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CONFERENCE PAPER

Mapping the success dimensions of the infrastructure projects in Germany

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Abstract

Megaprojects and infrastructure projects are historically associated to cost overruns, time delays, and often fail to achieve the expected values and revenues. In order to bridge this gap between project stakeholder expectations and project outcomes this research attempts to map the success dimensions for infrastructure projects in Germany and provide a wider understanding of project success. However, the definition of project success varies from stakeholder to stakeholder. This research claims that a successful project should be a multi-win project, and provide a win-chance to each participating stakeholder. Therefore, the research presents project success as a multidimensional framework, including technical and managerial aspects as well as economic and strategic targets. This will provide a suitable success framework, so the success of infrastructure projects can be evaluated with focus on project success definitions from the project's own point of view.

Keywords

project success, success criteria, success factors, multidimensional framework, multi-win

Introduction

The project management related literature widely examined project success, and since 1960s many authors used multidimensional concepts to describe it and to integrate many views of project success. “Most projects have multiple stakeholders with different views on the project’s purpose and different expectations of what the project must achieve” (Lyytinen & Hirschheim 1987). The stakeholders’ evaluation of project success potentially varies “as circumstances change” (McLeod, et al. 2012). Literature linked the concept of project success to achieving stakeholders’ expectations arguing, “Project is not an end it is a means for an end” (Bannerman 2008). Furthermore, the literature presents project management as a growing subject (Davis 2014), and the “definition of project success has changed over time” (Badewi 2016) from focusing on the technical aspects in the 1970s (Davis 2014) to a more stakeholder oriented viewpoint (Davis 2014).

This article will focus on the definition of the project success from the project’s own viewpoint, and derive a model to enable other stakeholders to measure and evaluate their participation in project success. Project success can create a multidimensional “win”.

Particularities of infrastructure project in term of project success

Infrastructure projects are different from other projects. In order to define their success, we need more dimensions to consider these differences for a wide range of stakeholders, and manage a high budget influenced by political decisions, long time span for planning and executing ... etc.

Mega-infrastructure projects are characterized as “uncertain, complex, politically sensitive and involving a large number of partners” (Clegg, et al. 2002) and “when complex projects go wrong they can go horribly wrong” with several financial consequences (Turner, et al. 2009). In Germany, Riemann and Spang (2014) claimed that most of these projects “end up in huge cost overruns”.

In terms of project ownership and project investment Olsson, et al (2008) claimed that “project ownership was found to have nuances for the governmental projects”. Furthermore, Turner & Zolin (2012) define the “owner and sponsor as separate roles”.

The quality of infrastructure has a big influence on improving the economic conditions (Spang, 2016)¹. Improving economic conditions includes the organizational capabilities and business conditions.

Infrastructure projects are strategic projects meant to last and function for many years and serve special strategic objectives. Strategic success was defined by Bannerman (2008) as highest level of benefits achieved by a project.

Project success as a multidimensional construct

Within the project management literature, “there is a lack of consensus on how to define success” (McLeod, et al. 2012), and defining success depends on which success criteria have been met (Baccarini 1999). However, these criteria vary rapidly among the project stakeholders (Baccarini 1999). Turner, et al. (2009) argued that project success can not be evaluated from “only one perspective at one point in time”. Further, Pandremmenou, et al. (2013) suggested

¹ Spang 2017, Page 7: Quantität dieser Infrastruktur haben einen großen Einfluss auf die Funktionsfähigkeit der Wirtschaft und auf die Wirtschaftskraft eines Landes

two models for project success regarding time. Micro level covers “the development of project, and macro level is after the completion of the project”. Therefore, many authors e.g. Keller (1994) and Sauser, et al. (2009) claimed that instead of all projects having similar success measures, they each require specific outcome measures that are peculiar to the “organizational context in which the project is taking place”.

To overcome this problem, the literature defined project success as a multidimensional construct (Shenhar, et al. 2001; Shenhar & Dvir 2007; McLeod, et al. 2012; Carvalho & Rabschini 2014), yet the project management literature lacks the definition of project success from the project’s own perspective.

In order to apply this approach on infrastructure projects, this research defines projects success dimensions as shown in Figure 1 as functional success, management success, investment and ownership success, organizational success, business success and strategic success.



Figure 1 Dimensions of project success

FUNCTIONAL SUCCESS / OPERATIONAL SUCCESS

Any project is initiated to deliver a certain value through successfully fulfilling certain functionalities. The project might be completed with delay and cost overruns and yet fully or partially deliver the aspired functionalities. Furthermore, if the project fails to achieve the functional success, the project will mostly be considered an unsuccessful project even if it was finished within time and planned budget.

