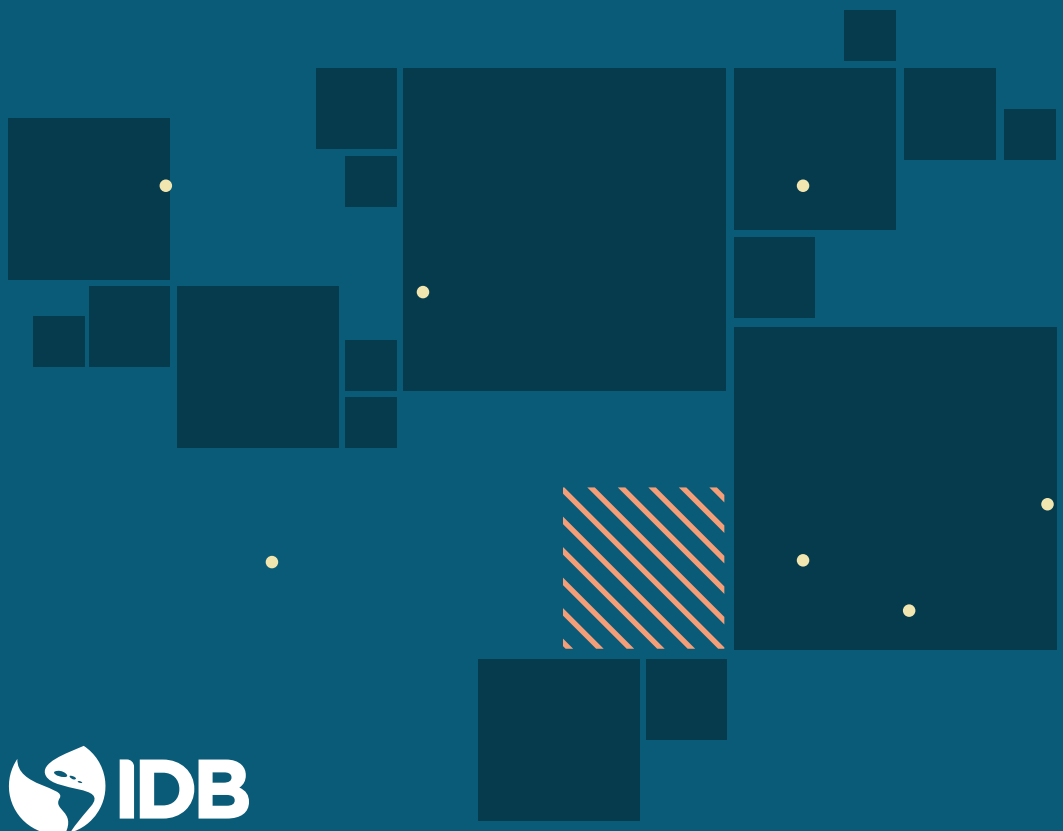
SERIES: Technical Documents on Megaprojects

PLANNING AND APPRAISAL RECOMMENDATIONS FOR MEGAPROJECT SUCCESS

Juan Alberti



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TECHNICAL DOCUMENTS ON MEGAPROJECTS

SERIES

This document belongs to a series called “Technical Documents on Megaprojects”. It is part of a significant research effort developed to study megaprojects in the transport sector in Latin America and the Caribbean in 2016, 2017, and 2018. The objective has been to carry out an in-depth analysis of particularly relevant issues concerning the planning, appraisal, and delivery of these endeavors.

For each issue studied, different views proposed by academics and practitioners are illustrated and one position is advocated. It is not the spirit of this series to generate a consistent message around every matter analyzed in the different documents, but to stimulate the discussion and a research environment on this topic. The series can be used as input in those countries that wish to face the challenge involved in developing a megaproject in the transport sector.

PREFACE

This paper compares two approaches to the evaluation of megaproject success. The first one is called the "iron triangle" approach. Under this approach, a megaproject is considered successful when it is delivered on budget, on time, and in line with the required specifications. The second approach is here called the "holistic" view of megaproject success, which considers other commonly used criteria: social efficiency, effectiveness, equity, relevance, and political pay-off, among others.

This paper shows how the way in which the success of a megaproject is measured leads to different recommendations for the planning and appraisal stages. It shows that such recommendations may or may not be consistent with the nature of the problem these endeavors imply at the different stages. It is here argued that focusing on the "iron triangle" approach to success can promote planning and appraisal with a narrow view of the problem, by assuming consensus, encouraging depoliticization, understanding the problem as a mathematical optimization made by a single decision-maker. The "holistic" approach to success, on the other hand, favors more comprehensive and integrated ways of planning and appraising infrastructure megaprojects. It does so by promoting a reduction in data demands, focusing on simplicity and transparency aimed at clarifying the terms of conflict and accepting uncertainty, keeping options open, all while focusing on the actual criteria used by the relevant stakeholders.

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INTRODUCTION

1.1. OBJECTIVE

Measuring megaproject success is an arduous task. One very popular way to do so is to use the "iron triangle" approach. Under this approach, a megaproject is considered successful when it is delivered on budget, on time, and in line with the required specifications. A more complex but "holistic" view of megaproject success, however, would consider other measures that are usually pursued, such as social efficiency, effectiveness, equity, relevance, and political pay-off, among others.

This paper aims to illustrate how these two approaches to analyzing megaproject success lead to different recommendations for the planning and appraisal stages in the lifecycle of megaprojects. Its aim is, furthermore, to analyze which of these recommendations are more appropriate for a central government that needs to face the challenge of developing one of these endeavors.

Ideally, central governments should look to deliver the widest possible range of positive transformational benefits that megaprojects are able to bring in terms of economic, social, environmental, and territorial outcomes, both in the short run and in the long term. The author acknowledges that this is not always the case. Central governments may respond to the interests of a specific set of stakeholders, and can be interested in obtaining results in the short term, and for a specific territory. However, this paper develops a normative analysis and studies which of the planning and appraisal recommendations are more suited for decision makers that intend to deliver the widest possible range of benefits.

