy was tailored to maximize the benefits from a competitive market. After contracts were awarded, the structure had sufficient flexibility for merging contracts to improve performance and project control.

Oil and gas projects normally have several owner-partners (case A had six owner companies) one of them acting as an operator on behalf of all. High-level plans, technical concept, and many management issues have to be approved by all partners. Normally each partner has its own governance system. In case A, all partners agreed to jointly aligned project governance. Frame condition 1 thus allows us to compare this multi-owner project with projects with a single owner. Frame condition 2 is a response to the local political requirements and expectations. Frame condition 3 is important to understand the flexibility in contracting that the project team was allowed.

Our interviews were structured according to the five Pentagon aspects. The research team conducted extensive analyses of the interviews and extracted what we judged to be main contributors to success. These contributors had been mentioned by several interviewees at different organizational levels as a key aspects or policies on how the project was managed. The researchers further cross-checked the contributors identified with selected interviewees in order to gauge their prominence. Figure 3 shows the contributors so identified, mapped to the Pentagon model as success factors.

The following list gives brief explanations of the nine success factors identified for case A:

- Aligned governance (Pentagon aspect “Structure”): a common governance structure with all involved partners in the project was agreed at the very beginning. This included common decision points and procedures for all partner’s approval.
- Recruitment strategy (Pentagon aspect “Social relations and networks”): managers selected participants on the basis of their known competence as well as their former relations and personal networks. They built up the organization gradually, emphasizing team building and learning. Good continuity of personnel was obtained over the different project phases.

- Established ways of working (Pentagon aspect “Culture”): the mother organization had a general acceptance of an established way of working that made it relatively easy to establish a common conceptual platform building on shared norms and professional language.
- Project tools (Pentagon aspect “Technologies”): well-proven project management tools with specifications, deliveries, and schedules were used according to well-established practice of the operating company.
- Contract strategy (Pentagon aspect “Structure”): a flexible contract strategy tailored to maximize the benefits from a competitive market was adopted. Each of the main contracts was followed up by a company representative. All changes were handled continuously, with a parallel and detailed updating of documents.
- Risk management (Pentagon aspect “Technologies”): an extensive system for risk management was established.
- Existing relations (Pentagon aspect “Social relations and networks”): existing working relationships across organizations laid the foundation for developing a project culture characterized by openness, allowing room for discussion and new ideas.
- Information strategy (Pentagon aspect “Interaction”): an important mechanism for obtaining good coordination was to hold regular meetings, both within the management group and within sub-projects.
- Stakeholder management (Pentagon aspect “Interaction”): a clear strategy for managing all external stakeholders was developed and implemented. This was crucial for obtaining acceptance in the local community and commitment from the local key players.

The pre-project and the execution projects for the onshore and offshore installations were organized and managed according to different principles and leadership styles. An important lesson from this case study is that the project manager’s ability to adapt leadership and organizational development to the actual internal and external nature and complexity of the offshore vs the onshore project was a major contribution to success. Another important lesson is that the management team succeeded in balancing different aspects of the project organization, working with the development of both internal and external qualities.

5.3 Case B

Case B is a building construction project in California, USA. The facility is a large healthcare institution and is considered to be an extremely complex project, in part due to the governmental regulations to sustain earthquakes. In fact, the first team that tackled this project failed in their assignment, unable to design a project meeting the owner’s requirements within the available budget. Recognizing the improbability of being able to meet all demands using familiar project management practices, the project leaders set those practices aside, and proceeded with “no business as usual” (e.g. Knott, 1996). Their strategy was to apply the principles of lean construction.

Project planning started in 2005 and resulted in a project plan (including design), a project organization and a clearly defined project management approach. The design phase completed in 2012, but the project was put on hold awaiting permitting.

