Breakin' the Project Wave: Understanding and avoiding failure in project management

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Abstract

Temporary organizational forms in general and here namely projects often do not reach their objectives. Catastrophic outcomes are a particular problem. Recent studies imply that projects which massively fail are 'Black Swans by design'. This paper provides a more refined explanation as it studies the emergence of failure through a temporal lens. The metaphorical concept of a project wave is introduced to describe the process. It reflects compounding times of not knowing: 'not wanting to know',' not supposed to know' and 'must not know'. The concept is illustrated and supported by evidence from a particular case reviewed: The construction project of the new airport BER in Germany's capital Berlin. It is shown that the project wave also serves as a framework within which proposed remedies to typical project management problems can be positioned.

Key words: project-based organizing, project management, temporality, delays, cost overruns, delusion, optimism, deception, principal agent problems, Black Swan, metaphors

Introduction

For business in particular but also for society in general, temporary organizational forms become more and more relevant. This sign of the times is increasingly reflected in academic writing dealing with questions related to temporary organizational forms (Bakker, 2010, 466). One omnipresent issue with temporary organizational forms is that they appear to often fail in meeting their communicated objectives. This becomes highly evident and measureable when it comes to successful completion of projects. Irrespective of the industry or the even sector concerned, projects are regularly intended to be on time, on budget and on scope. It is widely accepted that all too often, they are not (Flyvbjerg et al., 2002; Altshuler/ Luberoff, 2003; Priemus et al., 2008). Projects fail in the sense that they do not meet their schedule, cost and scope respectively quality objectives.

Against this background, critical research on management emphasizes a 'non-performative intent' and argues that other indicators of project success are important to consider (Cicmil/Hodgson, 2006). But for evident reasons, the objectives of the iron triangle (Oisen, 1971; Atkinson, 1999) continue to be a key priority for project stakeholders (BMVI, 2015). This is a motivation here to keep the focus on the narrow sense of project management success rather than on the more general notion of project success (Ika, 2009, 8). The aim is to understand how projects can be on time, on budget on scope, but to nevertheless follow the proposition by critical

project management research to "introduce alternative theoretical approaches to the study of projects" (Cicmil/Hodgson, 2006, 111).

The alternative theoretical approach put forward here is the concept of a project wave. The concept is metaphorical. This is guided by the insight that metaphors are not only language but govern human thought and action (Lakoff/Johnson, 2003, 3). Conventional metaphors like 'time is money' or 'love is magic' are good examples for that. The project wave is a metaphor providing a new understanding (Lakoff/Johnson, 2003, 139ff) of our experience of project management failure in terms of too late, too expensive and too different from the intended outcome. The project wave describes the cumulative effects of interactions between people who do *'not want to know'*, are *'not supposed to know'* and *'must not know'.*

Three objectives are pursued. First, the metaphor and its implications are unfolded by relating it to the relevant literature on project management failure. To achieve this, initial focus is given to the Black Swan (Taleb, 2010) nature of major project failure. Second, the viability of the metaphor is tested by applying it in an illustrative way to the case of Berlin Brandenburg Airport (BER), one of the most prominent contemporary project management failures (Diekmann et al., 2013). Third, by returning to the literature on project management, the metaphor is used as a framework to position proposed managerial remedies to typical problems which occur in the built-up of the wave. With such a methodological approach, it is intended to bridge functional and instrumental views of project managers and project sponsors with an alternative but complementary perspective that captures and critically reviews as well as summarizes the social and political dynamics on projects. In this sense it can in part also be interpreted as "descriptive theory, grounded in empirical narrative study on human interaction on projects" (Cicmil/Hodgson, 2006, 117; see also Packendorff, 1995, 326).

The overall idea is that if project practitioners on all levels recognize the metaphor of the project wave, it can help their thoughts, their actions and probably most importantly their interactions in ways that break the wave of project failure. That such a metaphor can be a missing link which connects previous lessons learned with new projects is exemplified by the case discussed here: Berlin Brandenburg Airport will be finalized at least €3.5 billion over budget. In the mid-nineties, Denver International Airport finalized $3.5 billion over budget followed by a detailed review concluding on widely communicated lessons learned which was supposed to serve but obviously failed as "a resource for all airport managers and professors confronting the increasing aviation demands of the next millennium" (Prather, 1998, 15).