It is here argued that the planning and appraisal methodologies that are reasonable when using each of these approaches to success can have an impact on the capabilities of the government to deliver these benefits. This is the case because they can help to frame the problem or hinder its framing in a realistic way. The discussion which follows shows that the use of a more "holistic" approach to megaproject success favors more comprehensive and integrated ways of planning and appraising infrastructure megaprojects, as it promotes a more transparent decision-making process that links policy, planning and appraisal criteria to project delivery and ultimately to project operations, outcomes and impacts as well.

1.2. INFRASTRUCTURE MEGAPROJECT DEFINITIONS

Infrastructure megaprojects are a particular kind of infrastructure projects; they are categorized as "mega" for several reasons. One of the most frequently argued reasons has to do with their very high construction costs. There is growing consensus that infrastructure megaprojects are large-scale ventures, high investment expenditures of one billion US dollars or more (Bruzelius *et al.*, 2002; Flyvbjerg, 2014)[1] . Notwithstanding this common narrative, some authors believe that this measure should in some way be related to a country's gross national product (Greiman, 2013) or even to the development context within which they are developed (Capka, 2004).

Apart from matters related to the scale of costs, other characteristics are frequently included to differentiate mega infrastructure projects from other projects. For example, megaprojects are frequently seen as being critical to the economic, social, environmental and territorial development of the areas they traverse and influence (Dimitriou *et al.*, 2014). In other instances, they are seen to involve a large number of important public and private stakeholders that can influence (or be influenced) by the progress of their development (Macharis and Nijkamp, 2013). Either way, they are frequently understood to represent high risk endeavors especially because they are developed under conditions of considerable uncertainty (Allport, 2010).

1 Although the word "mega", as a scientific and technical term, means a million,"giga" means a billion, and "tera" a trillion, the term "megaprojects" is commonly used to cover all large-scale projects that incur costs in excess of one billion US dollars.

From the existing literature it arises that projects of this kind have been studied separately not only because of their special features in relation to their size, uncertainty, and the risks they involve, but also because of the ambiguities they frequently pose, the complex interfaces and integration challenges they encounter, and the significant political and external influences (Greiman, 2013) they incorporate—all interwoven frequently in complex stakeholder decision-making processes over long periods of time (Priemus & van Wee, 2013).

This paper especially focuses on the analysis of infrastructure megaprojects in the transport sector that comply with said USD 1 billion price tag plus many of the other features of megaprojects described above. Although this paper focuses on transport projects, it acknowledges that many megaprojects are not in fact 'stand alone' projects but a program or programs of projects. Many transport megaprojects are developed or evolve in urban corridors or regional development corridors, and are related to other mega infrastructure projects found in the same corridors. While the analysis of this interdependent systemic relationship between infrastructure systems is not the focus of this paper, it is important to appreciate the advantages and disadvantages of the presence or absence of other infrastructure systems which are often critical to the success of the transport megaproject.

According to predictions made by the Mckinsey Global Institute, in order to keep pace with the projected global economic needs of population growth, the world needs to invest USD 3.3 trillion annually in infrastructure through 2030 (Woetzel *et al.*, 2016)[2] . This same source argues that a significant portion of such investment will be developed in the transportation sector, much of it in the form of megaprojects. With this in mind, understanding the complexity of the issues and challenges that surround such projects and unveiling the most suitable planning and appraisal approaches from the perspective of the governments responsible for overseeing their planning and appraisal stages, becomes crucial to all involved, especially policy-makers.

2 The premises of these statistics need further examination. They are based on past trends and current trajectories that are changing and likely to experience significant changes in the future. The statistics presented in this paper are used in a manner that is indicative, rather than definitive.

1.3. MEGAPROJECTS AS A MEANS TO ADDRESS PROBLEMS

Beyond the definition(s) of megaprojects in the transport sector offered earlier, such projects can be seen as the means selected by decision-makers (usually government decision-makers) to address a set of identified public policy **"problems"**. In this sense, the success of such projects could be understood in terms of the extent to which they address these problems.

According to Checkland (1981), a very broad definition of **"problems"** is the one proposed by operational researchers: "there is a desired state, S_1 and a present state, S_0, and alternative ways of getting from S_0 to S_1. Problem solving, according to this view, consists of defining S_1 and S_0 and selecting the best means of reducing the difference between them" (cited in Rosenhead and Mingers, 2001). Under this view, the context of the problem is taken as given.

This definition of **"problems"** is useful to show the following challenges for megaproject infrastructure planning and appraisal: 1) the demarcation of the *context* of a megaproject; and 2) the specification of the *states*.

Regarding *context*, the impact of megaprojects may be influenced by their historical and organizational context (Engwall, 2003). If context changes, complexity and non-linearity need to be considered when analyzing project "success", given that context alters the way the project may generate the change between states (Cicmil *et al.,* 2006). Hall (1980) also refers to the power of context as it affects judgements about project outcomes by making reference to the impact of changing societal values employed to judge 'success'. Dimitriou, Ward and Wright (2012) also allude to the power of context on judgments about megaproject 'success' by highlighting the importance of recognizing the need to differentiate between the original objectives a project was set out to deliver and subsequent 'emergent objectives' it is expected to deliver in changed policy contexts. The desired *state* can change. The difference between the initial desired *state* and the final desired *state* can be substantial when the gestation period between conception and delivery is long or when a new *context* has emerged for the project as compared to the scenario for which it was originally conceived.