In other words, the success in the permitting procedures does not always mean delivering a successful facility e.g. Berlin Airport (BER). The construction process was approved in 2004 after four years of planning processes (Ministerium für Stadtentwicklung, Wohnen und Verkehr des Landes Brandenburg 2004), but the airport has failed to cope with the testing and commissioning procedures because of technical problems. The project company has announced many opening dates e.g. 31 October 2011, 3 June 2012, 17 May 2013, 27 October 2013 and finally they announced that they couldn’t set up an opening date because of many technical problems (Fiedler & Wendler 2015b).

It is important to point out that other criteria can strongly affect functional success e.g. safety, quality of the provided services and competitiveness. Granting all this, the functional

success must support more criteria e.g. sustainability, life cycle cost efficiency and client acceptance as well as satisfaction.

MANAGEMENT SUCCESS

Management is the process of dealing or controlling things or people (Oxford Dictionary 2017) and managing infrastructure projects is a big challenge because they are technically complex, with many uncertainties and stakeholders.

In order to manage an infrastructure project, companies sometimes have to establish a joint venture, alliance contracts or follow a special form of public-private partnership (PPP) contracts. Consequently, in the last few years, project management has re-emerged as part of the organic organizational and management paradigm (Gareis 2004). The organizations that participate in an infrastructure project usually have a sophisticated management hierarchy, with different management and authority levels e.g. project governance, supervision board, executive board, program management, portfolio management, area management, project management etc.

Literature distinguishes between project management and process management, and claims that process management approaches are more capable of coping with the complexity of projects.

Project management success

Project management success was defined by (Bannerman 2008) as “the immediate performance of a project against its main design parameters: schedule (time), budget (cost), scope, and/or quality”. Yet implementing projects on time and within cost “does not necessarily mean delivering the expected benefits and stakeholders’ satisfaction from them” (Badewi 2016). Further, McLeod, et al. (2012) claimed that the well-known iron-triangle (cost, time and quality) “has been criticized for its exclusive focus on the project management process and for not incorporating the views and objectives of all stakeholders”.

The PM Body of Knowledge (PMBOK) provides a more integrated project management framework through ten knowledge areas: “integration, scope, time, cost, quality, human resources, communication, risk, procurement, and stakeholder management” (PMI, 2013). Furthermore, safety is a major factor in managing an infrastructure project in construction and operation phases.

This research claims project management success to be measured over the whole project, or at the best case over each stakeholder’s contract. Due to the infrastructure projects’ long duration and massive number of stakeholders’ contracts, process management success is required to keep the project well controlled and managed.

Process management success

“Process is a series of actions or steps taken in order to achieve a particular end” (Oxford Dictionary 2017). Because of the long time needed to plan and construct an infrastructure project, these projects are usually divided into different phases and these phases are divided into various processes in order to maintain clear and achievable goals.

The criterion is defined within the project management concept to identify, control and manage the different processes of the project. In the infrastructure projects, each stakeholder should design his own process in line with his responsibilities and expectations.

The importance of having criterion was also discussed in literature. Bannerman (2008) argued that the “absence of such a criterion makes it difficult for a stakeholder outside the project to know whether a project was late because of poor schedule management or some

other embedded process within the project”. Moreover, to cope with the PMBOK procedures of management, project managers need to set up clear processes.

INVESTMENT AND OWNERSHIP SUCCESS

For many projects, the project sponsor is the project owner, but for infrastructure projects they might differ from each other depending on the contract form and project size. To achieve project success, the project needs to have a clear finance policy and has to be carefully allocated to the right owner.

Investment success

The literature defines project sponsor or investor as the organization that finances (sponsors) the investment project (Pandremmenou, et al. 2013). Sometimes it does not differentiate between owner and sponsor. However, for infrastructure projects it is important to see and identify the difference between project owner and project sponsor because of the different mechanisms used to finance them e.g. government funds, cooperation (on balance sheet) and project finance (PPP or off balance sheet project company) (World Bank 2016). In some of these forms, the project owner definitely is not the project sponsor, and they do not share the same motivations, responsibilities and expectations.

The sponsor is one of the key players in executing an infrastructure project, regardless which finance mechanism is used. A survey carried out by Demirag, et al. (2011) claimed that 75% of PPP projects would not go ahead without a direct agreement between the senior debt holder and the government.

