# Planning under Pluralism: Implications to Project Organization Design and Performance

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This study illuminates the design of the project-based organizations formed to plan capital-intensive systems and the impact of organizational architecture on performance. The research is grounded on four large infrastructure projects in the UK. We first use Design Structure Matrices to establish that planning is carried on by project organizations with a polycentric architecture. We show that in this pluralistic form of organizing, the project promoter has the authority to set performance targets, but shares the authority over the final planning choices with multiple autonomous actors. We also show that shared decision rights lead to multiple local disputes and pressure to relax the performance targets. Our main contribution is a conceptual framework that proposes four differing logics linking organization design and performance contingent on whether, first, the surrounding context provides an ‘umpire’ to referee disputes; and second, the promoter has slack resources to mask slippages in the performance targets from the eyes of third parties. We argue that the four logics reveal fundamentally different classes of managerial problems, and draw implications to practice and policy.

# Introduction

A long-standing puzzle in management and policy literature has sought to explain why empirical accounts repeatedly show that capital-intensive project organizations struggle to meet the initial performance targets. These accounts matter because announcements of performance targets that turn out way off the mark fuel a perception that the project organization has ‘failed’. This perception is rooted in deep-seated norms that posit ‘successful’ projects manage to avoid scope creep and achieve the goals on time and within budget (Cleland and King 1968, Dvir and Lechler 2004).

Extant theoretical explanations for recurring slippages in performance targets fall within two broad groups. One group blames the actor that promotes and finances the projects (the ‘promoter’) for regularly underestimating the performance targets. The explanations for the promoter’s behaviour range from cognitive optimism bias and strategic misrepresentation (Wachs 1989, Flyvbjerg et al. 2003) to lack of capabilities to realise the value of investing in planning and of letting suppliers’ input feed into the planning decisions (Morris 1994, Merrow et al. 1988, Stinchcombe and Heimer 1985). The second view is common too—that capital-intensive projects cannot be planned reliably, not because of agency and capability problems, but because of external events and vested interests that lie outside the promoter’s control. Hence, in the second view, the promoters are hostage to project pathologies including scope creep and collective inflationary consensus (**Hall 1972,** Shapiro and Lorenz 2000, Altshuler and Luberoff 2003, Miller and Lessard 2000, Gil and Tether 2011) and escalation of commitment to a losing course of action (**Szyliowicz and Goetz 1995,** Ross and Staw 1986).

Whilst critical, the debate on the performance of capital-intensive projects has been stuck for more than *twenty years* (Pinto and Winch 2016). Extant performance studies have employed large datasets by implicitly premising that capital-intensive projects are alike from an organization design perspective (Morris 1994, Miller and Lessard 2000, Flyvbjerg et al. 2003, Merrow et al. 1988). Specifically, this work assumes that project organizations are authority hierarchies led by a promoter vested with centralised control over the final planning choices. Building on this assumption, this work has confirmed empirical regularities on performance slippages. However, it has rarely allowed theorists the ability to ‘dive down’ into projects. As a result, as Pinto and Winch (2016) put it recently, ‘[planning] remains a ‘black box’.

In this study we propose to move forward the performance debate by examining the planning of capital-intensive projects from an organization design perspective. This cognitive lens focuses on establishing relationships between organisational structure and organizational performance (March and Simon 1958, March and Sutton 1997). Structure relates to the designed arrangements that enable and constrain collective action, this is, the arrangements that define roles and assign authority to make decisions on how to allocate resources and resolve disputes between organizational participants (March and Simon 1958, Lawrence and Lorsch 1967, Scott 1987).

Crucially, an organizational design lens challenges the premise that capital-intensive projects are planned by authority hierarchies legitimised by ownership stakes, contracts, and regulation. Admittedly, multiple accounts show that the promoters have power to unilaterally set performance targets at the onset of planning—in this regard, it is fair to say that promoters act as an authority hierarchy. But planning is way more than setting targets. During planning, the promoter has to forge a unifying system-goal with multiple autonomous actors so as to entice them to contribute resources under their control to the project (Lundrigan et al. 2015). As such, planning occurs *before* the promoter has ‘simulated’ an authority hierarchy through development agreements and buyer-supplier contracts (Stichcombe and Heimer 1985). Rather, planning occurs within a ‘pluralist’ setting in which the authority to make decisions is diffused (Denis et al. 2011). In pluralistic settings, a dominant coalition can rarely mobilize sufficient power to impose their perspective on others (Pettigrew 1973). Instead, major decisions require extensive communication between self-interested agents to resolve disputes rooted in cognitive differences, competing norms, and conflicting goals and interests (Jarzabkowski and Fenton 2006). Hence, major decisions under pluralism are inherently political and involve, perforce, a search for consensual solutions.

This understanding that disputes are endemic to the pluralistic planning stage of capital-intensive projects is instructive, but leaves outstanding the issue as to how the design of the project organization enables and constrains the search for consensus. We know that diffused authority creates management complexity. But complexity is not the same as chaos, and scholars of consensus-oriented collective action argue that managers intuitively design structures to attenuate the complexity of pluralistic settings (Ostrom 1990). We also know that relationships between organizational design and performance are contingent on context (March and Sutton 1997). This reasoning leads to our core questions: what is the design of a capital-intensive project organization in the planning stage? To which degree does this design change as the context varies? Finally, to what extent can we trace project performance to organizational design?

We address these questions through multiple-case research. This approach is useful to explore new ideas in comprehensive ways as it reveals the complexity in social settings and the longitudinal interconnections between events (Eisenhardt and Graebner 2007). Our sample consists of four large infrastructure projects in the UK. To vary the context, we examined three projects promoted by the central government (with differing degrees of regulation over the planning decisions), and one project promoted by a private firm. The sample also varies the architecture of the product that is being planned because organization design literature claims that managers intuitively leverage product design knowledge to design organizations that are less complex to manage (Baldwin and Clark 2000, Sosa et al. 2004, MacCormack et al. 2012).

Our study leads to two main conceptual contributions. First, it suggests that—irrespective of the project context and product design architecture—planning disputes emerge and are resolved within a ‘polycentric’ organizational design. Polycentric architectures are an intuitive approach to decompose large arenas of consensus-oriented collective action (Ostrom 1972, 1990). Polycentric designs decentralise authority across nested groups of decision-making power with capacity for mutual adaptation and local variation. In our settings, polycentric architectures give the promoter authority to set performance targets for the project as a whole and for system components. Nevertheless, the promoter must share authority over the final local planning choices with different groups of local actors. Our second contribution is to develop a framework that establishes a relationship between the organizational design of a capital–intensive project in planning and subsequent performance. This relationship is contingent on two administrative structures that can be deployed to resolve disputes: one relates to whether the environment imposes on the participants an ‘umpire’ to referee disputes; the second relates to whether the promoter has slack resources to mask slippages in the performance targets from the eyes of third parties.