Furthermore, there may be certain **"problems"** where the definition of the *states* can be agreed upon by the stakeholders, and other *contexts* where alternative types of explanations of the phenomenon are employed, with the latter situation suggesting the need to also investigate how different stakeholder perceptions impact judgements of project 'success'. The work of Rittel and Webber (1973) elaborates on such circumstances, and explains how opinions about the opportunity of potential options to change *states* could impact megaprojects. Moreover, the definition of a desired *state* suggests an initial goal formulation, with a set of values and objectives, prioritizing particular criteria to evaluate project outcomes, such as efficiency, efficacy, equity, and political feasibility, among others (Bardach, 2012). Using this public policy lens, therefore, the success of the infrastructure megaproject will always be debatable, as the selection of the criteria will at all times be a discretional decision.

A sector-specific categorization of the **problems** megaprojects in the transport sector are often intended to solve is presented in the early work of Banjo and Dimitriou (1990). The authors differentiate between 'manifestation problems' and 'root problems'. The former are problems that manifest themselves, primarily in the transport sector, as a result of the causal effects of a number of other broader developments, for example traffic congestion, air and noise pollution, and road accidents. Whereas 'root problems' largely have their origins outside the transport sector, and may be attributed to factors such as: increased trip-making as a result of urban expansion, urban forms incompatible with transport technologies and high density urban configurations that generate high capacity transport demands that exceed the capacity of the transport system in place. Further examples of 'root problems' refer to increased traffic generation levels spawned by increased household incomes and subsequent rises in motor vehicle ownership, incompatible traffic mode mixes, especially of motorized and non-motorized modes, or public transport systems (Banjo and Dimitriou, 1990). It should be pointed out that megaprojects in the transport sector such as metro lines, railways lines, and major highways can contribute to solving both types of problems.

This position paper focuses on the study of the two approaches to analyzing megaproject success mentioned above: the "iron triangle" approach and the more "holistic" approach, which lead to two

lines of professional practice regarding planning and appraisal. It argues that they do so because the different success criteria impose a different problem structure; they focus on a different nature of the desired state, which implies different assumptions regarding the context. Therefore, recommendations arising from the different approaches are linked to the assumptions used in each case.

2

THE "IRON TRIANGLE" APPROACH

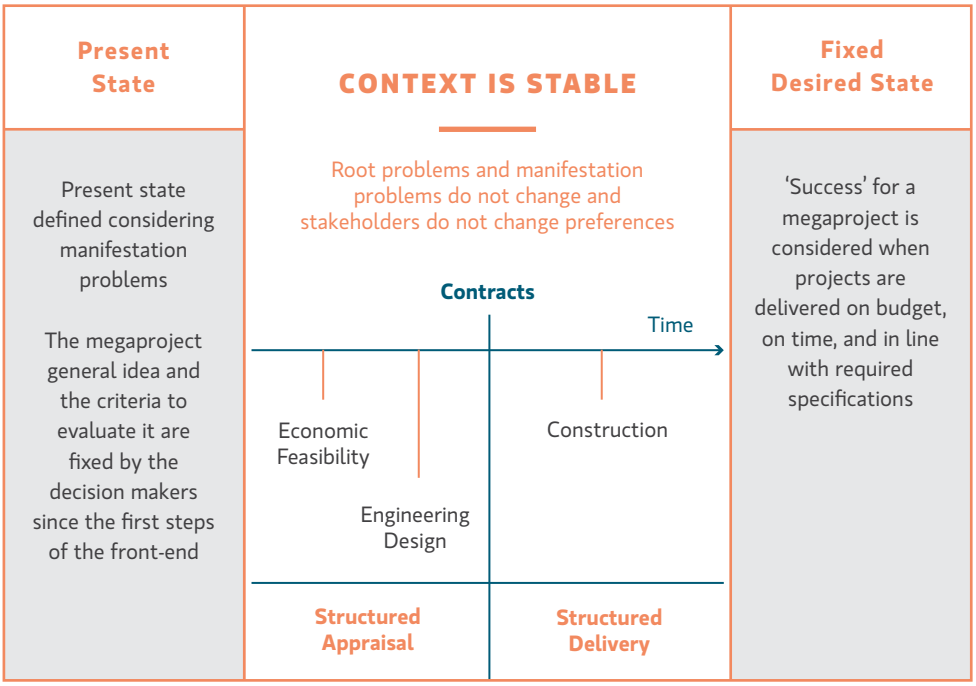
2.1. CHARACTERISTICS AND PROBLEM STRUCTURE

Under this approach, a megaproject is considered successful when it is delivered on budget, on time, and in line with the required specifications. The term "iron triangle" was coined in 1969 by Martin Barnes, former Executive Director of the Major Projects Association, mostly referring to the deliverability of the outputs of projects (Weaver, 2007).

Often referred to as the "traditional view" on project management, according to Lenfle & Locch (2010:1), it is confined to a model of project life cycle or phased stage-gate approach to executing. It is a control-oriented phased approach that infers the management of structured phases of a project life cycle one after another (Lenfle and Loch, 2010).

Returning to the earlier definition of "problems" (to be addressed by megaprojects in the transport sector), this approach implies that the project to be constructed (the desired state) should be fixed. It also assumes that contexts are not only given but also static and stable. Otherwise, completing the project on budget, on time, and in line with specifications would not be possible. If the context or the desired output change, these variables would change as well. The following figure illustrates this perspective.

Figure 1: The nature of context and states under the "Iron Triangle" approach



By assuming the stability of the context and a fixed desired state, the "iron triangle" approach to success is premised on the formulation of the problem in terms of the optimization of a decision maker. It is centered on the capability to address and abolish uncertainty often by assuming consensus among key stakeholders and interested parties. It is a data-hungry approach, which looks to present the problem(s) addressed as scientifically as possible in as quantitative a manner as is feasible. In this respect, the approach is very much focused on generating and finding credible data that helps to optimize product delivery (Rosenhead and Mingers, 2001).