This article suggests the payback period (Figure 2) as a core evaluation method to measure the success of a project and to cover the multiple perspectives of the project stakeholders. Therefore, each stakeholder should develop his own analysis to create his own payback period. Not all stakeholders will have the same payback mechanism e.g. engineering offices, contractor will achieve his payback period using owner’s payments, and the owner will achieve his payback period using project revenue.

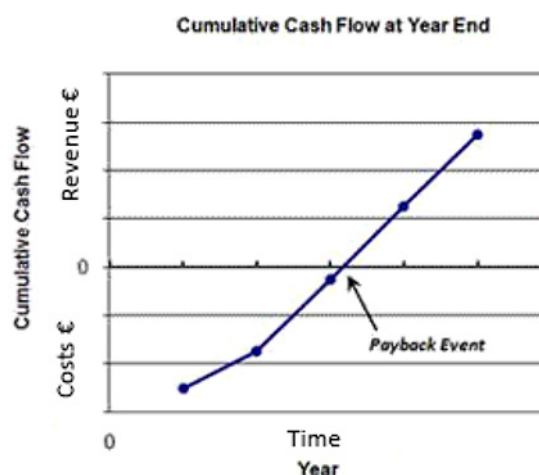


Figure 2 Payback Period

The project will be judged according to this dimension a couple of years after completion, since the project might have been subjected to time delay and cost overruns and yet classified as a success investment e.g. The Sydney Opera House and Thames Barrier (Morris & Hough 1987).

Being a successful investment project does not mean that all stakeholders will achieve their investment targets or get their payback period. For example, the contractor will pay for extra costs and time delay with or without cost recovery according to the contract conditions. A project may be successful for some stakeholders, but not for others. For example, Kassel-Calden Airport was described by the president of federal association of German airlines as a complete investment mistake² (Teckentrup 2013a), however, all the extra costs were paid and the some other project stakeholders reported it as an investment success.

Ownership success

“There is no universal definition of project ownership” (Ahola, et al. 2014). Although the literature provides a definition of project owner as “a stakeholder who takes the risk related to both cost and future value of the project. Such a stakeholder has incentives to analyze and follow up a project based on weighting the costs against the benefits” (Olsson & Berg-Johansen 2016). “For governmental projects, this is usually at the ministry level, but two or more ministries can be involved (for example the New Opera House and the Gardermoen project)” (Olsson, et al. 2008). From another prospective, infrastructure projects can be carried out as a PPP project, and the ownership will be divided between different stakeholders from both public and private sectors, or the private sector will hold the ownership for a certain “period of time and then transfer it back” to the public sector.

The decision of who shall own the project plays a great role in selecting the project contract type and the project success. For example, in Elbphilharmonie in Hamburg the project governance decision to use a forfeit model instead of an investment model transferred the whole risk to the public side and made it fully responsible for massive cost overruns (Fiedler & Schuster 2015a).

Along with this, the “use of natural resources” often generates conflicts among stakeholders (Matilainen, et al. 2017), since natural resources are traditionally perceived by local people as “their own” (Peltola, et al. 2014). The psychological side of ownership can also causes problems and affects the project success e.g. Stuttgart 21 where the local people of Stuttgart demonstrated against the project, requesting more participation rights in the decision-making process (Brettschneider & Schuster 2013)³ since the project was financed from tax money. For the sake of achieving a successful project, the ownership responsibilities and strategies have to be clearly defined and each stakeholder understand his duties regarding project ownership.

ORGANIZATIONAL SUCCESS/ ASSESSMENT

“Without projects, organizations would become obsolete”, irrelevant, and “unable to cope” with today’s competitive business environment. (Shenhar, et al. 2001). Further, PRINCE 2 defines projects as organizations. That’s why project success “has also been extended to encompass the achievement of a broader set of organizational objectives” (McLeod, et al. 2012) e.g. creation of added value, innovation, employee satisfaction, social responsibility, customer loyalty, market share and gross value... etc.

Typically, infrastructure projects include many stakeholders with different organizational structures and targets. An infrastructure project should provide a chance for these organizations to develop their capabilities and achieve their targets.

² Als „eine komplette Fehlinvestition“ Ralf Teckentrup.

³ Stuttgart 21 ein Großprojekt zwischen Protest und Akzeptanz; Page 108: Einerseits findet die Hoffnung auf eine stärkere Partizipation der Bürger und damit auf eine Stärkung der Demokratie Erwähnung.

The literature introduced two main aspects to measure and assess organizational performance: organizational effectiveness and efficiency. “Efficiency is oriented towards successful input transformation into outputs, while effectiveness measures how outputs interact with the economic and social environment” (Bartuševičienė & Šakalytė 2013).