We organize the rest of this paper as follows. First, we review our understanding about designing organizations in pluralistic settings. Next we describe the research design, sample, and methods. The analysis examines the polycentric architecture underlying project organizing, and variance in the structures deployed to resolve disputes. The discussion proposes four organizational design-performance logics. We conclude by addressing boundary conditions and implications to policy and practice.

# Designing Organizations in Pluralistic Settings

Pluralistic settings are characterized by the diffusion of decision-making authority. In these settings, decisions require lengthy discussion in order that the actors can understand complex issues and strike a consensus (Susskind and Cruikshank 1987, Thomson and Perry 2006). The risk of inaction is also high if the participants mistrust one another and keep disputing each other’s evidence—what Langley (1995) calls ‘paralysis by analysis’. Furthermore, diffused authority makes politics and bargaining essential to the decision-making process (Ring and Van de Ven 1992).

The management complexity endemic to pluralistic settings begs the question as to why an organization would deliberately want to become pluralistic. The answer to this question lies in the idea that co-opting environmental actors helps organizations to survive (March and Simon 1958). In other words, by bringing external actors inside the organizational boundaries and sharing rights to make decisions, the organization’s leader accepts a fundamental trade-off: less uncertainty in the environment comes at the expense of a loss in decision-making autonomy. This trade-off illuminates why promoters of capital-intensive projects open the decision-making process in planning to key stakeholders. For example, Gil and Tether’s (2012) account of the design of Heathrow Airport Terminal 5 shows how the airport owner involved the airlines in critical planning decisions. Likewise, consensus building is also central to Pitsis et al. (2003)’s account of the development of infrastructure for the Sydney Olympic Games.

However, the decision to co-opt multiple actors in the project planning stage creates a complex management problem. First, the promoter cannot simulate a hierarchical authority vested in ownership stakes, regulation, and contracts because the co-opted actors are autonomous (Rittel and Weber 1973). Second, because the co-opted actors are drawn from different communities of practice, it is difficult to build a ‘meritocracy-based’ authority to resolve disputes (O’Mahoney and Ferraro 2007). Third, diffused authority makes it hard to use dominant coalitions to enforce individual preferences (Pettigrew 1973). And fourth, the promoter cannot modularise the organization to sidestep difficulties in building consensus. Modularity enables independent actors unified by a goal to make individual choices with limited need to interact with one another (Baldwin and Clark 2000). But capital-intensive projects produce *one-off* assets that impact multiple autonomous actors. Hence, multiple actors with rivalrous preferences will claim rights to directly influence the planning decisions – this is, capital-intensive planning choices are ‘indivisible’ (Gil and Baldwin 2013).

These circumstances leave the project promoter with a complex management problem—as Rittel and Webber (1973: p. 160) put it, ‘the plurality of objectives held by pluralities of politics makes it impossible to pursue unitary aims’. However, although pluralistic settings are so complex that they resemble ‘organised anarchies’ (Cohen et al. 1972), theorists in collective action claim that managers intuitively design structures to attenuate this complexity (Ostrom 1990, 2010, Dietz et al. 2003). One way to do so is by creating polycentric organizations; that is, by decentralising authority across nested centres of decision-making. Polycentric designs have been observed in settings as diverse as water resources management in California and police forces in Indiana (Ostrom 1990). The idea resonates with the notion in organization literature that complexity can be reduced by grouping the participants on the basis of either similarity or complementarity of knowledge (March and Simon 1958, Thompson 1967, Nadler and Tushman 1988, Galbraith 1973). However, lack of in-depth studies limits our knowledge of how these ideas extend into capital-intensive projects.

Related to this issue, we also know little about how the project promoter can manipulate the design of the capital-intensive project organization in planning to cope with the high levels of interdependency with the environment. Planning decisions are contentious because they allocate resources in ways that are hard to reverse and impact the property rights of many actors. Since not all environmental actors impacted by the decisions can be co-opted, planning decisions are scrutinised by numerous third parties including the public, press, regulators, and spending watchdogs. This interdependence puts pressure on the promoter to ‘lock in’ early on performance targets. Early commitments reduce ambiguity in the cost-benefit analysis and give the promoter a kind of ‘pseudo-legitimacy’ to acquire the resources necessary to achieve the goal (Stone and Brush 1996). However, bounded rationality makes it hard for the promoter to set targets that can accurately predict the outcomes of the ensuing searches for consensus. Furthermore, were the promoter to set overly conservative targets, planning could collapse because the project idea would be neither convincing nor compelling. As a result, the chances are real (and examples are innumerable) that the promoter will underestimate the initial targets. Difficulties to build consensus will make it tempting to relax those targets to increase the solution space, but any slippage in the targets risks eroding the promoter’s legitimacy to ask for more resources (Denis et al. 2011).

We turn now to discuss how we set off to investigate how managers manipulate the project organization architecture to balance the needs to co-opt resource-rich actors with the pressure to limit the amount of concessions and keep the project on target.

# RESEARCH DESIGN, SAMPLE, AND METHODS

This study adopts a multiple-case research design with embedded units of analysis (Eisenhardt 1989, Yin 1984). Case studies allow researchers to incorporate contextual and temporal dimensions, and thus are suitable to explore novel ideas (Eisenhardt and Graebner 2007). **To advance theory** and yield generalizable and robust insights we built a diverse sample (Siggelkow 2007). The sample consists of four large infrastructure projects in the UK**, and our holistic question asks: can we trace project performance back to the design of the project organization in the planning stage?** The sample includes four cases for which we gained exceptional access to the project leaders: i) London Crossrail, a high-capacity railway; ii) London Olympic park; iii) Heathrow Airport Terminal 2 (T2); and iv) UK second high-speed railway (HS2). Table 1 summarises for each case the system goal, the actors promoting the project, the outcome of the planning effort, and data sources; Appendix I summarises the project timescale, prior history, context, and evolution of the performance targets over time.