Major Project Failures - Black Swans

Taleb (2012, 284) argues that frequent project failure is a more recent phenomenon, pointing to complex projects like the Empire State Building in 1931 or the London Crystal Palace in 1851 which were successfully completed within schedule. Studies undertaken by Bent Flyvbjerg (2009, 346) confirm that for contemporary infrastructure projects significant delays and cost overruns are common. When

shifting the focus from conventional construction projects to state of the art IT-projects the picture becomes even worse as the average IT budget overshoot appears to be much higher than in construction (Flyvbjerg, 2009, 363). On this basis, one could argue that temporary project organizations are not only temporarily but increasingly failing.

Looking at the distribution of failure across many projects can be revealing. A study of out-of-control tech projects showed that many projects performed reasonably well. However, a surprisingly high proportion of one out of six projects encountered massive cost overruns of 200% and schedule overruns of almost 70% (Flyvbjerg/Budzier, 2011).[1] The authors suggest that bad performance of IT-projects on average is driven by a "fat tail" of damaging outliers with gigantic overages. These are described as the industries' "Black Swans" which refers to the term coined by Taleb (2010) for large-scale unpredictable and irregular events of massive consequence which are retrospectively explainable. Recent examples in other sectors like the construction of Hamburg's Elbphilharmonie in Germany or the Queen Elizabeth Class Aircraft Carrier defense project in the United Kingdom suggest that comparable "fat tail" patterns may also be detectable outside IT. Berlin Brandenburg Airport also falls into this category.

The welcome finding here is that most projects are better than average figures seem to imply. But, if things go wrong, they go terribly wrong.

Flyvbjerg (2009, 349) distinguishes three explanations for failure of large projects: technical, psychological, and political-economic. He arrives at the conclusion that political-economic explanations serve best in explaining project failure. "According to such explanations planners and promoters [of projects] purposely spin scenarios of success and gloss over the potential for failure (Flyvbjerg, 2009, 350). This view is further supported by Flyvbjerg and COWI (2004); Wachs (1986, 1989, 1990) who more bluntly explained that 'planners lie with numbers'. As a consequence, many projects are "designed as disasters waiting to happen" (Flyvbjerg, 2009, 353) or to put it slightly differently: 'Black Swans by design'.

Failure through the temporal lens: at the beginning there is a grey baby swan

The contributions briefly reviewed above have considerably enhanced our understanding of project failure. However, the idea of 'Black Swans by design' has something irritating about it. It somehow nurtures Taleb's view that "we don't realize the role of these swans in life because of this illusion of predictability" (2012, 6). On a less philosophical level, questions like the following arise: Why are project failures more severe these days than in the past? How does the "fat tail" distribution of project failure come about?

These questions, but even more so the widespread worries of many people who are involved with temporary project organizations in practice, request an even closer

[1] See also Jones (1995, 2000) for high cancellation rates of large IT projects and El Emam/Koru (2008) for a contradicting view.

look at the process of project failure. The guiding idea here is to study failure through a temporal lens by reviewing on a step by step basis what happens from start to end of a project. Whilst it can be accepted that an element of design is inherent to Black Swans, it is proposed that a hatching baby swan is always grey and that it turns either white or black later in life.

The concept of the wave

Scientific analogies and metaphors have repeatedly helped to understand and clarify complex phenomena.

I propose to conceive projects as coming along on a wave. Perfect projects would not show any waves. But the usual project embedded in the temporal flow can be expected to show some movement. The shore line can be interpreted as the boundary of a project. This is where projects come to an end, thus reflecting the finite nature of projects. Failing projects generate a big wave. Major project failures are not weeks or months but years too late, and cost overspent is measured in multiples of the originally planned sum. When the wave hits the shore the project overruns and overspends. Berlin Airport is a typical case for this pattern. Based on officially communicated information made available until December 2015, figures 1 and 2 show how, over time, the communication of again and again higher costs and later completion dates took place to form a massive project wave.