These two aspects are exclusive, yet they can influence and affect each other. Pinprayong & Siengthai (2011) differentiated “between business efficiency and organizational efficiency”, defining business efficiency as comparing and revealing the performance of outputs and inputs ratios, and organizational efficiency as reflecting the improvement of internal process of the organization e.g. organizational structure, culture, trust and community.

Table 1 Findings from Zokaei & Simons (2006) and Bartuševičienė & Šakalytė (2013).

Table 1 Organizational performance assessment

Organizational assessment and success Effective		Effectiveness (\$): outputs, sales, quality, creation of value added, cost reduction ... etc.	
		Effective	Ineffective
Efficiency: Strategies, culture, organizational structure, decision making processes, Know-how, Employees' motivations, skills and motivations.	Efficient	“Succeeds at minimum cost. The company thrives.” “High performance entities” “Operational performance as well as strategic planning”	Cost under control but no success Slowly Bankruptcy. Difficulties to achieve business targets.
	Inefficient	“High cost” success. “The company exists.” The project hardly breaks even Little profit.	“An expensive failure.” The company is going bankrupt fast.

According to Table 1, the organizational efficiency characteristics will influence the project acquisition and execution, and the project economic outputs will affect the organization profit, ability to improve its efficiency and existence.

The project organizational success concerns all project stakeholders and could be influenced by the project ownership strategy. Furthermore, the project stakeholders' organizations might have different organizational targets and their organizational performance should be evaluated.

BUSINESS SUCCESS

A project is not an end, it is a means for an end (Bannerman 2008), and any project is meant to support and enhance a certain type of business. “Business success has traditionally been measured by financial returns” (Simpson, et al. 2004; Howard 2006). Other authors defined some other aspects that concern project owners when they assess the success of their business e.g. sense of achievement and sense of pride (Getz & Carlsen 2000; Walker & Brown 2004) e.g. the Sydney Opera House is always considered as an iconic building, and in 2007 was recognized as a UNESCO World Heritage Site.

A comparison between Munich Airport (MUC) terminal 2, Berlin Airport (BER) and Kassel-Calden Airport (KSF) states clearly the meaning of this dimension.

The Munich Airport terminal 2 was awarded the praise of the world's best terminal⁴ (Rittberger 2017). Moreover (Kerkloh 2017) the airport manager announced that the revenue of the airport has reached a record high in 2017, and served 42.3 million passengers.⁵ The case of Munich Airport is defined according to this research as a complete business success.

On the other hand, the Kassel-Calden Airport (opened in April 2013) has reported annually losses in 2016 of 6.17 million euro and around 6 million euro in 2015. Moreover, it has failed to attract more than 4,822 passengers⁶ (capacity is 700,000 passengers), although the cargo transportation is a growing business in KSF from 168.10 ton in 2015 to 1.861,99 ton in 2016⁷ (Ernst 2017).

Berlin Airport (BER) is still failing to match releasing conditions and reported massive losses. The BER still cannot deliver the expected revenue, pride or enhance the air traffic business, and always has been described as a catastrophic project. That supports the previous assumption "without functional success, projects are mainly classified as unsuccessful ones".

STRATEGIC SUCCESS

A broader understanding of project success demands organizations include "more strategic objectives and benefits, including impacts on markets and competitors, business development or expansion, and ability to react to future opportunities or challenges" (Bannerman 2008; Jugdev & Müller 2005; Toor & Ogunlana 2010).

Infrastructure is the foundation upon which our economy is built (Infrastructure and Projects Authority UK 2016) and infrastructure projects are usually a part of a strategic plan, which includes different programs and projects e.g. Federal Transport Infrastructure Plan (Bundesverkehrswegeplan BVWP) in Germany and National Infrastructure Delivery Plan 2016-2021 in UK. Therefore, they serve some strategic economic target e.g. supporting growth and creating jobs, raising the productivity capacity of the economy, boosting international competitiveness and increasing the investment attractiveness e.g. the effect of Sydney Opera House on increasing the number of visitors to Sydney over the past few decades (Colbert 2003). This dimension enables the participation of more stakeholders than those in the investing organizations, and the creation of more benefits than intended from the project.

However, Bannerman (2008) claimed that few projects achieve strategic success. A strategic plan is essential for infrastructure project. The president of federal association of German airlines Teckentrup (2013b) claimed that one major factor of Kassel-Calden Airport is the absence of a strategic plan for air traffic and airports in Germany⁸

4 Der Flughafen München und Lufthansa dürfen sich über eine äußerst begehrte Auszeichnung freuen: Bei den World Airports Awards 2017 des Londoner Skytrax Instituts wurde das Terminal 2 am Münchner Flughafen zum besten Terminal der Welt gewählt.