2.2. PLANNING AND APPRAISAL AT THE "FRONT-END"

The first phase of such approach is usually called the "front-end' of the project decision-making phase. It commences when the project 'idea' is first conceived and ends with the final (political) approval, after project appraisal, on whether or not to finance and implement the

project. This front-end phase is the stage that is analyzed in this paper. Within the scope of this project management oriented view, promoters generate information that looks to enable optimal decision-making by key stakeholders in line with the decision-makers' interest or that of those whom they represent (Samset and Williams, 2010).

Much of this phase is associated with the forecasting of the costs and consequences of different alternatives, involving knowledge and evidence provided by planners, engineers, economists, and other professionals. Ideally, employing this approach, these studies offer unbiased findings based on what are generally considered to be scientific procedures (Wachs, 1990).

Several issues are usually considered as particularly relevant for the development of a correct front-end phase when employing the 'iron triangle' approach. The following text provides a summary of these issues and the problems that usually arise.

2.2.1. THE "PROBLEM ANALYSIS"

Among the issues that arise in this phase is the fact that all too often no proper 'problem analysis' is conducted, and no impartial appraisal of alternatives is generated (Priemus, Flyvbjerg and van Wee, 2008). Moreover, frequently noted, is the lack of alternatives, and an abundance of ambiguities regarding the scope of the project, thereby generating shortcomings in the ex-ante appraisal phase (Priemus, 2010).

With the above circumstances as a backcloth to much megaproject investment planning and appraisal, one particular topical issue that is under constant consideration is the escalating commitment of decision-makers to an ineffective course of action. This means that before the formal decision is made to 'go ahead' and build a megaproject, decision makers have frequently already given their earlier implicit commitment to proceed with the project.

This is often referred to as a "lock-in" (Chantal C. Cantarelli *et al.*, 2010). The process by which some project stakeholders actually make a decision to build the project before fully completing the planning and appraisal steps suggests the pursuit of less flexible analyses that

closes the pre-investment analysis to considering other alternatives (Chantal C. Cantarelli., 2010).

Under this "iron triangle" approach, it is particularly relevant to conduct a proper problem analysis and an impartial appraisal of alternatives at the front-end, discouraging lock-in. However, the literature shows that this is not usually the case.

2.2.2. FORECASTING COSTS AND TIME

It is allegedly at this stage that cost overruns and delays start to take form. They do so because cost overrun is defined as the difference between actual and forecasted construction costs, as a percentage of forecasted construction costs (Flyvbjerg *et al.*, 2004). In this sense, cost forecasts are, by definition, an intrinsic part of cost overruns. Such is the case with project delays, as well as their scope. When lock-in occurs, the forecasted cost, time, and scope at the moment of commitment to the project may be very inaccurate.

On the contrary, if the "success" of the megaproject is to be evaluated by employing "iron triangle" criteria, the advice is that a great deal of time and thought should be put into strengthening the forecasting processes. This is an important recommendation of those who defend this paradigm. Evidently, this explains the insistence to work with reliable information and with state of the art techniques, in a context of institutional incentives to promote ethical and transparent practices (Wachs, 1990).

The forecasted costs and benefits of projects are embedded in the supporting cost-benefit analyses, and in the social and environmental impact assessments used for the business cases, and they are so important that they are then used to decide whether or not the project is to be implemented. There is ample narrative and academic work focused on explaining why the forecasts developed by project promoters tend to be so inaccurate.

A good categorization of such errors is the one provided by Flyvbjerg, Bruzelius and Rothengatter (2003) who differentiate between technical, economic, psychological and political errors. According to this same source, technical errors include: forecasting

errors, poor project design and incompleteness of estimations, changes of scope, general uncertainty, inappropriate organizational structure, inadequate decision-making processes, and inadequate planning processes. Economic concerns include a rational underestimation attributed to: lack of resources, inefficient use of resources, dedicated funding process, poor financing and contract management, and strategic behavior. Psychological errors are related to: optimism bias[3] among local officials, cognitive bias[4] , and cautious attitudes towards risk. Finally, political concerns are associated to deliberate cost underestimation and manipulation of forecasts (Chantal C Cantarelli *et al.*, 2010).

Flyvbjerg *et al.* (2009) summarize the above as either "delusions" (or honest mistakes) or "deceptions" (i.e. strategic manipulations of information or processes). These authors go on to argue that for each case there are different potential policy responses (options) to address these problems, as is suggested in the discussion that follows immediately below.

Their recommendation is to take an 'outside view' of these issues using 'reference class forecasting', which is a statistical procedure that entails: selecting a reference class, assessing the distribution of outcomes, assessing the reliability of the predictions, making an intuitive prediction of the project's position in the distribution, and then correcting the intuitive estimates (Flyvbjerg, Garbuio and Lovallo, 2009). To particularly address concerns of deception, the same source advocates that active steps should be taken to enforce accountability and transparency in decision-making. These steps, it is further recommended, should be accompanied by the introduction of incentives in the event there be a need to discourage strategic misrepresentations of different stakeholders that participate in principal-agent[5] relationships (Flyvbjerg, Garbuio and Lovallo, 2009).

3 The systematic tendency to be overly optimistic about the outcome (Chantal C. Cantarelli et al., 2010).

4 The errors in the way the mind processes information.

5 Defined by relationships where a principal engages an agent to act on their behalf. There are certain conditions that make strategic deception more likely within each Principal-Agent relationship, for example self-interest, asymmetric information, differences in risk preferences and time horizons, among others.

2.2.3. STAKEHOLDER MANAGEMENT

This "iron triangle" approach also involves a considerable amount of effort aimed at stakeholder management. Advocates of this approach state that many projects fail—(in "iron triangle" terms)—, because the project manager is unable to successfully manage the agendas of the various (often competing) project stakeholders (Sutterfield, Friday-Stroud and Shivers-Blackwell, 2006).