--**Insert here Table 1 --**

We built this sample to increase the generalizability of our insights. First, the cases differ in the architecture of the product under planning (Figure 1 illustrates this point in a stylised way). An Olympic Park suggests a decomposable system. It comprises a set of sport venues connected by underground utilities. But the utilities are ‘slaves,’ designed not to constrain planning choices for the high-value assets. In contrast, railways are much less decomposable. All stations connect to the same track and control systems, and must accommodate the same train cars. In turn, an airport is suggestive of a hybrid system—some components are physically linked, for example, the tunnels that connect the concourses, but other components (e.g., car park, hotel, etc.) are not. We know managers intuitively seek to reduce management complexity by aligning organizational architecture with the architecture of the products that the organization produces (Sosa et al. 2004, Colfer and Baldwin 2016). But we were unclear if this logic could extend to the planning stage of capital-intensive projects.

--**Insert Figure 1 about here --**

Our sample also varies in the project context. The T2 project was promoted by BAA[[1]](#footnote-1), the regulated private owner of Heathrow Airport. In contrast, the other schemes were financed by central government acting alone (Olympic Park, HS2) or in a coalition with a public agency (Crossrail). A project promoted by a firm which already owns the necessary land is less interdependent with the environment than one financed by the tax-payers that requires compulsory land acquisitions. We thus expected to find less tension between the need to share decision rights and announce performance targets in the T2 case than in the public cases. And yet, we were not sure if this logic would hold since any regulated firm is a pluralistic setting. Furthermore, large budget contingencies in the public projects could make it less difficult to resolve disputes. Within the sample of public projects, the context also varies the degree of regulation over the planning decisions. In the Crossrail and HS2 cases, planning decisions had to be approved by the UK Parliament. In contrast, the promoter had autonomy to make planning decisions for the Olympic park. Still, all public projects were led by politicians, and thus we were unclear about the actual impact of regulatory variance.

## ***Units of Analysis***

Multiple-case studies that embed a unit of analysis are useful to investigate a holistic question without overlooking operational details (Yin 1984). Accordingly, our units of analysis were planning disputes. Disputes are situations in which actors disagree and thus illuminate the conflict process and how people resolve conflict (Coleman and Ferguson 2014). In this study, the analysis of disputes was important to explore, first, how decision rights were shared; and second, how differing product architectures and contexts could impact on the design of the project organization and performance. However, it was not our focus to probe into the negotiation processes themselves. We agree that researching connections between organizational design and informal social networks is critical to further our understanding of organizational performance (Van de Ven et al.2013). We also agree that dispute resolution hinges on the interplay between formal and informal mechanisms. But we argue that we cannot further our understanding of this interplay in capital-intensive projects unless we first understand better the design of these organizations, and this is the focus of our study.

## ***Data Collection***

**Data collection was part of a broad research program looking at capital-intensive projects from an organization design perspective. In 2011, we first gained access to the top managers of the Olympic Delivery Authority (ODA), the public agency established in 2005 to develop the Olympic park. This agency reported to the four promoters, but had no power of veto over planning decisions. Between 2011 and 2014, we leveraged our access to top managers within the ODA to, first, independently access top managers of other stakeholders directly involved in the planning for the Olympic park; and second, acquire similar levels of access to participants in the other three cases.**

**Data collection involved interviews and analysis of archival documents. We arranged the interviews by adopting a snowball approach (Biernacki and Waldorf 1981). Hence, for each case, once we identified salient disputes with the help of the initial respondents, we asked for names of other people who had intimate knowledge of the disputes. In total, we conducted and tape-recorded 123 interviews, each up to 2 hours long. Follow-up interviews were conducted to probe deeper into particular issues, double check a verbal account, and bridge gaps in the database.** **We were not asked to sign non-disclosure agreements for interview data, but always first sought permission to use verbatim quotes and offered to keep the source anonymous; some respondents gave us free rein to use the transcripts, whereas others disallowed the use of particular quotes. We formally committed not to share any reports that were not in the public domain.** To gather extra data and allow for member checks (Lincoln and Guba 1985), we shared the emerging findings with the respondents. We also invited 13 respondents to give presentations and stay for lunch. For each visit, we produced hand-recorded verbatim notes of the talks and of the informal conversations at lunch time.

To improve data accuracy and the robustness of the insights (Jick 1979), we triangulated the verbal accounts against archival data (Miles and Huberman 1994). The planning stage of a large infrastructure project in the UK is highly regulated. In public projects, many documents are uploaded online because the promoter either elects or is mandated to do so under the Freedom of Information Act. Key documents included minutes of board meetings, letters exchanged between the promoter and development partners, and reports announcing performance targets and corresponding plans. In the case of BAA, we studied capital programs, master plans, and consultation documents. The disputes between BAA and the main user of T2, Star Alliance (which included over twenty airlines), were documented in reports produced by the regulator and in exchanges between BAA, STAR, and the regulator. The inclusion of the HS2 case was important because planning for this project unfolded concurrently with data collection and analysis, which further limited the risk of account bias and created added opportunity to test the emerging insights (Denis et al. 2011, Miles and Huberman 1994). For all cases, we crosschecked information in the project documents against third-party reports. Hence, we combed through reports produced by the National Audits Office, Parliamentary committees, spending watchdogs, and other public agencies. Other sources of archival data were articles and interviews with top managers in professional outlets, e.g., *New Civil Engineering*, *Construction News*, and articles in the mainstream press, particularly for disputes that had fallen in the public domain.

## ***Methods***

Following recommendations for inductive reasoning (**Langley 1999,** Ketokivi and Mantere 2010) we produced detailed accounts for each case. Each account provides a contextualised and chronologic understanding to guard against account bias. We then used Design Structure Matrices (DSMs) to model the planning problem. The DSM is a modelling tool from design theory suitable to represent complex systems (Steward 1981, Eppinger et al. 1994, Eppinger and Browning 2012). Specifically, DSMs enable researchers to represent a complex system into a square matrix by capturing the interdependencies between its constituent elements. DSMs have been used to illuminate the designs of organizations and of the products which the organizations produce and have enabled researchers to establish relationships between organizational design and performance (Sosa et al. 2004, MacCormack et al. 2012, Colfer and Baldwin 2016). The use of the DSM methodology was thus appropriate to explore relationships between the organizational architecture of capital-intensive projects and performance as we controlled for different product architectures and contexts.

Extraordinarily, DSMs have rarely been used to model the structure of a planning problem, and thus we had to develop an original protocol. Our aim was not, however, to exhaustively model the planning problem. Rather we sought to explore: i) whether changes in the architecture of the planning problem and/or in the context impacted the architecture of the project organization; and ii) the relationship between organisational architecture and performance. To build the DSMs, we used data on planning disputes for major components such as a sport venue or a railway station. Our database consists of 35 disputes which the respondents told us to illustrate well the focal planning problems. We then modelled the planning problem by capturing the interdependencies between five constituent elements of planning choices: i) local goal (affects interests); ii) cost forecast (affects budget); iii) capacity (affects viability in use); iv) footprint (affects land acquisition); and v) any controversial sub-element. In addition, we also sought to establish which actors shared decisions rights to directly influence which constituent elements of the planning choices. Hence, for each DSM, we produced a companion matrix that reveals the membership of the decision-making forums.