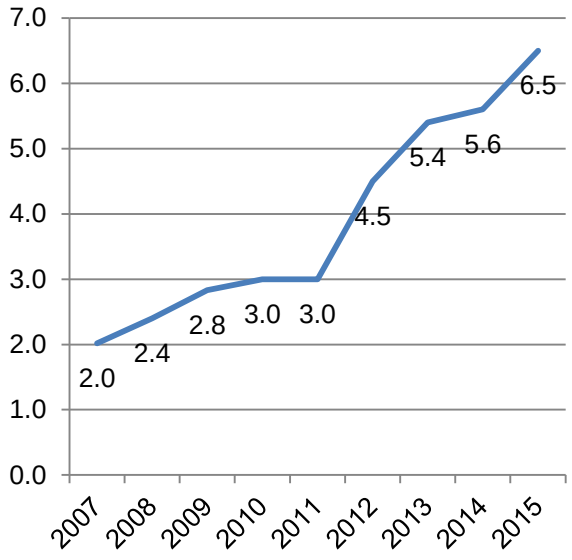

Figure 1: BER communicated cost forecast

Figure 2: BER communicated opening dates

Generally, on the open sea the size of a wave depends on the wind. More specifically, it depends on the strength, the duration and fetch of the wind, whereas the latter term refers to the uninterrupted distance of open water over which the wind blows. Therefore, in nature a number of either mutually reinforcing or offsetting effects determine the size of the wave. As will be explained below, the size of a project wave depends on the treatment of knowledge. The more knowledge and

available sources of knowledge are neglected the larger the project wave is likely to be. This pattern is summarized in figure 3.

Similar to the wave in the ocean the project wave can be a destroying force. It costs scarce resources, time, money and it challenges the human beings involved in it. Whilst the magnitude and force of waves are all too evident when they hit the shore, it is less easy to assess them in the middle of the open sea. Project waves are even more difficult to detect before it is too late. Therefore, it can be helpful to make an attempt to describe and understand their dynamics.

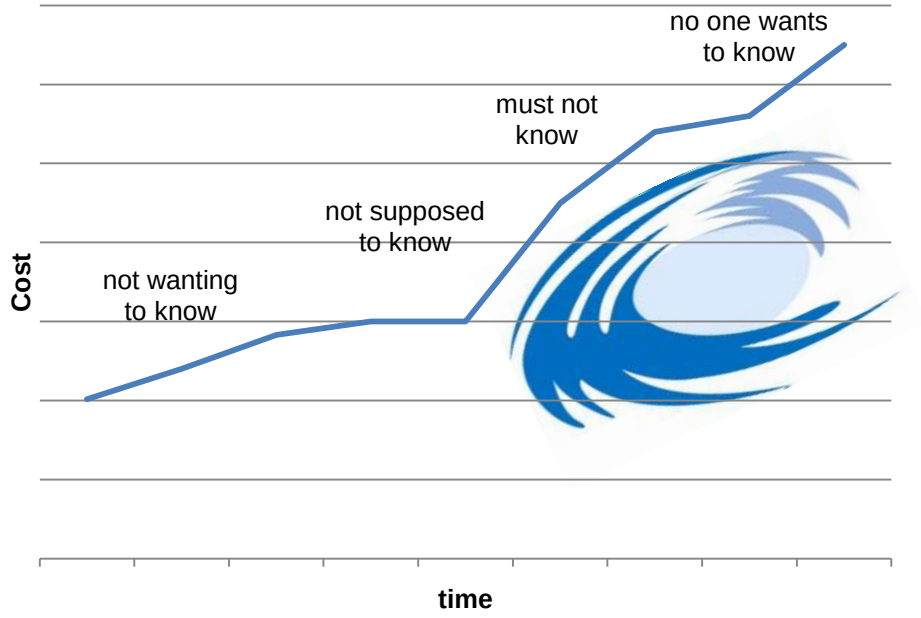

Figure 3: Cumulative times of not knowing - the project wave

Not wanting to know

The project wave can be interpreted as a wave of *not wanting to know*, *not supposed to know* and *must not know*. At the outset, initiators of projects do everything to promote the undertaking. They do not only create a wind of change but they also make every effort to avoid headwind. These agents *'do not want'* to hear about the real costs or realistic schedules. Such information could endanger implementation right away. Instead, they encourage others to join them in looking at the project through "rose-coloured glasses" (Lovallo/Kahneman, 2003, 57).

BER is a good example for such a "rose-coloured glass" view. Here, a budget of € 2,0 billion ($ 2,2 billion) was agreed whilst it was evident that elsewhere major airport development projects regularly come in at a significant multiple of this sum (see table 1). Later, journalists unveiled internal documents which already two years prior to start of construction warned against excessive cost overruns (Heiser, 2014). The danger of spreading such over-optimism lies in the high expectations of the unknown

(Lovallo/Sibony, 2006, 21) while an anchoring to unrealistic original ideas takes place.