As with case A, the frame conditions for project execution are important for understanding the expectations the project organization had to meet. Some of the authors on our paper had been involved in the project delivery system design monitored and participated in the project. Based on their experience (and cross-checked with the project management), the most important frame conditions challenging the project organization were:

- (1) An earlier project team had failed. This led to the opinion that traditional project management approaches in the then-current market conditions would not be able to meet the demands of this project.
- (2) Complicated and slow local government permitting had created a vicious circle where incomplete drawings submitted early for approval led to increased review time from the government.
- (3) A significant gap existed between the estimated costs of the facility required and the financial resources available for the project.

Through their involvement in the project, the researchers came up with a list of seven factors for project success, which were cross-checked with the project's top management. The list of success contributors were analyzed by the research team and grouped according to the Pentagon model. Figure 4 shows the mapping of the success factors on the Pentagon model. Two of the factors cover more than one Pentagon aspect. The success factor "Five Big Ideas" addresses both culture and social relations. The success factor "integrated form of agreement" is at the same time part of the Pentagon "structure" aspect addressing the project governance while at the same time enabling interaction and developing social relations.

The list below gives brief explanations of the seven success factors identified for case B:

- No business as usual (Pentagon aspect "Structure"): due to the failure of the first team, it was decided to think "outside of the box" in order to meet the challenging external conditions.
- Manage by means (MBM) approach (Pentagon aspect "Culture"): instead of using the management approach called "managing by results" (MBR), the project team set out to "MBM". MBR approaches focus on outcomes, and strive to minimize deviations from the plan set out to achieve those outcomes. In contrast, MBM approaches focus on teaching principles and practicing their application, striving for continuous improvement but without judging those who are learning based on their outcomes. Project leaders align and nurture the capabilities of the project delivery team with the demands imposed on the project (Johnson and Bröms, 2000).
- Lean construction principles (Pentagon aspect "Technologies"): lean construction is an adaption and augmentation of lean manufacturing principles to construction projects, e.g. focussing on elimination of waste and on managing flows (Koskela *et al.*, 2002; Ballard *et al.*, 2002).
- The Five Big Ideas (Pentagon aspects "Culture" and "Social relations and networks"): five ideas were developed to foster a sound project team working culture (Lichtig, 2006). The ideas are: collaborate – really collaborate, increase relatedness, projects are networks of commitment, optimize the whole, and tightly couple learning with action.

- Integrated form of agreement (Pentagon aspects “Structure,” “Interaction” and “Social relations and networks”): an innovative relational form of contract called the integrated form of agreement was developed (Thomsen *et al.*, 2009). This contract form fosters an environment of collaboration and innovation on the project. It includes contract language that asks project participants to define their operating system and encourages all project participants to cooperate rather than to compete. It increases the team’s ability to deliver their project optimized as the whole.
- Facilitate team learning (Pentagon aspect “Culture”): in-line with all previously mentioned contributors, implementation of the Plan-Do-Check-Act cycle, was promoted throughout the organization in order to facilitate individual team member’s and the team’s learning.
- Office infrastructure (Pentagon aspects “Technology” and “Interaction”): participants from different disciplines shared physical workspaces and had easy access to each other for information sharing and discussions, which proved to be valuable for effective coordination in the project development.

5.4 Case C

Case C is an infrastructure project in the UK. The facility, an airport terminal, was successfully completed in 2008 on time and within budget. In light of numerous failed deliveries of public megaprojects in the UK in the years preceding, the owner chose to follow a radically new approach to deliver the project. The owner had so much at stake that project failure could have meant company bankruptcy. As in case B, principles of lean construction were applied in case C.

Architectural design started in 1989. The owner submitted a planning application in 1993. This was followed by an extended public inquiry until the authorities granted the planning consent in 2001. The project design phase started for full and the first construction work took place in 2002.

Both case B and C were launched requiring radically new thinking around management and execution of the projects. This similarity in frame conditions facilitates comparison of project organization performance. Actually, our research team identified four frame conditions that we consider crucial in driving how the project was managed:

- (1) following several failed deliveries of public megaprojects much was at stake for this project; a project failure could mean company bankruptcy for the owner;
- (2) the owner was actively involved in project management and daily project execution;
- (3) the project is one of Europe’s largest and most complex public megaprojects; and
- (4) the owner agreed to carry all the cost risks of the construction project, rather than contracting that out.