The DSM analysis revealed a critical regularity: the creation of project-based polycentric organizations across *all* cases. Furthermore, the DSM analysis revealed variance in the extent to which an umpire, external to the project organization, was employed to settle disputes that the disputants alone failed to resolve. The DSM analysis per se could not, however, reveal the impact of the disputes on performance targets. As we sifted through the data to investigate this issue, we uncovered a second source of variance—the amount and use of contingency funds by the promoter to attenuate the public impact of cost overruns. This variance mattered because it radically altered the interdependency between the project organization and the environment. As we iterated between the findings and theory development (Miles and Huberman 1994), a contingency relationship between organizational design and performance emerged. We stopped iterating when we reached theoretical saturation.

# ANALYSIS

We organise the analysis by first showing how the DSM analysis systematically revealed a distribution of decision rights characteristic of polycentric architectures. We then examine variance in the structures surrounding dispute resolution and performance implications.

## ***The Polycentric Architecture of the Project Organization in the Planning Stage***

We have previously noted that a polycentric architecture is an intuitive design approach to attenuate the complexity of managing a pluralistic setting (Ostrom 2010). The basic logic consists of decomposing the organization into a nested structure of decision-making groups with restricted authority. Within this architecture, the high-level authorities retain centralised control over system-wide choices, but share decision rights over local choices with different groups of local actors. As local disputes emerge, the authorities may have, de jure, power to enforce their own preferences. But to avoid a political backlash, the authorities prefer instead to search for consensual solutions until they run out of time. Our analysis confirms this logic by revealing a polycentric architecture across all cases. Table 2 illustrates the protocol that we used to interrogate the database of local disputes and construct the matrices. Figure 2 illustrates the analysis with excerpts of the DSMs and corresponding organizational matrices. The cells along the diagonal of the DSMs represent local planning decisions (the decisions are listed to the left of the rows) and the off-diagonal entries indicate interdependency between the decisions. For example, if the DSM has an entry in row i, column j, the decision concerning element i has an impact on the decision concerning element j. Hence, the decisions represented in the diagonal cells have inputs entering from the top and bottom decisions, and outputs leaving from the left and right sides.

<Insert Table 2 and Figure 2 here>

A first point to note is the regularity of the architecture of the planning problem: invariably, all DSMs show densely populated clusters of off-diagonals ‘x’. Each cluster reflects the reciprocal interdependencies among the constituent elements of the planning choices for a component. For example, one component illustrated in Table 2 and Figure 2 is the Olympic Aquatics Centre. The decision to set its local goal as a ‘massive iconic venue’ is an input for decisions on cost, footprint, and capacity; these decisions, in turn, are inputs to refine the goal. For example, the local goal needs readjustment if: i) the cost is unaffordable; ii) there is not enough land; or iii) a massive venue is unviable for use. As the goal gets readjusted, the other local decisions may need to change too. One level down, a controversial decision to add a ‘stylistic’ diving board is interdependent only with the decisions to set the local goal and cost forecast.

The four DSMs differ substantially, however, in the degree of interdependency between the off-diagonal component clusters. For example, the Olympic Park DSM is sparsely populated off the component clusters. This result reflects the technological independency between sport venues, and thus the modular architecture of the Olympic park. The exception is the interdependency between different local cost decisions since increasing the cost for one venue potentially leaves less money to invest in the other venues. In marked contrast, the Crossrail and HS2 DSMs show high interdependency between the component clusters due to the integral architecture of the railway systems. For example, in the case of the HS2 DSM, the local goals for each station are interdependent—the goals need to be analogous to respect equitability of investment across cities. Technological constraints, in turn, create interdependency between the local decisions on station capacity and footprint, while budgetary constraints create interdependency across all local cost decisions. Hence, the railway DSMs are densely populated off the component clusters. In turn, the DSM for T2 suggests a planning problem with a hybrid architecture: on the one hand, the cluster of planning decisions for the car park is, apart from cost interdependencies, independent from the concourse and baggage system clusters. The two latter components are physically connected, however, and thus the decisions on goal, capacity, and footprint are interdependent.

Critically, our analysis uncovered much less variability across the organizational matrices that show which actors have decision rights over which local decisions (represented at the right of the four DSMs in Figure 2). At the highest level, all four matrices show a top governing body whose membership is restricted to the actors promoting the project. The promoter (in coalition or individually) and its agent are embedded in all decisions since they are financing the project and accountable for performance. For example, in the HS2 case, the UK government and its agent, HS2 Ltd., directly influenced all local planning decisions. Likewise, in the Olympic Park case, the four promoters and their agent, the Olympic Delivery Authority (ODA), shared decision rights over all the local planning decisions through the Olympic board. One level down, and consistent with a polycentric architecture, the organizational matrices show a fragmented structure of working groups—so-called ‘project boards’. The project board members—local resource-rich actors and the promoter’s agent—share decision rights over planning choices. But the project boards are closed to opponents and resource-poor actors (although consultation reaches all affected parties).

Table 2 and Figure 2 also show how the influence of the local actors is restricted to specific components. For example, the UK government and its agent, HS2 Ltd, share decision rights for the HS2 Euston Station plans with the London government, Transport for London (a local transport agency), and Camden Council (local regulator of land use); as one respondent said, “you could make HS2 Ltd its own planning authority [but] that would flout democratic processes.” Similarly, the UK government shares decision rights on the plan for the Manchester station with the Manchester government, the Transport for Greater Manchester, and other local actors. Moreover, the London actors do not participate in the Manchester planning talks and vice-versa. Likewise, in the Olympic Park case, for each sport venue, a different group of sport bodies and other local actors directly shared decision rights with the promoter.

In sum, our DSM analysis establishes the following insights. First, we consistently found a degree of decomposability of the planning problem. As expected, this decomposability is high for modular systems like an Olympic park, but low for integral systems like a railway. Second, we found no evidence of strict modular planning problems because of the interdependencies between local cost forecasts. Third, we uncovered a polycentric architecture irrespective of the product architecture or project context. In this organizational design, the promoter and its agent have decision-making authority over *all* planning decisions; they can also unilaterally set performance targets. But for each set of local planning decisions, the promoter needs to build consensus with a group of local actors whose decision rights are restricted to that local planning problem. We turn now to examine how this underlying architecture allows for variance in the administrative structures surrounding consensus building.