Country	City/Airport	Project	Projected cost $ bn.
Qatar	Hamad International	New Airport	15,5
USA	Los Angeles LAX	Various incl. new terminal	12,0
USA	Atlanta	Long term development project	9,0
Saudi Arabia	Jeddah	Terminal expansion	7,0
Oman	Muscat	New Terminal	5,2
China	Chongqing	New runway and terminal	4,7

Table 1. Some of the world's biggest airport projects, 2013-14 (CAPA, 2014)

The initiating agents often do not have much to lose. After all, the resources they intend to mobilize for 'their' project are not their own and they are not held responsible for overstated benefits either. Therefore, projects regularly feature principal-agent problems (Turner/Müller, 2004; Müller/Turner, 2005; Jensen/Meckling, 1976). In Berlin it all began in the early nineties with euphoric expectations for growth in passenger numbers after the German unification and with the prospect of getting Lufthansa to return to its hometown which resulted in the former CEO of Lufthansa becoming advisor to and a member of the supervisory board of the holding company of the new airport (Malich/Welskop, 2001). The creative handling of information asymmetries is well documented in airport internal information which became public (see for example Heiser, 2014 and Siegle, 2014).

Immediate consequences of *'not wanting to know'* are unclear objectives and scope definitions. Any textbook or seminar on project management emphasizes the importance of a well-defined consistent set of project goals and requirements. Nevertheless, this initial step is often neglected. Simple but firm and agreed upon project charters as for example described in Hayes (1999) are difficult to find. Whether on purpose or not, imprecise and vague project starts are perceived as problematic (Savolainen, 2010). This can be confirmed for the BER project, which despite insufficient planning moved into the implementation phase. The confrontation between different interests involved is well illustrated by a comprehensive letter from a disappointed senior manager to the CEO at the time, Hartmut Mehdorn (Siegle, 2014).

Not supposed to know

From here, the wave of not knowing starts to build up. Next, those actors who are *'not supposed to know'* are called into play. Planning and implementation of large-scale projects requires experienced managers and specialists. Tender processes help to get the necessary contractors and subcontractors involved. All these actors have at least two things in common. On the one hand, they have the necessary know-how. On the other hand, they are being confronted with unrealistic budget- and schedule requirements. From experience they know, it won't work that way. But they are not supposed to know. In this respect, their know-how is not in demand. However, they want (to keep) the job, they need the contract. Sometimes naively, sometimes compulsively, wrong promises are made, schedules are confirmed and detailed out. The initial anchoring mentioned above, becomes more and more formal. This phase of a project regularly gives rise to what has been called the planning fallacy, where past experience is not sufficiently taken into account and task completion times are underestimated (Buehler et al., 1994). Decision makers in charge react with delusional optimism instead of looking for mistakes and miscalculations (Flyvbjerg et al., 2009, 5). Forecasts and project plans are developed further based on the results of tender processes for all relevant parts of the project scope. And here, regularly prices are quoted which remain below the expected costs (BMVI, 2015, 42). All of this is based on a mix of wishful thinking and previous experiences which suggest that later in the project there will be opportunities to justify delays as well as so called variation orders resulting in additional costs for the client. If there are perceived chances of future compensation, it is likely that the bidder who most underestimates the true cost of the project will secure the work, which Flyvbjerg (2009, 23) describes as the "winner's blessing". Again BER serves as a prime example for such developments: In 2014 a government enquiry brought to light that the volume of change orders had reached a value of € 1.4 billion. Whilst by the airport management this was framed as "normal project business" (F.A.Z, 2014), the sum equaled a remarkable 70% of the original budget. The acceptance of such practices as "normal" is in so far alienating as also conclusions drawn on previous airport projects clearly describe the significant financial risks involved (Dempsey et al., 1997, 430).

Must not know

Meanwhile, those who *'do not want to know'* are all too ready to listen to the empty rhetoric and to the false promises of those who are *'not supposed to know'*. Herby, all goes according to plan. Now, there is sufficient 'substance' to meet those who *'must not know'*. These are the project-owners, the project-sponsors, in other words, those who decide over the funding and the future of the project.

The wave starts to show ripples and its first whitecap. Sufficient quantities of paper and power-point presentations have been presented to supervisory boards, steering-committees, risk-managers and project approval have been given. The wave can no longer be stopped.