We already mentioned the first frame condition. The second facilitated decision making as the owner was involved in the project. The size of the project and the fact that it is an airport terminal (requiring post 9/11 security measures during construction) made it quite complex as was also the case for the case B project (although the nature of the complexity was different). The fourth frame condition

enabled flexibility in contracting that is comparable to what they obtained through the Integrated Form of Agreement used in the case B project.

Case C findings are in line with our case B findings, as both projects pursued an adaptive management approach.

Our information on case C was derived from three different sources. First, we studied project reports; mainly close-out reports summarizing experience from project execution including the strategies adopted and the experience of how the project was managed. Second, one of the researchers had been engaged on the project as an advisor to the sub-project management team. Third, we were able to organize a full-day “debriefing” seminar with the management team and the representatives of the main contractors where they presented their view on what was successful and not successful and answered to our questions.

We analyzed this information to define the main contributors to success and mapping them to the aspects of the Pentagon model. The results are shown in Figure 5. Again some of the factors cover more than one Pentagon aspect. The systems integration model covers the Pentagon aspect “Structure” as it serves as project governance. At the same time it provides a number of tools covered by the Pentagon aspect “Technologies.” The fact that the owner decided to carry all risk is a “Structure” aspect. At the same time it was a significant enabler for communication in the project and thus also falls under the Pentagon aspect “Interaction.” The project branding also facilitated communication and interaction (Pentagon aspect “Interaction”) and at the same time it served as the most important initiative to build a project culture (Pentagon aspect “Culture”).

The list below explains the five success factors identified for case C:

- Application of a systems integration model (Pentagon aspects “Structure” and “Technologies”): an approach defined by Davies *et al.* (2009) was applied. This involves six processes required to execute a megaproject: first, systems integration to coordinate the design, engineering, integration, and delivery of a fully functioning operational system; second, project and program management to support an integrated supply chain; third, digital design technologies to support design, construction, integration, and maintenance activities; fourth, off-site fabrication, pre-assembly, and modular production, to improve productivity, predictability, and health and safety; fifth, just-in-time logistics to coordinate the supply of materials, to increase speed and efficiency; and sixth, operational integration to undertake systems tests, trials, and preparation for hand-over to operations.
- Continuous project process improvement (Pentagon aspect “Culture”): a standard set of guidelines was introduced as a project handbook. The intention was to improve the project development and project management process by ensuring a consistent approach which meets business needs and opportunities and thus created continuous improvement across the organization.
- Team working environment (Pentagon aspect “Social relations and networks”): this helped build trust throughout the project organization.
- Owner carried all risk (Pentagon aspects “Structure” and “Social relations and networks”): this fostered better collaboration across contractors.
- Project branding (Pentagon aspects “Culture” and “Interaction”): a strong focus on the project brand followed up by personnel training created strong commitment toward the project objectives.

6. Project management approaches

We next use our findings from the literature and the three different cases to discuss differences in project management approaches.

From case A we identified nine contributors leading to success, which were sorted according to the five aspects of the Pentagon model (Figure 3).

Aligned governance and the adopted contract strategy is part of the structure aspect. This served as a foundation for project execution, and is summarized in Figure 3 as “well-developed governance and procedures.” Also “proven tools” (including project tools and risk management) were used from project start-up and onwards.

The project management approach adopted had an initial focus on the formal qualities of the Pentagon model aspects. During the initial phase the project team was selected and the stakeholder relations developed. The project team was trained according to the governance structure and to use the proven tools of the operator. The team building took advantage of existing relations within the organization of the operator and across the partners and main contractors. The recruitment strategy adopted built trust and strong personal relationships in the organization. This, combined with well-established ways of working, laid the foundation for a common project culture which came to be important for the successful accomplishment of the project task.