## *Structural Variance within a Polycentric Project-based Organization*

As aforementioned, within a polycentric architecture, the promoter can set performance targets unilaterally but the final local choices hinge on building consensus. Searching for consensus within a solution space constrained by targets set ex-ante leads to multiple disputes. Crucially, our analysis reveals important variance in the structures that surround dispute resolution along two dimensions. The first relates to the extent to which the laws in the environment include provision of an ‘umpire’—this is an actor external to the project organization with a mandate to referee disputes as an alternative to public courts.[[2]](#footnote-2) This umpire was in evidence in the HS2 and Crossrail DSMs, but not in the Olympic Park and T2 DSMs. The second dimension relates the amount of slack resources the promoter can deploy to mask overruns from the public eye. We observed substantive slack in the public projects, but limited slack in the private project. We turn now to analyse how variance along these dimensions affects the relationship between polycentric organizing and project performance. Table 3 shows an excerpt of our database for six disputes, and illustrates the analysis.

*<insert Table 3 about here>*

*Variance in the use of an ‘umpire’ to resolve local disputes*

Our findings reveal substantive variance on the extent to which an umpire to arbitrate between contending parties was institutionalised in the environment. In the Crossrail and HS2 cases the UK Parliament was instructed by law to set up a committee to regulate land use. Hence, any actor who was ‘materially affected’ by the promoter’s plans could lodge a petition in Parliament and defer dispute resolution to that committee. The dispute about the HS2 London Euston station (Table 3, #1) is telling. From the onset of the planning talks in 2010, HS2 Ltd said the UK government preferred a utilitarian, modular station to keep the costs down. On the other hand, the local actors argued that the existing station, which had not been modernized for 50 years, needed to be fully redeveloped. To persuade the government to increase the project scope, the affected local parties commissioned masterplans in support of their vision. However, under pressure to keep to the original performance targets, HS2 Ltd refused to cave in. It was then up to the Ministers in the Cabinet[[3]](#footnote-3), a level above, to decide what to do next, as one top official in HS2 Ltd explained:

HS2 Ltd, if you like, are the infantry out there; actually doing what they’re told by [central] government. So HS2 Ltd get all the fights, appear to have all the fights, are the bad boys, but they’re really only doing what they’re instructed to do.

Consistent with polycentric organizing, our findings on the Euston station dispute show that the local decision rights were *de facto* shared. The UK government may have had *de jure* power to impose its preferences but rather than forcing the issue, they opted to negotiate. After three years of planning talks, the scope and cost increased commensurately. Still, a number of issues remained outstanding and dispute resolution was deferred to Parliament; as one local official said, “HS2 Ltd. didn’t persuade us that our points were wrong nor did they persuade us their points were right.…[petitioning] is ultimately about making your case that your vision is superior.” The Parliamentary committee was impartial, but also inefficient. It consisted of elected lawmakers who needed significant time to listen to all the arguments before making a judgement. In the Euston case, the Parliamentary debates lasted three years until a consensual solution emerged that further inflated the scope and cost. The Woolwich station dispute (Table 3, #2) shows a similar pattern—linking efforts to build consensus with performance slippages. In this case, after three years of talks, the promoter refused to add this station to the project scope to keep the costs down and avoid establishing precedence. Petitioning thus gave local actors a chance to overturn what in their view was a flawed decision. After 40 months of hearing evidence, Parliament ruled that the station should be built, and that the petitioners should partially finance the extra costs (over £250m[[4]](#footnote-4)).

In marked contrast, we did not encounter evidence of external umpires settling disputes in the T2 and Olympics cases. In the T2 case, for example, the more concessions on project scope the airlines asked BAA to make, the more BAA asked to increase the levies, leading to disputes (‘we’re battling all the time’, said one BAA respondent). Our findings also show that BAA and STAR were both happy to ask the regulator to mediate disputes. However, since it was within the mandate of the airport economic regulator to cap the levies requested by BAA, the regulator was not ‘third party’ to the project organization. Furthermore, the regulator lacked the power to settle disputes. One example is the dispute about the main concourse (Table 3, #3). The airlines desired a modern campus, whereas BAA planned to simply replace old facilities (in part to avoid umpiring by public inquiry). Consistent with its preferences, BAA announced a modestly-budgeted £700m new concourse to open in 2012. STAR then wrote several letters to the regulator complaining that BAA was ignoring their needs, a claim that BAA found unfair—‘I can never get consensus on almost anything’, said a BAA director. In the end, BAA agreed to safeguard the airlines’ vision, but demanded an increase in the airport levies. The regulator facilitated the negotiations by postponing the deadline to complete the talks. A level below, BAA and STAR recruited a retired director to arbitrate privately minor disputes. In the gate dispute (Table 3, #4), for example, the airlines preferred ‘closed’ gates which they deemed more efficient, whereas BAA favoured ‘open’ gates so passengers could move around up to boarding. To resolve the differences, the arbitrator suggested building ‘flexible’ gates, an idea which added £5 million to the cost forecast.

The Olympics case provides another example of a project context where the decision rights were shared but the participants were left to their own devices to settle the disputes. In this case, because of the rigid deadline, Parliament rushed to give planning powers to the ODA, the promoter’s agent, right after the UK won the bid. Still, mindful that unilateral decisions could cause a political backlash, the ODA appointed a ‘design sponsor’ for each project board, and gave them a mandate to search for consensual designs. The Olympics aquatics centre (Table 3, #5) offers a good example of how the planning talks led to substantive performance slippages. The promoter had pledged a massive venue designed by a famous architect but as the cost forecast started to climb the goal became unviable. However, backing down from the public pledge was tricky—as one official said, ‘if you challenge them [the architect] they will just walk away’. Complicating matters was a constraint imposed by the International Olympic Committee on the minimum capacity of the venue and individual preferences of the local government, the future operator of the asset. Unable to defer dispute resolution to an umpire, the parties resolved the issues by keeping the aesthetics, shrinking the venue size, and safeguarding a capacity increase just for the games. This solution doubled the cost forecast, however, and a public outcry ensued—‘they seem to be willing to spend money like water’, said a watchdog[[5]](#footnote-5). Even more complex was agreeing a plan for the Olympic stadium (Table 3, #6). In this case, two claimants to the planning choices – the London Mayor and professional football clubs – opposed the initial bid pledge to fold the stadium into an athletics venue after the games. After two years of failed talks, the ODA suggested increasing the budget by 20% (~£100m) to build retractable seating and thus allow for dual use. Unmoved, football aficionados ruled out what they called a ‘jack-of-all-trades’ design. With time running out, the Olympic board went ahead with an unresolved design for the 2012 Games that increased the cost by some fifty percent. Still, the tussles between the disputants dragged on until 2014 when the dual-use idea was finally accepted by all the participants. By 2016, the conversion cost had reached £323m, more than doubling the initial cost forecast for the stadium.