To avoid being drowned, those who *'do not want to know'* just like those who are *'not supposed to know'* rely on drifts which almost always occur. One phenomenon which can be expected on sizeable projects is that during the course of the project new requirements, wishes and desires come up and will demand implementation. Frederick Brooks did point this out when he wrote that "for the human makers of things, the incompleteness and inconsistencies of our ideas become clear only during implementation" (1975/1995, 15). It does not need to be emphasized that such late changes will turn out to be disproportionally expensive and will cost more time than one would expect. BER serves as an outstanding example for the incompleteness and inconsistencies of ideas of decision makers. This is illustrated by a need for 20 additional check-in counters (21% more) which was made public less than two months before the planned opening of the airport in 2012. The airport was planned to have less check-in counters than the old airport at Tegel (Purschke, 2012).

No one wants to know

But this is not the only drift. Whilst on the surface the sea is still calm, there is a lot going on below the waterline. Those who *'must not know'* are of course not aware. And they insist on compliance with budget and schedule. But in the meantime, middle managers have the facts on their desks. Reports, minutes of meetings and memos speak for themselves. Costs exceed budgets and milestones are not reached. But the information is not rising to the top. Instead, those directly in charge of parts of the project are optimistic that catch-up is achievable. Where negative news surface, they do so in a lifebelt: It is widely acknowledged that if negative news can no longer be avoided, those who *'must not know'* need to receive a solution to any arising problem straight away. Optimistic mitigation plans are presented, and they are more than welcome. The project reaches a phase, where *'no one wants to know'*.

Once inevitable delays and cost overruns have become public the wave receives further tailwinds. Regularly, the opportunity cost of finishing late and later is considered to be higher than any direct cost of accelerating project completion. Also, if a project is running late "everything possible" needs to be done to mitigate the issues. These actions have to be visible to be credible. This is often accomplished by adding manpower as well as further 'experts' to the project. This is more costly than perceived because in many cases the consequence will be that the added, often hourly paid, manpower stays longer. Many industries can today confirm Brooks's Law, once formulated for Software Engineering: "Adding manpower to a late […] project will make it later" (Brooks, 1975/1995, 25).

Typical examples for *'no one wants to know'* issues at BER were the overloading of cable trays which turned out to have massive knock-on consequences (dpa/ap, 2014) and the permanent introduction of a six day work week in November 2015 to maintain the communicated schedule at the expense of resulting overtime charges (rbb, 2015). For a period of more than two years Berlin airport also maintained a peculiar, expensive and far reaching case of optimistic and at least in part fraudulent mitigation management when it approved down-payments to one of the most

important contractors on the project against empty promises to deliver. The contractor was later unmasked as an expert in adding manpower to already late projects (Fuchs, et al., 2015).

Breakin' the wave…. to drown a Black Swan

Ultimately, the project wave as described above washes a Black Swan ashore. The case of Berlin Brandenburg Airport has served as an extreme example here. Yet, it has to be emphasized that the illustrative description of a failing project does not describe what normally happens when temporary organizations are formed to undertake a sizeable project. Rather, it refers specifically to the "fat tail" mentioned at the beginning. As such, it stands for a worst case scenario and tries to capture how a variety of contributing factors for project failure can come to work together to explain why the outcome is catastrophic rather than only poor or below average.

What makes the metaphor useful from both a theoretical and from a practical point of view, are two considerations: First, if it is accepted that metaphors are not only language but govern human thought and action (Lakoff/Johnson, 2003, 3), then referral to the metaphor throughout a project can trigger behaviours on all levels and during all phases which let the project wave break early. The leitmotif of the project wave is one of *'wanting to know'*. If people involved in projects know that the phenomenon of the project wave exists, then *'wanting to know'* is the appropriate answer to a sequence of *'not wanting to know'*, *'not supposed to know'* and *'must not know'* behaviours. This can lead to a performative turn (Bachmann-Medick, 2006, 104ff) when managing a project. One of the effects of *'wanting to know'* can for example be that relevant changes to a project occur earlier, which lowers the cost of these changes and increases the chances to mitigate and minimize resulting delays (see figure 4).