In the case of large projects, this is particularly important for the successful completion of their deliverables. In particular, much effort has been developed to better research and understand the nature of social movements that oppose megaprojects, given that many such groups allegedly delay, block, or permanently disable large infrastructure projects (McAdam *et al.*, 2010). Stakeholder management is, therefore, fundamental when focusing on "iron triangle" perceptions of project success (Bourne and Walker, 2005).

Under the "iron triangle" approach to success, the recommendation is to identify and measure stakeholder power and interest, to better understand their potential influence, and then propose a particular strategy to manage their participation (Mendelow, 1991). Under this view, "extensive" megaproject consultation processes are questioned because consultation could be seen as a condition for conflict (McAdam et al., 2010).

2.2.4. CONTRACT STRUCTURING

There is, furthermore, growing interest under this approach, in studying how megaproject contracts are structured, in the belief that different contracting methods obtain the best results in terms of adherence to project cost, time, and specification targets. Henn *et al.* (2016) argue that this is an important matter in the planning and identification of projects and it is not a step that should be taken after planning decisions have been made, as the choices made have a critical impact on the success of projects.

According to Gordon (1994), project promoters need to design an appropriate contract for each project, in order to optimize project delivery in terms of "iron triangle" objectives. They must develop an

appropriate contract design and select a proper contracting method. They must consider the scope, organization, contract, and award of the project, which in turn impact on project duration, provide flexibility for changes, reduce adversarial relationships, and generate cost-saving incentives (Gordon, 1994). Under this view, these aspects are central in megaproject planning and appraisal.

3

THE "HOLISTIC" APPROACH

3.1. CHARACTERISTICS AND PROBLEM STRUCTURE

What is here called the "holistic" approach to analyzing megaproject success is made up of a set of approaches rather than one singular approach. It understands "iron triangle" measures as merely one (albeit very important) indicator of successful delivery of a project and its outputs.

According to Samset (2013, p.13) "a successful mega project is one that delivers its outputs and significantly contributes to the fulfilment of agreed objectives". He mentions that there is a set of "success factors" that can be pursued, including efficiency, effectiveness, relevance, and impact, among others. Holistically responding to these aspects requires an important tie-up of tactical performance concepts in project management efficiency and strategic performance to the other criteria cited.

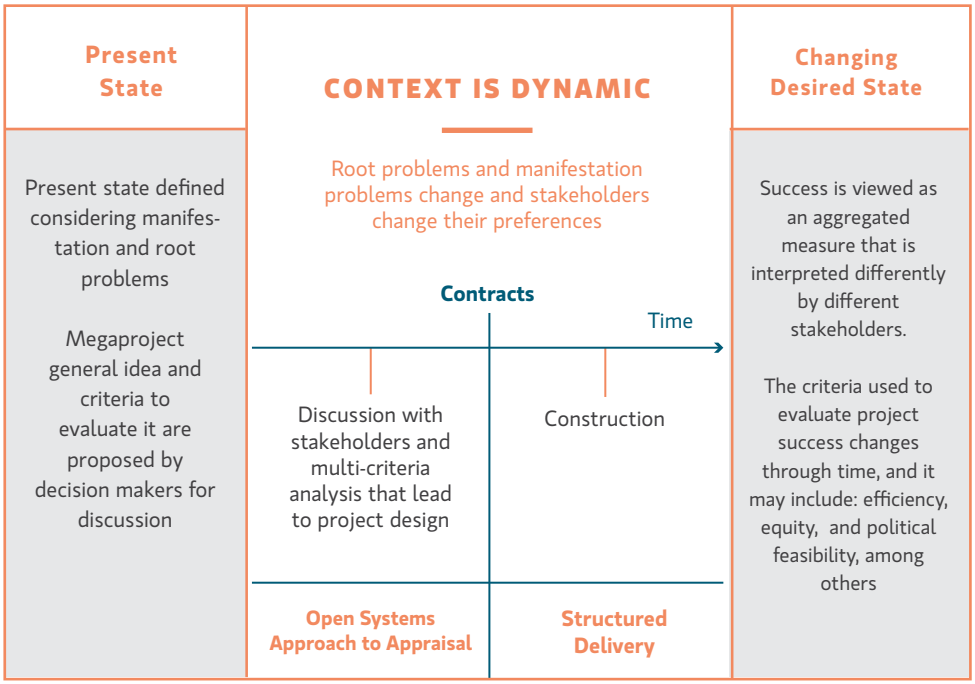
The required inclusion of the success factors above goes back to the 1960s when the United States Agency for International Development proposed this, endorsed by the United Nations, the Organization for Economic Cooperation and Development and the European Commission (Samset, 2013). Therefore, this "holistic" perspective and the "iron triangle" approach are in fact contemporaneous.

Bardach (2012) includes the success factors mentioned above as criteria or assessment standards used to judge the appropriateness of the projected policy outcomes and impacts. Under his view, the alternatives under consideration do not usually produce better outcomes and impacts than any of the other considering every single

criterion; there are trade-offs. Therefore, project "success" is viewed as an aggregated measure that can be interpreted differently by different stakeholders using a different weighing of the criteria (Samset, 2013).

An approach of this kind focuses on the way infrastructure megaprojects can address both manifestation and root problems, simultaneously. It considers their capability to meet project objectives that arise over time, allowing changing visions among different stakeholders, and different values, priorities, and expectations that change as development and cultural contexts change (Dimitriou *et al.*, 2013). The following diagram illustrates this perspective.

Figure 2: The nature of context and states under the "holistic" view



This more holistic perspective looks to capture a wider range of concerns beyond those of project delivery (outputs), including coverage of project outputs, outcomes and impacts, and examining how well the manifestation and root problems the megaproject was designed to address actually addressed them.