In sum, resolving local disputes consistently required throwing more resources (money, time) into the pot. This finding resonates with claims in the projects literature that promoters regularly underestimate the initial performance targets, leading to huge budgetary increases downstream. Crucially, these results show that performance slippages are often rooted in local searches for consensus and since the performance targets are set by the promoter, it is tempting to blame the slippages on the promoter. We turn now to discuss differences in the administrative structures that the promoter itself can deploy to mitigate this risk, and the impact on project performance.

## *Variance in the Use of Slack Resources to Mask Performance Slippages*

A second major source of structural variance surrounding the local disputes related to the amount of slack made available to resolve the disputes. We focused our analysis on the contingency funds because they enable the promoter to internalise the extra cost of local concessions and thus sustain a public narrative that the project is ‘on target’. In the sampled public projects, UK Treasury policy recommended promoters to set aside a substantial percentage of the initial cost forecast into a contingency fund to neutralise optimism bias[[6]](#footnote-6). The elected leaders adhered to this policy unreservedly since they also had no appetite to let the budget envelope (cost forecast plus contingency) publicallyslip multiple times. As one civil servant explained: ‘There’s a bandwidth there…if we push it [budget] too far we won’t get the project...so there’s that game that goes on to try and find what the [UK] Treasury’s real limits are…it’s a political decision.”

The Olympic Park case is a good example of this phenomenon at work. The bid cost forecast (~£4.9bn[[7]](#footnote-7)) turned out to be insufficient to meet the bid pledges and the multiple local disputes that were likely to ensue—‘it’s like the Olympics will solve all the world’s problems’, said one official. To get a grip on a chaotic situation, in late 2005, the promoter set a 2-4-1 target: two years to plan, four to build, and one to test. However, by mid-2006, numerous local disputes remained unresolved and facing an immovable deadline, the promoter chose to set aside a large contingency (£2.0bn) on top of what was by then a much higher cost forecast (~£6.1bn); one official said:

Treasury were really, really clear...big envelope and never knock on our door for money…actually they were right…we were then able to make decisions…rather than being petrified because we didn’t have enough money to do what we needed to do.

Appendix A shows a similar pattern for HS2 and Crossrail. In both cases, the promoters faced a public outcry at the planning onset related to cost slippages. To mitigate the risks of further overruns the promoters set large contingencies. The use of the contingency funds was scrutinised by watchdogs to reduce moral hazard—‘[contingencies] are there for known risks, not for somebody’s betterment’, said one official. But similarly to London 2012, both Crossrail (NAO 2014) and HS2 (Butcher 2015) depleted their contingencies; still, in the public discourse, all projects were ‘on target’. In marked contrast, in the privately-financed T2, this procedure was ruled out. First, BAA seemed confident on its ability to parry any backlash caused by cost slippages since there was less public scrutiny. And second, since BAA had a guaranteed return on capital investment, the airlines and regulator were against large contingencies to keep the construction costs down. As a result, the T2 planning unfolded with a single-digit contingency which was insufficient to mask cost overruns.

In sum our cross-case analysis reveals two consistent dynamics: i) project organizations are polycentric to make pluralism more manageable; and ii) slippages in performance targets are necessary to resolve local disputes endemic to the polycentric architectures. Within this broad relationship between organization design and performance, we observe within-set variance; first, whether or not an umpire exists to referee disputes; and second, the amount of slack the promoter can deploy to resolve disputes. The juxtaposition of structural variance along these two dimensions creates fundamentally different classes of managerial problems. We turn now to discuss how these insights further our understanding of capital-intensive project organizations.

1. **DISCUSSION**

We noted at the outset that the debate on the performance of capital-intensive projects has been stuck for some two decades: one explanation traces performance slippages to competence and agency problems with the promoter; the other traces them to external causes. Underlying both views is the assumption that project organizations are authority hierarchies. Here, we sought to move the debate forward by probing deeper into this complex form of organizing work.

By employing Design Structure Matrices (DSM) we established that capital-intensive project organizations have a polycentric architecture at the planning stage—a finding consistent with predictions of theorists in consensus-oriented collective action (Ostrom 1972, Ostrom 2010). Specifically we show that decision rights over planning choice are decentralised within a nested structure of local groups. Decision rights determine organizational boundaries—as Pfeffer and Salancik (1978: 32) argue, an organization ends where its discretion ends and another’s begins. Hence, resource-rich actors awarded decision rights are *de facto* members of the project organization; and yet, these actors maintain autonomy from the promoter until a development agreement is forged. This makes the project organization pluralistic, but not wholly flat. Our analysis shows that the promoter has authority to unilaterally set performance targets and constrain the solution spaces at the onset of planning. This conceptualization of project organizations is crucial to further our understanding of their performance.

It is first important to note that a polycentric architecture is advantageous in enabling the promoter to achieve the system-goal. If the promoter withholds decision rights, the affected actors are less willing to volunteer their own resources. Hence, by co-opting local actors and designing a ‘negotiated environment’ (Cyert and March 1963), the promoter creates conditions for the project organization to survive. For example, in the Crossrail and HS2 cases, local governments would be much less likely to volunteer time, effort, and money it they felt the UK government was paying lip service to shared decision-making. Second, a polycentric architecture gives the promoter authority to set budgets and deadlines. These numeric targets are necessary to fill the strategic void created by the ambiguity that is endemic to pluralistic settings (Denis et al. 2001,2006, Stone and Brush 1996). For example, it is hard to conceive how the Olympics project could forge ahead without a commitment on a preliminary budget for bidding purposes. Third, a polycentric architecture attenuates management complexity by leveraging knowledge of the product architecture to decompose the project organization, a finding in agreement with design theory (MacCormack et al. 2012, Colfer and Baldwin 2016). In a polycentric design, participation in each inner centre of shared decision-making power is restricted to the actors directly affected by a system component. By aligning organizational and product architectures, a polycentric design reduces the size and heterogeneity of the local groups, attenuating the complexity of the local searches for consensual solutions (Cemerer and Knez 1996, Heath and Staudenmayer 2000). Finally, by negating the potential for promoter dominance in local choice, a polycentric design allows for ambiguous projections of future resource allocation. This ambiguity creates space for conflicting goals and helps avoid defections of organizational members (Jarzabkowski and Fenton 2006, Denis et al 2001). Indeed, our findings suggest that the announcement of targets consistently enabled the promoters to gain momentum to forge ahead with their plans, but the ensuing slippages in the targets were critical to sustain support for the evolving plans.