A success factor was the good interaction created both inside the project, among the partners and with the external stakeholders. The external stakeholders include the local community and the local government. The information meetings and discussions in the local community created trust and secured commitment and acceptance from local decision makers.

From case B we identified seven contributors leading to success (Figure 4).

The case B project started with a need for radical new thinking, thus abolishing commonly accepted thinking on starting with a governance structure and a project execution model. Instead, management pursued “no business as usual.” The structure aspect in the Pentagon model is therefore characterized as “low governance initial focus.” Actually, the main focus of the management was to obtain designers and contractors that would cooperate and share risks and opportunities. A culture had to be created where everyone used their competence and resources to maximize the project performance rather than trying to advocate for their own interest in the project. This was obtained through a new relational contract form called “Integrated Form of Agreement.” Contractors were selected based on their perceived interest in complying with the principles laid down in the contract. The contract form enabled the creation of a cohesive team culture and resulted in trust among the participants and commitment to the project objectives. It proved efficient in fostering true cooperation and collaboration.

Another success factor was the implementation of “the Five Big Ideas,” a form of vision-branding. As these were understood and adopted throughout the organization, it supported development of networks and a project culture.

In its initial phase, the case B project focussed the informal qualities of the Pentagon model. Once the organization was built and the project culture and networks were established, formal qualities were addressed. This includes the adoption of new thinking such as the lean construction principles.

From case C we identified five important contributors leading to success (Figure 5).

For this project a systems integration model was applied. This created a strong governance focus and brought a set of well-defined project management tools.

The initial approach is on the formal qualities of the Pentagon model. The structure and the technologies establish a framework for the project team and all contractors.

Then, quite early, the management focus also included the informal qualities, such as project branding. This proved to be an extremely efficient tool to develop a common project culture and to obtain cooperation through commitment from team members and contractors.

A project handbook was developed. This handbook allowed a continuous improvement of the project processes as the project progressed. This focus in conjunction with the project branding enabled the creation of values and norms that led to project management excellence which the project needed due to its high-risk profile.

Although the case C project started off with a focus on formal qualities, it rapidly also developed a focus on the informal qualities.

The three case projects are all different but share some characteristics that are typical for megaprojects. The owners are large organizations with good project management competence, the projects are large and complex, they involve many contractors, and they have high-political attention. Our focus is on the early phase of the projects. We thus consider all three projects to be successful although the case B project is not yet completed. However, the route to success is different.

In cases A and C the initial focus was on the formal qualities. However, once the projects were started, the informal qualities were developed in the organization. This is the traditional project management approach that we will refer to as a prescriptive approach. The basic idea is that a framework for how the project organization can work and operate is established in the belief that this will increase the competence of the organization so that earlier known mistakes can be avoided. It also creates a common knowledge platform for the project team and its contractors.

In case B the initial focus was on the informal qualities. As the project team had developed necessary trust and committed to a common project culture, the formal qualities were addressed in cooperation among the project team and its contractors. This project management approach contrasts with accepted thinking strongly focusses on governance, procedures, and front-end loading. It starts by building trust in the organization that is given more leeway in its approach. We refer to this approach as an adaptive approach.

Using the Pentagon model, the adaptive approach means entering the project from the bottom part of the model through the informal qualities whereas the prescriptive approach means entering from the top through the formal qualities.

The distinction between the two approaches and their characteristics has been derived from analyzing the project organization performance for each of the cases. These analyses are based on interviews at different organizational levels for case A and through the action research for the cases B and C.

For the case A project several of the interview objects pointed to the project governance system of the operating company (owner organization) and its importance for the way they were working and for securing timely progress and successful completion. They faced challenges in developing a common project culture involving both the project team and its main contractors. The offshore and onshore subprojects used different leadership styles for developing the project culture, but for both the existing relations and their established way of working was a major contributor to their success.