Adapted from World Bank Institute - Evaluation Group

3.2. THE DYNAMIC NATURE OF MEGAPROJECT PLANNING AND APPRAISAL

The work of Friend and Jessop (1969), developed later in the context of megaprojects by Peter Hall (see Hall, 1982) and further elaborated by Friend and Hickling (1987) highlights the importance of the strategic view of holistic thinking as a dynamic phenomenon which, among other things, has judgements about the success of projects reflected and acknowledged by changes in the values of societies over time. In these terms, it is not unreasonable to have megaproject objectives set at the outset of the planning stage to change over time to what Dimitriou, Ward and Wright (2012) refer to as 'emergent objectives' in response to changing policy or development contexts in different dimensions that reflect alterations in cultural and societal values, economic and fiscal circumstances, administrative frameworks, and spatial conditions, among others (Dimitriou *et al.*, 2013).

While the above approach to holistic infrastructure megaproject planning and appraisal is but one approach, it shares with other more "holistic" approaches (see for example Allport, 2010) the perspective that such projects involve dynamic complex project decision-making systems that interact with changing policy and development environments that all too often lead to emergent rather than directed outcomes. An appreciation of this complexity is reflective of the fact that project components interact in non-linear and stochastic ways that are usually impossible to predict.

To accommodate these circumstances when dealing with the selection (among options) of the project and when deciding objectives and goals to be adopted for a project, these sources advocate the adoption of an "open systems" approach to decision-making, such as the one proposed by Sussman *et al.* (2007). This approach encourages an examination of the political, economic,

social, environmental and institutional aspects that lie beyond the more technical and engineering boundaries of decision-making (Dimitriou, Ward and Wright, 2013). Sussman *et al.* (2007) propose a process that consists of three stages: representation of the system; design, evaluation and selection of strategic alternatives; and implementation. It is a process suited for complex, large-scale, interconnected, open, sociotechnical (known as "CLIOS") systems.

Several issues are usually considered as particularly relevant for the planning and appraisal phases when employing this "holistic" approach. The following text provides a succinct summary of the issues usually addressed by the literature.

3.2.1. A COMPLEX DECISION-MAKING PROCESS

As already implied, the complexity referred to above is primarily associated with the inevitably complex decision-making process involved in megaproject developments, particularly concerning relations between the multiple stakeholders involved in the decision-making process and the states of markets and politics surrounding these endeavors. The complexity of the projects themselves, which obviously affects overall decision-making, may be divided into three categories: technical, organizational and external (Priemus, Giezel and Bosch-Rekveldt, 2013).

In this context, the term 'technical complexity' refers to (among other things): the presence of a high number of project goals, a non-alignment of project goals, uncertainties of project goals, a multiplicity of locations, difficulties arising from a lack of experience with (new) technology, uncertainties in methods, and involvement of different technical disciplines (Priemus, Giezel and Bosch-Rekveldt, 2013). 'Organizational complexity' arises from (among other things): a lack of resource and skill availability, a lack of experience with the stakeholders involved, the challenges posed by the multiplicity of stakeholders and contracts, the difficulties presented by the involvement of different nationalities (and cultures), the multiplicity of financial sources, and a lack of trust among involved parties (such as developer contractors). To add to organizational complexity, the implications of the 'external complexity' of the project's decision-making (among other things) are impacted by the number of external

stakeholders affecting the project's progress and outcomes, the level of dependence on external stakeholders, the degree of external political influences bearing on decision-making, and the lack of experience in working in the country where the project is to be built (Priemus, Giezel and Bosch-Rekveldt, 2013).

According to Landau (1969), the best way to deal with complexity in these circumstances is to adopt a redundancy and resilience approach to the decision-making strategy, whereby alternatives and multiple options are considered from the early project phases. Redundancy here implies a pragmatic and experimental decision-making process, permitting several and competing strategies to be followed both simultaneously and separately (Landau, 1969). Resilience, on the other hand, advocates a preparedness to cope with uncertainties and unanticipated situations. It may be reactive, protecting a particular position from external shocks, or proactive, in managing a range of possible directions (Dovers and Handmer, 1992).

Academics and practitioners working in the field of megaprojects that support a more holistic perspective contend that the more conventional project management approaches to analyzing megaproject success prevent the adoption of Landau's advocated approach by virtue of such projects being usually framed as 'closed systems', fixing project objectives in early stages (as the phenomenon of "lock-in" was suggested in the previous section), thereby undermining the project's ability to adapt to the changing contextual influences. In response, they advocate the use of both an open system and a closed system approach, each one for different stages in the project lifecycle (Dimitriou, Ward and Wright, 2013).

Under this view, at the planning stage, megaprojects should be treated as "open systems", to better frame how the different components that are relevant to their justification are accommodated. While at the construction stage, decision-making for megaproject delivery by necessity should be treated as "closed systems", keeping to the latest project objectives (revised or otherwise from project outset) and the way they intend to achieve them on time, within budget and to specification (Dimitriou, Ward and Wright, 2013).

Megaproject decision-making also depends on other variables that can divert the megaproject from adopting an initial, "rationally"

proposed path. To explain this, there are behavioral and cognitive deviations associated with the mindset of decision makers that need to be understood. The way in which information, both objective and subjective, is brought to the planning and appraisal process is important. This frequently very much depends on the stakeholder that receives and acts on the decisions made.

This is very much related to the fact that politics and political personalities associated with megaprojects usually play a major influential role in the decision-making process. Planning, if understood as a technocratic and systematic way to appraise alternatives, particularly at the pre-investment phase, may be less important than politically motivated directives (Allport, 2010).

There are, furthermore, political and strategic issues that can undermine the technical rationality of the decision-making process. According to Leijten (2013), these issues include: the use of key information and the shift of problem ownership, both susceptible to political opportunism. In this context, sub-optimum outcomes are more likely, especially if they imply satisfying the interests of more stakeholders. It is important to differentiate between the success of a project and the success of its management (Leijten, 2013). While the success of its management is related to "iron triangle" concerns, the success of a project is related to outputs, outcomes and impact as a whole.