The main disadvantage of a polycentric architecture lies in its inadequacy for meeting normative expectations in keeping the project on target. A polycentric design offers choice to local actors within a constrained solution space. However, because self-interest encourages the participants in joint searches to try to optimize solutions (Knudsen and Levinthal 2007), local actors will demand concessions; as March and Simon (1993 p.312) put it, ‘we create our wants, in part, by experiencing our choices’. Planning discussions thus put pressure on the promoter to relax the targets, a pressure exacerbated by the irreversible nature of long-lived planning choices, which makes it harder for people to give ground when seeking a compromise (Gil and Tether 2011). Ironically, the promoter often lacks autonomy to relax those targets because the targets create interdependency with the environment. In other words, a polycentric design leaves the promoter in a Catch-22: if it governs by diktat, it alienates the local actors; if it abandons the targets, the project ‘fails’. For example, the reputation of the Olympics project was impaired after the bid budget was dropped; likewise, the HS2 reputation was marred after the promoter raised the budget ceiling to increase the slack. At the extreme, a polycentric design creates a risk of planning talks unravelling. The history of our cases is telling: two failed attempts to promote Crossrail, three failed attempts to host the Olympics; and a Heathrow Airport terminal awaiting replacement for 20 years. This evidence is consistent with agent-based simulations that show decentralized searches of solutions for interdependent problems can bog down (Mihm et al. 2010).

The consistent existence of polycentric architectures across our diversified sample suggests capital-intensive projects are a ‘population of organizations’ (Hannah and Freeman 1989) that share a common design and face similar vulnerabilities. But our analysis also suggests that different contexts create fundamentally different managerial problems within this form of organizing; these divergent contexts invalidate indiscriminate comparisons. We discuss next a framework that establishes logic between organization design and performance contingent on contextual structures.

*A Framework of Capital-intensive Project Organization and Performance*

Our analysis reveals substantive difference in two key administrative structures deployed to resolve the local disputes endemic to polycentric architectures. Alternative permutations inform a contingency framework linking organization design to performance. Figure 3 illustrates our main contentions. On the horizontal axis, we differentiate contexts with/without external umpiring. On the vertical axis, we show internal availability of slack; whilst slack is a continuous dimension, for the sake of the argument we assess its availability categorically as either “limited” or “substantial.”

*<Insert Figure 3 about here>*

*Understanding the Role of Umpiring*

The umpire is a structure external to the project organization, and institutionalised in the environment for giving authoritative judgement over disputes internal to the project. In other words, the umpire acts as a safeguard against the risk of self-interested actors failing to achieve a common interest (Olson 1965). Importantly, the umpire is different from private arbitration (Heine and Kerk 2017). Private arbitrators are members of the organization tasked to leverage their latitude in decision making and observability power to reward disputants with a greater share of the surplus of the joined activity (Lumineau and Oxley 2012). As such, private arbitrators are third party to the dispute, but not third party to the organization. In contrast, umpires are similar to a public court and thus operate under strict procedural rules but lack expert knowledge.

The main benefit of an umpire is to avoid hold-ups by individual parties. This referee cannot be co-opted, has no property rights, and is impartial. This dispute resolution structure is arguably more efficient than a public court, and successfully prevented local disputes from evolving into legal action in the Crossrail and HS2 cases. However, because the lawmakers lacked knowledge and time, they took years to assimilate the arguments. Notwithstanding the risk of overruns, the disputants (who rarely opposed the system goal) systematically deferred the disputes to the umpire, creating a major source of uncertainty. Hence, the presence of an umpire creates a negative precondition for the interacting parties to cooperate, an insight in agreement with collection action literature (Frey 1994, Ostrom 1990). The late intervention of the umpire also repeatedly led to significant cost overruns and delays. Umpires thus are effective to adjudicate disagreements, but exacerbate the interdependency of the project organization with the environment by offering disputants a last-resort, delaying mechanism that makes it harder to meet normative expectations of performance. Knowing this, and recognizing that time was not a luxury that the project participants possessed, Parliament chose to get out of the way for the Olympic Park project. This suggests the presence of an umpire fundamentally changes the management problem.

*Understanding the Role of Slack Resources*

Unlike umpires, slack resources such as contingency funds are controlled by the promoter and thus are an administrative structure internal to the project organization. The main advantage of slack resources is that they help disputants reconcile their interests without having to resolve the problem, what Cyert and March (1963) call ‘quasi-resolution’ of disputes. However, literature on slack is also in agreement that there is a real risk of slack encouraging inefficient behaviour (see Dolmans et al. 2014 for a recent review). It is outside the scope of this study to resolve this trade-off in the context of capital-intensive project organizations. Our point here is to show that the amount of slack available also fundamentally changes the management problem.

In our setting, public policy pragmatically encouraged promoters to establish large contingency funds to accommodate cost hikes over time. In all public projects the promoter took advantage of the policy, and set conservative budgets; our analysis also shows that over time the contingency funds were depleted to finance local concessions. This pattern merits two observations. On the one hand, by masking cost hikes, slack enables the promoter to claim publicly that the projects are on ‘target’. Clearly, “no project is an island” (Engwall 2003) and slack by itself cannot fully decouple the project from the environment. Still, if slack is substantive, it provides the promoter with the ability to make numerous concessions to the co-opted actors without violating the norms used by third parties to evaluate project performance. This circumstance reduces the interdependency between the project organization and the environment, which in turn reduces management complexity.

On the other hand, the fact that cost forecasts invariably grew asymptotically to the budget envelope resonates with the notion of self-fulfilling prophecy – the idea that people’s behaviour, influenced by false expectations, causes those expectations to come true (Merton 1968). Self-fulling prophecies occur when public definitions of a situation become an integral part of the situation, and thus affect subsequent developments. In our case, public policy differentiates ‘cost’ and ‘budget’, but the two words are frequently used interchangeably in lay discourse. Our data is insufficient to determine whether eventual policy misconceptions either made the promoter more willing to concede and/or made it easier for others to force the promoter’s hand. However, our analysis does suggest that slack amplifies the risk of scope creep and corresponding cost escalation up to the threshold set by the slack that is available.