For the case B project the action researchers experienced a strong management focus on creating a project organization where the contractors should focus on the

benefit for the project rather than trying to optimize their own profit. This was enabled through the Integrated Form of Agreement and the Five Big Ideas. Only contractors that were assumed to understand these principles and expressing commitment to them were considered for contracts. The need to think “no business as usual” drove this successful approach.

For the case C project our discussions with the project management and the main contractors revealed that the situation was very much the same as for case B. However, they developed the project culture and commitment from the organization in a different way, namely by focussing on developing identification and pride, symbolized by extensive project branding.

Our findings on project management approaches are to a large extent also in line with the literature findings on different project management schools.

Andersen's (2005) task- and organizational perspectives align with our prescriptive and adaptive approach. In the task perspective, the focus is on accomplishing the project task. This is also the case in our prescriptive approach, but we also consider the management process involved which in this case will be based on the existing experience from the organization expressed through project governance and enabling technologies, i.e. the formal qualities of the Pentagon model. In Andersen's organizational perspective, the focus is on developing an appropriate project organization. This matches our adaptive approach, i.e. the informal qualities of the Pentagon model.

The distinction between our approaches and Andersen's perspective is that we claim that both perspectives are needed in a project. The adaptive approach starts with the organizational aspects, but also requires that the formal qualities are developed as soon as the project has been launched, and vice versa for the prescriptive approach. This view is also supported by Rolstad's *et al.*'s (2011) strategies for risk navigation that comply with our adaptive approach.

Both Bredillet (2007) and Söderlund (2010) have defined a number of schools of thought. We will refer primarily to Söderlund's findings as this work is the more recent and updated (Söderlund studied 305 articles in 30 leading management and organizational journals). A school of thought represents a scholarly background for the research in the field which also indicates what to be focussed and the philosophy behind the way the project task is to be accomplished. A school of thought can therefore be associated with what we call a project management approach. A closer look on Söderlund's seven schools supports this view. His classification of contingency, behavior, and relationship schools all represent an adaptive approach whereas the remaining four points toward a prescriptive approach. One could argue that instead of our two approaches, there should be seven, each one matching each of Söderlund's schools of thought. However, the distinction between some of the schools is in our opinion not sufficiently significant to justify the definition of a project management approach. The schools are defined based on a research focus. A somewhat different approach will be to focus on distinctions between project management approaches that can help the project organization in being deliberate on its initial focus and use this for deciding on the success factors to be addressed.

7. Conclusion

The recipe to project management success has yet to be found, and there will probably be no single best solution. Success depends on many factors that may shift from project to project and from organization to organization. This does of course not mean that research on success factors is not important. On the contrary, further research into

success factors is necessary, but it is also important to seek alternative ways to understand success. We see the recent publications on project management schools as a novel approach that increase the understanding of what leads to success. In this paper we have given our contribution which is to look at project management approaches.

Our study shows that dependent on the project management approach (prescriptive or adaptive) selected, there are different success factors to be focussed on by the project organization. We believe that the probability of project success can be increased by consciously selecting a project management approach at the launch of a new project. Our distinction between the prescriptive and adaptive approach represents extremes on a scale where any combination may be feasible in practice. We recommend that the project management approach is discussed and decided at project start up and that relevant success factors are defined in accordance with the approach selected. We think that this is an important practical application of our research. How to design the project and the project organization is an imperative question in all megaprojects.

We started by defining our research questions as:

RQ1. How can the project management approach influence the probability of success?

Our conclusion is that the distinction between a prescriptive and an adaptive approach can help in selecting an appropriate approach dependent on the project and its frame conditions. We do not claim that one approach is better than the other. The approach must be decided based on the challenges in the project and the competence of the project organization. Further research is needed to clarify the conditions for best use of each approach.

We have provided a model that facilitates the study of the factors that influence the performance of the organization. This Pentagon model can be applied to analyze completed projects. It also indicates important aspects to focus when designing a project organization. Finally, it can serve as a tool for transfer of experience from one project to another.

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