3.2.2. INFLUENCES AND STAKEHOLDER MANAGEMENT

The decision-making process at the planning stage should, under this "holistic" view, consider three overlapping influences. The first influence is technical appraisal, the one related to the technocratic view of the subject matter. An approach of this kind should be complemented by political influence and the popular view. The political influence is related to the policy agenda and the political process. The popular view refers to what people really think, to the public opinion. Satisfying the three of them jointly would, according to Allport (2010), help to implement a "good" project. However, this is not usually the case as coalition-building between project stakeholders may have high technical costs.

Under this "holistic" perspective, stakeholder management is consequently a central task in the planning and appraisal phases of megaproject development. The competition for power and influence by the different project stakeholders, including politicians, central and regional government officials, media interests, and environmental lobbyists, among others, all too frequently detracts from the use of a technical "rational approach" to decision-making. Within this context, some have argued that cost-benefit analysis as an appraisal tool is ultimately of minor importance, and at worst irrelevant (Altshuler and Luberoff, 2003).

With the above conclusion in mind, there is significant merit to focus much more on the analysis of stakeholders' motives and agendas, as well as their levels of influence, from the early stages of the project through its execution. Those who advocate for the use of this approach promote the work on coalition building, which they understand as fundamental in order to propose a "good" (in the previous sense) project.

3.2.3. RISK MANAGEMENT

Another recommendation that is particularly relevant under this approach is a "proper" risk assessment. Dimitriou, Wright and Ward (2011) argue that the treatment of risks in decision-making that takes a "holistic" approach to the planning and appraisal of megaprojects comes from a variety of sources. They may, for example, come from: the changing nature of stakeholders' agendas, different political interventions over different time periods and different development contexts, and the technical inabilities of the planning and appraisal tools employed to clearly discern and analyze the full range, nature, scale and potential of contextual changes that generate risks, the lengthy planning and implementation period, and the wider economic climate.

To cope with the above challenges, the same source argues that it is imperative to adopt an anticipation-based approach to risk assessment, prepare adaptable planning, appraisal and delivery strategies, and confront technical leaders and political champions to respond more effectively to complexity. This requires, however, full access to relevant, updated and correct information about

decision-making contexts (i.e., a condition of full transparency) and information on how they impact project outcomes.

This is crucial to plan and appraise “successful” projects, from the perspective of a central government in a holistic manner which intends to deliver the fullest range of transformational benefits that megaprojects are able to bring, considering economic, social, environmental and territorial long-term outcomes for the nation they represent. To take risk management one step forward, the three questions that follow should be answered: What can go wrong (for whom, where and when)? What is the likelihood that it could go wrong (for whom, where and when)? What are the consequences of failure (for whom, where and when)? (Graham, 2009).

4

CONCLUSIONS

Both approaches have points in common and differences regarding the pre-implementation phase of megaprojects, when planning and appraisal activities take place. The following sub-sections provide a summary of these issues.

4.1. COMMON RECOMMENDATIONS

On the common ground, both understand that decision-making for megaprojects does not exist in a predictable world of known causes and effects. Planning is therefore basically stochastic. Stakeholders participating in the decision-making process have technical limitations and are subject to political incentives for making non-optimum (in project management efficiency terms) decisions. While the "iron triangle" approach talks about delusion and deception in decision-making, the more holistic perspective refers to cognitive deviations from rational planning and political strategies.

Furthermore, as mentioned earlier, both approaches pay particular attention to stakeholder management. Both are concerned with the potential impacts and influences of different stakeholders. However, as these perspectives measure success using different tools, they make singular recommendations on how to deal with this challenge, depending on the author studied.

4.2. THE SOURCE OF THE DIFFERENCES: THE NATURE OF THE PROBLEM

The “iron triangle” approach to megaproject success is basically related to success measures regarding the outputs of the project and occasionally on its impact on manifestation problems. On the other hand, the more “holistic” approach to megaproject success evaluates outputs, outcomes and impacts. It does so by assessing the project impact on both manifestation problems and root problems, considering the different views of the stakeholders involved. The “holistic” approach includes success measures of the project management perspective but not vice versa.

Sections 2 and 3 show how the different success measures impose a different problem construction. They fail to agree on the role of the context and on the specification of the desired state.

In summary, the “iron triangle” approach to analyzing megaproject success considers the changing values and objectives surrounding the megaproject as a driver of distress. Therefore, it leads to an appraisal stage that consists of analyzing a discrete desired state in a static context. Under this view, information should be gathered in order to reliably use state of the art techniques to rationally assess the different options. In this sense, technocrats should estimate outcomes, of different structured alternatives, to put it in “iron triangle” terms, and politicians should select the alternative considering the trade-offs proposed by the selected alternatives.

In contrast, the “holistic” perspective to analyzing megaproject success focuses on manifestation and root problems and therefore on a broader set of criteria: efficiency (including “iron triangle” measures but also economic and social benefits and costs), effectiveness, equity, relevance and impact. It encourages the consideration of changes in context and the development of redundant and resilient strategies to analyze different options. Moreover, it contends that the appraisal of dynamic desired states should involve continuous reflection of policy-based collective constructions, as a result of evolving stakeholders’ interests.

4.3. CONSEQUENCES

While the first view proposes megaproject planning and appraisal as a technocratic optimization process for diminishing uncertainty in order to evaluate alternatives, the second view addresses it as a process of collective construction, embracing uncertainty until a feasible alternative is locked for implementation.

The most important question the author intended to address in this paper was: which approach to project success leads to a professional practice that is more suited to develop megaprojects, from the perspective of a central government? Rephrasing: which planning and appraisal structure, derived from the proposed success factors used, is more suited to the challenges posed by megaprojects, given the unique characteristics of the problems they intend to address?