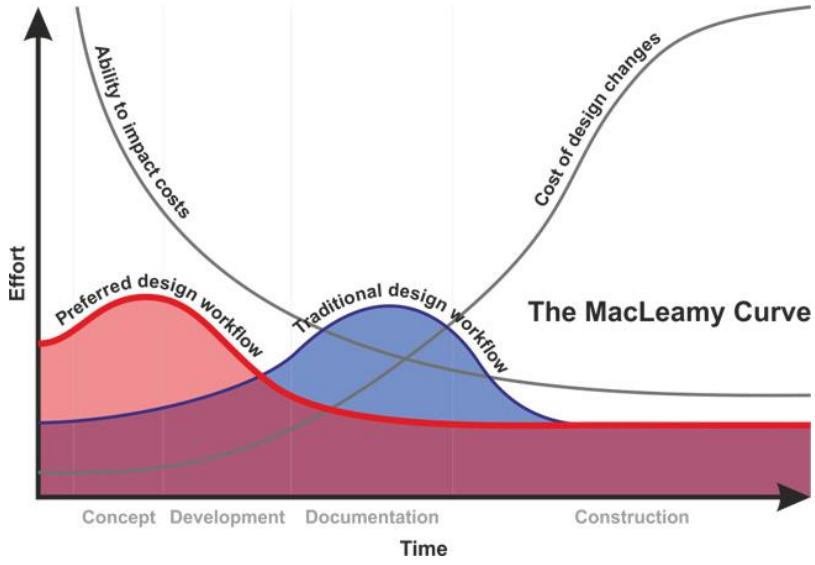

Figure 4. The MacLeamy Curve[2]

[2] AEC Magazine (2013), adapted from The Construction Roundtable (2004, 4).

Second, the project wave is a theoretical framework which can systematically accommodate proposals as well as proven solutions to make project selection and project management more successful. A corresponding summary is presented in table 2. As shown there, sufficient time for project planning and preparation is considered to be a necessary condition for successful management throughout the lifecycle of a project. The knowledge developed during this phase can be seen as an investment into the future of the project. It also allows for a substantial clarification of requirements and it enables the decision makers to set clear objectives, another factor to avoid a high project wave. These are more likely to be appropriate objectives if the designated project is compared with other, already completed projects by the means of reference-class forecasting (Flyvbjerg et al.,2009). On such a basis, one or the other project may not be pursued any further. Yet, it has to be kept in mind that project management success can only be achieved if projects are undertaken in the first place. Thus *'wanting to know'* is a move forward which is open for critical views. The challenge is to confront the facts (Collins, 2001, 65ff) at any given time and to differentiate between substance and noise.

Once a project is underway, it appears that the project wave can be tamed if focus is given to risks, new wishes and new requirements. The adoption of risk management (Purdy, 2010) and change-control processes (Kappelman et al., 2006) is one thing. To accept lack of knowledge another, in project management an often neglected approach. But to successfully confront the facts also means not to speculate about things which cannot be assessed at a given point in time.

Gaining the relevant knowledge and constructively acting on the basis of this knowledge can be facilitated by collaborative approaches to project management (Maylor, 2001) and by alliance forms of contract (Pitsis et al., 2001).

In summary, it has to be emphasized that the table is to be understood as an indicative rather than a comprehensive representation of possible remedies. The suggested conclusion is that a comprehensive and integrated project management approach which accommodates actions shown in the table is likely to result in a smaller project wave. It would not be wise to expect perfect projects. But much would be achieved if the project wave breaks early so that it drowns the Black Swan before it reaches the shore.

Conclusion

The project wave metaphor of *'not wanting to know'*, *'not supposed to know'* and *'must not know'* was introduced to capture our experience of project management failure. With the help of the case of the Berlin Brandenburg Airport new built project, it was shown that how comparatively rare severe project management failure develops through cumulative times of not knowing. Existing literature on project management failure could neatly be integrated with the concept of the project wave. As such, failure was reviewed and possible remedies were survey through a temporal lense. The metaphor may help practitioners with their thoughts, actions and interactions to break the wave of project failure.

There are a number of limitations to this contribution. To achieve further substantiation, the metaphor of the project wave would have to be applied and reviewed in the light of further cases. It has to be considered that the problems and possible remedies summarized in table 2 only refer to issues related to the project wave. They do not represent a general review of success criteria and success factors in project management as presented elsewhere (e.g. Morris, 2013, 289ff; Kappelman et. al, 2006). Also, it was not possible to critically review all of the indicated potential remedies here (again see Morris, 2013 for this).

Finally, with Berlin Brandenburg Airport the case of a large scale construction project was studied. The literature review however also referred to other project industries and in particular to Information technology. In the future, it would be necessary to derive how exactly different project-driven industries and how public and private sectors can learn from each other.

