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Keeping it simple? A case study into the advantages and disadvantages of reducing complexity in mega project planning

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Abstract

There are many articles discussing time and cost overruns in mega projects. This research, however, looks at a case that was successful in managing these aspects: a metro extension in the Rotterdam Region in the Netherlands. The literature identifies several causes for overruns and the question thus becomes what *prevented* these causes from occurring? The answer in Rotterdam's case seems to be a strict focus on reducing complexity, or in other words to keep it simple. Therefore, the main focus in this article is on the reduction of complexity and its effects on the planning of mega infrastructure projects. Are there only advantages to this approach or do certain facets of this approach have negative consequences? Using a case study method with interviews, this article shows the conditions under which the reduction of complexity is beneficial or detrimental.

Keywords: Project success and strategy; Managing context - political, economic, social and technical; Managing design, planning and appraisal; Decision-making; Risk, uncertainty and complexity

1. Introduction

Sometimes things are not as simple as they seem, but sometimes they are not as complex as they seem, either. The same is true of mega infrastructure projects. Not all of these are necessarily of the same complexity. Especially line infrastructure projects, such as rail and highways, start with a single primary function (connecting several places) but can become very complex over time. They have to deal with a frequently changing context of different interests, purposes, constraints and ambitions. It has been a natural inclination in academic works to have a negative view of large infrastructure projects. They cost too much; they take too long to complete; they do not deliver on promises of patronage. As Flyvbjerg et al. (Flyvbjerg, 2007; Flyvbjerg et al., 2002, 2004) show, the large majority of large transport projects do indeed show these symptoms. However, not all mega projects are planning disasters and this paper looks at a project that was successful in keeping budget and schedule in order to see what its 'secret' is. Although project success has many potential definitions (e.g. patronage, economic spin-off, public appreciation), most mega project literature focuses on time and cost aspects for project successfulness (Shenhar et al., 2001). As this literature is the basis of the exploration of the case, we will keep success limited to cost and time management aspects. The analysis in this case also does not extend to the time after delivery, thus an analysis on other success factors, such as patronage, is beyond the scope of this article.

The metro project Beneluxlijn in Rotterdam, The Netherlands, was finished nearly on time and with budget to spare. It is one of the most expensive infrastructure projects finished in the Netherlands in the last decades, and therefore can be considered a mega infrastructure project. Patronage was not taken into account during the appraisal period, making it difficult to evaluate the project on that basis. What is interesting is that this is also one of the largest projects, in total cost, which was finished in the first decade of this millennium. At first sight it seems the project success can be found in it being kept simple

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in process, and project scope and management. However, was this indeed key to its success and did it come at a cost?

Keeping it Simple Stupid, or the KISS principle, (Terano, 2008) is a common expression (albeit with slight variations) in project management and ICT. It is a design standard that aims to keep the used techniques, originally in aerospace engineering, as uncomplicated as possible (simple) and as easy as possible to understand and repair (stupid). Keeping it simple is, more formally put, the reduction of complexity. The reason for doing so is that with the reduction of complexity comes a reduction of uncertainty as complexity is often defined in relation to uncertainty (Antoniadis et al., 2011; Bosch-Rekveldt et al., 2011). For instance, after a literature review, Vidal et al. (2011: 719) state: "project complexity is the property of a project which makes it difficult to understand, foresee and keep under control its overall behavior, even when given reasonably complete information about the project system." The reduction of complexity means that there are fewer unknowns and fewer variables to predict, and thus the project and planning of the project arguably becomes more manageable. However, as we know from our own academic writing, simplicity is good but it often comes at the cost of richness. We feel we cannot describe the full richness of our case or data because we are limited by words and structures. The same is true for planning and decision-making processes on mega projects. The more we try to close the process and reduce the scope of the project, the less influences we get from outside and the less feedback about alternatives and uncertainties is brought into the process (Deutsch, 1966; Innes and Booher, 2010). The 'tunneling' of decision-making lessens the strategic potential of cross-pollination between different trajectories and streams of policy-making (Marchau et al., 2010; Priemus, 2007; Swyngedouw et al., 2002). Two questions are thus raised. First, what are the advantages and disadvantages of reducing complexity by simplification? And second, can we say something about the type of projects that are more appropriate for either side of the complexity dimension?

This article starts with an overview of the factors behind the cost and time overruns in mega projects as identified in the literature. It relates them to issues of complexity and uncertainty because overruns are the manifestation of problems associated with these issues in this type of project. In the following section the research design is discussed. The subsequent section presents the case and the analysis of the mechanisms leading to its successful management of time and cost. The concluding section discusses the opportunities and threats of the approach identified and considers the findings in the light of existing literature.

2. Mega projects on a budget

It is analytically attractive to treat political decision-making and project management as separate fields of analysis, as it enables a researcher to separate the political aspects from the engineering side. In practice however these fields are strongly related. Mega projects remain under political scrutiny well after the official final decision is made. Decisions made early on can have disastrous effects when abstract political ambitions crystalize in specific technical challenges. The literature review will therefore deal with literature from mega project research, decision-making and project management. I will use a backtracking approach moving from effects (cost and time overruns), through identified causes, to finally link them to the strategies for dealing with uncertainty and complexity.

Mega projects take a special position in public policy. They require large amounts of financing and staffing, and are often part of very politically charged processes. As Flyvbjerg et al. (2003) and Altshuler and Luberoff (2003) indicate mega projects have a bad track record in keeping to budget and time schedules. Cost escalations happen in almost nine out of ten projects with a cost increase of 28 per cent on average (Flyvbjerg et al., 2003). In recent decades the cost of mega projects worldwide has increased dramatically despite technological improvements in building and management techniques (Altshuler and Luberoff, 2003). Although there are no articles addressing comparative analysis of time delays in large projects, there is a strong relation between delays and cost overruns. For instance, the delays in the Channel Tunnel increased the construction cost by about $1 million a day (Flyvbjerg et al., 2004). There seem to be several phenomena contributing to the overruns affecting mega projects.

Cost and time overruns are a mismatch between the estimation and the practical result. It therefore makes sense to first look at the accuracy of cost and time estimations. To be sure, there is a great uncertainty in estimations related to mega projects (Bruzelius et al., 2002). However, Flyvbjerg argues that uncertainty cannot be the only reason and that there is often a tendency of 'optimism bias' or 'strategic misrepresentation' (Flyvbjerg, 2008). Optimism bias relates to the fact that people are naturally inclined to estimate things more positively than one could objectively derive from practice. We hope that this time things will go right and thus are pre-disposed to neglect the elements that can go wrong. By contrast, strategic misrepresentation means deliberately under-estimating cost and time for political and strategic reasons. The rationale here is that if you were to show the real cost, the project would never be built; however, once you start building infrastructure it is difficult to stop even if the costs are far higher than previously expected. Thus it can be strategically beneficial to keep the estimates deliberately low. Flyvbjerg (2008) concludes that these two are the most prominent variables in explaining the inaccuracy of estimations and forecasts. The contested nature of information makes it attractive for different actors to present their information strategically (De Bruijn and Leijten, 2007). However, Osland & Strand disagree with the findings of Flyvbjerg and argue that his empirical data is not sufficient to support his argument of strategic misrepresentation and argue that he is guilty of applying the logic of suspicion. "For Flyvbjerg and other proponents for the hermeneutics of suspicion, the actors actually admitting telling lies can be seen as the "tip of the iceberg". However, it is also a perspective that would not be falsified if no examples of actors admitting lying were found. On the contrary, it could easily be interpreted as a verification that they were lying also for the researchers" (Osland and