Megaprojects are, as stated in section 1, particular endeavors characterized by size, uncertainty, ambiguity, complex interfaces and integration, and significant political and external influences. Contexts inevitably change in these projects, and stakeholder's agendas change as a result. Moreover, projected states expected to be achieved by means of the megaproject are dynamic and stakeholder dependent. In these terms, megaprojects may be seen as responses to a complex problem. It has multiple actors, multiple perspectives, and conflicting interests (Rosenhead and Mingers, 2001). The problem is ill-structured (interdisciplinary), complex (several variables are involved) and dynamic (environment and factors change over time) (Jonassen, 2004).

After analyzing both views in sections 2 and 3, it is reasonable to conclude the following in terms of the methodology they imply in order to plan and appraise megaprojects. The first one, the traditional "iron triangle" approach to success, recommends the formulation of the problem in terms of multiple objectives, subjected to trade-offs onto a common scale, in order to rationally assess them in "iron triangle" terms. This methodology is very data demanding, it assumes consensus, depoliticizes, implies a single decision maker and attempts to abolish uncertainty. The "holistic" approach to megaproject success, on the other hand, does not entail a methodology to mathematically optimize at the decision-making process. It can even occasionally promote a reduction in data demands, focusing on simplicity and transparency aimed at

clarifying the terms of conflict, facilitating planning from the bottom-up, and accepting uncertainty, keeping options open (Rosenhead and Mingers, 2001).

The second paradigm of success imposes a planning and appraisal practice that is more suited to the front-end phase actually used by central governments when developing a megaproject. In fact, what usually happens in practice, as defenders on both sides argue, is that the projects that are finally selected are the result of a decision-making process that transcends technical influences.

4.4. A COMPREHENSIVE APPROACH

Therefore, it seems unnecessary to force a planning phase for megaprojects which only promotes formal assessment in technical terms, in a linear way, without considering the other evident forces that are acting on the decision-making process. Moreover, from the perspective of a central government, project success should include more than the "iron triangle" variables. Megaprojects are frequently presented as critical to the economic, social, environmental and territorial development of their areas of influence. Meeting their scope, cost and time aspirations is insufficient if the conception above is accepted as valid. However, this is not the same as to say that the "iron triangle" variables are irrelevant; they are more than valid but they should be understood within the context of a broader set of criteria.

"Iron triangle" variables should be complemented with indicators about economic and social efficiency, effectiveness, political pay-off, equity, relevance, and impact, among others. If this is not done, an incorrect planning and appraisal paradigm is developed, as presented in this paper. The other criteria are actually used by decision makers when selecting the projects. The key at the planning and appraisal stages, is to reflect the real public policy problem intended to be addressed by the megaproject, considering quantitative and qualitative dimensions as well as the concerns of multiple stakeholders.

If the "holistic" approach is used, the perspectives can be seen as complementary approaches. The "holistic" view includes "iron triangle" concerns. The project management cost, time, and scope

variables are seen as one part of the economic and social efficiency criterion, which is also only one of the several criteria included in the planning and appraisal of megaprojects. This comprehensive professional logic to planning and appraising megaprojects can change the current status quo in favor of a more complete way to face the public policy challenges behind these endeavors. It may help to promote a more transparent decision-making process that goes beyond the traditional "iron triangle" approach.

5

SUMMARY

To sum up, this position paper has analyzed and compared two different approaches to look at megaproject success: the "iron triangle" approach and the "holistic" approach. Specifically, it studies their impact on the recommendations around how these endeavors should be planned and appraised. It shows that the use of different success measures imposes different interpretations on how the public policy problem behind the megaproject should be addressed when planning and appraising megaprojects.

In the introduction, the paper summarizes what is usually understood as a megaproject and it shows that the public policy problems behind them are complex entities in some context, implying two states: a present state and a desired state. After that, it revises in detail some important messages behind the two views and their typical advice on how to deal with these endeavors. Subsequently, it compares them. It explains that the main source of debate is related to the planning stage and appraisal methodology, where the first view promotes scientization and depoliticization, and the second one advocates for the use of an open system approach.

Essentially, the paper builds its reasoning based on the following the three thought-provoking ideas below. The first idea is that the definition of a megaproject implies that they are developed in a complex context, involving multiple stakeholders that may have different and evolving views of the expected objectives. The second idea is that common pitfalls in the application of the "iron triangle" approach to success at the planning stage, are a consequence of its failure to address this context and the usual impossibility to fix and maintain a desired state from the earliest stages of the project

onwards. Finally, the third idea is that the ”holistic” view generates its recommendations based on what happens in fact, including project management variables as only one part of the criteria actually used when planning megaprojects.

The main contribution of this paper is the development of a summary of how both paradigms of success impose different planning and appraisal recommendations, and how adequate these recommendations are to the nature of the problem at hand. The conclusion of this line of reasoning is that megaprojects should be planned and appraised considering project management variables, but also accepting complexity and non-linearity, addressing the power of context and the influence of the participating stakeholders, reflecting the actual criteria used in the decision-making process.

6

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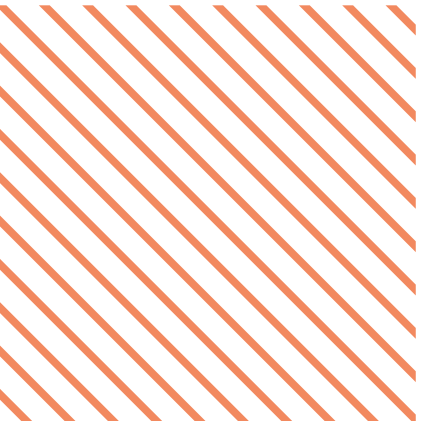

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