Table 2. : Phases of the project wave with related problems and possible remedies

No.	Phase	Initiating actor	Reacting actor	Problems	Possible remedy	Further details
1	**Not want to know**	Project beneficiaries	Project sponsors / owners	Overstatement of benefits. Anchoring. Political considerations dominate.	Independent second opinions. Proposals to include "next best" alternative. Foster culture of open debate. Unmask politically motivated estimates. Criminal sanctions. See also planning fallacy (no.3).	Lovallo/Sibony (2006) Flyvbjerg et al. (2009) Flyvbjerg (2009) BMVI (2015)
2		Project beneficiaries	Project sponsors / owners	Unclear objectives and goals. Masking of potential issues.	Transparency. Clear project strategy. Solid project definition. Specify requirements & business case. Systematic use of project charters. Enter into alliance instead of conventional top-down approach.	Flyvbjerg (2009) Buttrick (2009) Myers et al. (1986) Kappelman et al. (2006) Hayes (1999), Ryan (2011) Pitsis et al. (2003) Chen et al. (2012)

No.	Phase	Initiating actor	Reacting actor	Problems	Possible remedy	Further details
3	**Not supposed to know**	Project planners and forecasters	Project sponsors /owners /Project beneficiaries	Planning Fallacy. Delusional optimism. Understatement of cost. Overstatement of benefits. Anchoring.	Adopt an "outside view" of the project. Reference class forecasting. Application of "Optimism Bias Uplift". Don't start without/with insufficient plan. Use modular plan with sufficient detail. Consider BIM or comparable technology. Adopt "future perfect" strategy.	Buehler et al. (1994) Flyvbjerg et al. (2009) Flyvbjerg (2009) Lovallo/Kahneman(2003) BMVI (2015) Azhar, S. (2011) Pitsis et al. (2003)
4		Contractors and Sub-contractors	Project owners / managers	Quoted prices below expected costs. Detailed engineering without questioning the assumptions of basic eng. (Input also for forecasting, no.3)	Avoid "winner's blessing" based on quality of tender process and contractual agreement. e.g. fixed price contracts, contractually agreed liquidated damages for delay. Lowest Price ≠ best price. Best price systematically considers qualitative criteria. Alliance forms of contract.	Common industry practice BMVI (2015)
5		Freelance/agency personnel across project hierarchy	Project managers	Moral hazard / shirking due Sunflower management	Contractually agree same key personnel and or fixed %-age of directly employed personnel on sequential projects. Constructing the team. Establish a project culture.	Common industry practice e.g. in mechanical engineering Latham (1994)

No.	Phase	Initiating actor	Reacting actor	Problems	Possible remedy	Further details
6	**Must not know**	Project beneficiaries Project managers	Project owners	Strategic misrepresentation/ Moral hazard/ Deception: understatement of cost and overstatement of benefits.	Proposing and approving actor/institution to share financial responsibility. Privatize and/or insure (part of) the risk in case of public projects. Systematic risk management instead of risk ignorance. Pursue "best for project" & "no blame" culture.	Flyvbjerg et al. (2009) Purdy (2010) Lalonde/Boiral (2012) Pitsis et al. (2003)
7		Project beneficiaries Project managers Contractors	Project owners Project owners Project managers	Discovery of new requirements and scope changes	Consider agile project management techniques. Implement effective change control process. Appropriate use of risk registers.	Schwaber (2015) Sutherland (2014) Kappelman et al. (2006) Martin (2003) Budzier (2011)
8		Project managers Contractors Subcontractors	Project owners Project managers Contractors	Asymmetric Information, deception: hiding of problems	See no. 6 Collaborative project management (e.g. project charter). Allocate responsibility for the time plan to the team members. Transparent and matching project organizations of project partners.	Maylor (2001) BMVI (2015)

No.	Phase	Initiating actor	Reacting actor	Problems	Possible remedy	Further details
9	**No one wants to know**	Project managers Contractors Subcontractors	Project owners Project managers Contractors	Optimism bias, Anchoring on original plan: insufficient adjustments, unrealistic mitigation plans	See no. 1,2, 3, 6 , 7	
10		Project owners Project managers	Project managers contractors subcontractors	Mythical Man-Month: Adding resource in the belief that this would improve the situation	Consider Brooks's Law: Adding manpower to a project will make it later.	Brooks (1975/1995)
11		Project managers	Project owners	No feedback loop / lessons learned for future projects	Work with Deming Cylce (Plan-Do-Check-Act) across projects.	Maylor (2001)

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