5 Wie Flughafenchef Michael Kerkloh heute mitteilte, stiegen Umsatz und Gewinn auf ein neues Rekordhoch. Auch die Zahl der Passagiere stieg im vergangenen Jahr um 3 Prozent auf 42,3 Millionen, die Luftfracht legte um 5 Prozent zu. Dieser Trend werde sich voraussichtlich fortsetzen.

6 Das Geschäftsjahr 2016 kann voraussichtlich mit einem Jahresfehlbetrag von 6,17 Mio. Euro und damit in etwa auf dem Niveau des Vorjahres abgeschlossen werden.

7 Die Luftfracht stieg im Vergleich zum Vorjahr um mehr als das Zehnfache auf 1.861,99 Tonnen an (2015: 168,10 Tonnen).

8 "Kassel-Calden ist für mich das Paradebeispiel dafür, dass wir in Deutschland eine zentral geplante Infrastrukturentwicklung für Flughäfen brauchen."

The project strategic targets differ widely from the project's stakeholders strategic objects, yet a multi-win project is supposed to provide stakeholders the chance to enhance their strategic assets that "give firms competitive advantages over rivals and afford them the accrual of superior performance" (Barney 1991; Zheng et al. 2016) e.g. reputation (Deephouse 2000), employee engagement (Men 2012) and know-how.

Success criteria and success factors

"Criteria are the measures by which projects can be judged in terms of failure or success" (Cooke-Davies 2002), and they vary from success factors. Koops, et al. (2016) claimed that "success criteria need to be separated from success factors." Moreover, "projects differ in size, uniqueness and complexity, thus the criteria for measuring success vary from project to project" (Müller & Turner 2007), from stakeholder to stakeholder (Baccarini 1999; Jiang, et al. 2002) and according to when the project success is measured (Pandremmenou et al., 2013).

However, the "project success criteria and project success factors" are widely discussed by many authors. "Most studies focus on the success criteria relevant for executing party" (Koops, et al. 2016). To obtain a multi-win project where all or most stakeholders achieve their goals, and the project delivers the expected functionalities, values and revenues, this research claims that the success criteria and factors have to be defined for each project, and each and every stakeholder needs to define their own success criteria and factors, and report them to the project management and governance team.

PHASES AND STAKEHOLDERS OF THE INFRASTRUCTURE PROJECTS

Spang (2016) divided infrastructure projects into many phases: project concept, planning, tendering, executing and operation. Each of these phases includes different stakeholders. The involvement, as well as the influence, of the same stakeholder vary from one phase to another phase. During these phases, the success criteria and factors will vary not only for the project but also for the stakeholders.

Infrastructure projects take many years from the project idea to project completion. Just the planning period can take more than 10 years, and in the worst case up to 20-29 years (Spang & Sözüer 2014). The execution phase will take several years until the project reaches the operation e.g. Berlin Airport. Therefore, the project team needs to define different success criteria and factors to cope with changing project requirements during the different phases.

However, the six success dimensions should be considered, and traced from the start of the project. Some of them cannot be clearly measured until the end of the project e.g. function success and management success. Investment and ownership success, as well as organizational success, can be achieved during the project operation phase's near future, and other dimensions like business success and strategy success can only be achieved and measured over the long term project operation.

Summary

Projects differ in size, complexity and stakeholders' expectations. Infrastructure projects have certain uniquenesses that make it more difficult to define project success. They are often associated with cost overruns and time delays, yet they might be considered successful according to other aspects e.g. Sydney Opera House. This research presented the term

of project success as a multidimensional framework considering special dimensions for infrastructure projects to reflect their economic and strategic effect.

Because of the uniqueness of infrastructure projects, this research maps their success into seven dimensions. Functional success and management success to measure the project performance during the execution and operation. Investment and ownership success to measure the success of finance and ownership strategies. Organizational success to assess the development of participating organizations in the project. Business success and strategic success to reflect the project's effect on a higher economic and strategic levels.

Project stakeholders will not consider all of these dimensions equally, although the project itself has to consider and trace all of them during the whole project life cycle, since success criteria as well as success factors vary from project to project, stakeholder to stakeholder, project phase to project phase and from time point to time point.

Potentially fruitful areas for future research include testing and validation of the presented conceptual model in actual projects, and development of mechanisms to define and integrate the stakeholders' success criteria and factors within project success criteria and factors.

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