Knowing this, BAA management and the airlines fought against the use of excessive slack, denouncing the government’s use of, in their view, ‘over-egged budgets’. Interestingly, our evidence shows the subsequent cost overruns in T2 were much more moderate relative to the three public projects. However, T2 cannot be compared with the Crossrail or HS2 projects because there were no umpires in the context. This restricts our comparison to T2 and the Olympic Park projects. Like T2, the Olympics Park project had no umpire but unlike T2, the Olympic promoter built in substantive slack. The fact that the Olympics contingency fund was ultimately depleted again suggests a pattern in agreement with a self-fulfilling prophecy. It thus seems fair to say that limited slack makes disputants more accountable for the outcomes of collective searches for consensual solutions. Significantly, our sample does not include a case that conflates umpiring and limited slack [top right quadrant]. This situation is discouraged by UK policy, a point that we return to in the last section.

In sum our framework suggests that scope creep and overruns are rooted in local disputes endemic to polycentric organizing. And yet, simply noting that performance slippages are endemic is not a satisfactory theoretical approach. In this study, we show how different permutations of two structures – one internal and another external to the project organization – create fundamentally different classes of management problems. Our framework is therefore a first step toward a more general theoretical synthesis that addresses the question of why capital-intensive projects perform the way they do.

# CONCLUSION

In this study we have sought to advance our understanding of the design of capital-intensive project organizations, performance outcomes, and potential causal linkages. We illustrate how a polycentric architecture makes pluralism more manageable, and show different classes of management problems within this organization design. These insights reconcile two strands of conflicting explanations on project performance. In agreement with claims that trace underperformance to externalities, we found performance slippages caused by the interaction of the promoter with multiple autonomous, resource-rich actors. The difference is that our work endogenizes these actors into the project organisational boundaries because they share decision rights. In agreement with claims that trace underperformance to promoter’s behaviour, our study confirms that initial targets are set unilaterally and invariably optimistically. However, we found this pattern is rooted in optimism around the actual cost of building consensus. This insight adds nuance to ideas that optimism bias is rooted in agency problems and incompetence. To be clear: We do not rule out these additional explanations for underperformance; but equally, we should not ignore that building consensus is a ‘struggle’ particularly when the organization is highly interdependent with the environment (Dietz et al. 2003). Under these circumstances, a good dose of optimism is a necessary precondition to believing that capital-intensive goals are achievable; that is, the promoter’s optimism bias is both a blessing and a curse.

Importantly, our work only illuminates the performance impact of the arrangements designed to mandate interactions for exchanging and mobilizing resources in pursuit of collective goals (Gulati and Puranam 2009). As such, this study is agnostic about how informal social structure affects the relationship between organization and performance; we also cannot shed light on the influence of emergent interactions, negotiation tactics, and patterns of individual behaviour and the norms, beliefs, and values underlying such interactions, tactics, and behaviours. We agree, however, that explanations of performance should aim at combining formal and informal elements since underlying designed structures are actions carried on by individuals (Van de Ven et al. 2013, Simon 1947). Nevertheless, as our study suggests, reaching this goal requires nuanced understanding of the structure of the problem.

Still. three boundary conditions are in order when assessing how far our insights might be generalizable. First, infrastructure projects are socially complex but not so technologically complex that planning choices cannot be comprehended by multiple actors in the environment. The capability to discern what is at stake encourages these actors to claim decision rights. In contrast, in technologically complex settings such as aeronautical product development (Brusoni et al. 2001) and science (Tuertscher et al. 2014), the understanding of what is at stake is restricted to subject-matter experts. This circumstance enables theorists to reconcile pluralism with meritocracy-based authority, which creates a different class of capital-intensive project management problems.

Second, planning choices for large infrastructure projects are hard to reverse once approved, and impact the property rights of multiple actors. Hence, planning choices are, perforce, controversial. However, not all capital-intensive projects impact property rights or unfold under contentious system-goals. In the response to the Columbia space shuttle disaster (Beck and Plowman 2014), for example, a benign system goal enabled cooperation and a sense of collective identity to flourish rapidly between dissimilar actors who had never worked together. This circumstance suggests that the quality of the system goal is another boundary condition that merits further investigation.

Finally, our study is grounded in the UK context, an institutional setting that encouraged polycentric organizing; umpires and slack resources are also designed arrangements rooted in UK policy. However, these attributes of the context are not universal. Likewise, the observed emphasis on underpinning planning choice on formal cost-benefit analysis itself is also not universal. As Porter (1995) notes, intimate social networks among elites in some countries allow for much more informal decision-making processes under pluralism. Hence, caution is needed before extending our insights to fundamentally different institutional contexts.

Limitations notwithstanding, our study offers some important implications for policy. The regular occurrence of scope creep and overruns has dogged the reputation of capital-intensive projects and their promoters. Implicitly rooted here is the assumption that promoters have centralised (final) authority and thus, if projects overrun, it must be the promoter’s fault. This conception has fuelled ideas that promoters are not to be trusted, maintain secret agendas, and are loath to divulge “real” cost data, all of which influence policy including optimism bias and the use of umpires. Recognizing that planning choices happen within a polycentric architecture suggests a different direction for policy making. If organization design allows for shared decision rights, then policy wants to encourage shared accountability for the outcomes. This implication suggests, for example, that public policy could require actors who support the system goal to accept private arbitration to resolve disputes, freeing the time of umpires to resolve other dispute sets with actors which had not been co-opted into the project. While only conjecture, we would expect that private arbitration could make the project organization less interdependent from the environment, reducing uncertainty. This, in turn, would enable public and private organizations to reduce their reliance on slack resources and mitigate the risk of inefficient and opportunistic use of resources.

In conclusion, this study sees capital-intensive project organisations as forms of polycentric organizing under pluralism. It also reveals fundamentally different classes of problems within this broad population of organizations. These insights do not make these organizations less complex or suggests simple solutions, but they illuminate the structure of the management problems and help move forward the performance debate.

**APPENDIX –Summary of Sampled Projects: History, Context, and Performance**

|  |  |
| --- | --- |
| **Project History and Context** | **Summary of Performance**  (cash prices unless stated) |
| **Crossrail:** Main Planning Effort: occurs between 2001 and 2008. Prior History: The idea of building a cross-London railway first gained momentum in the seventies but the UK government dropped the plan after a few years because of cost concerns; the idea was reignited in the nineties but planning again unravelled after five years due to cost-benefit concerns. The start of the third attempt happened in 2001 when the UK and London governments formed a coalition to promote the scheme. Performance baseline: during planning talks, the goal evolved from a 9km central London train to open by 2012 into a 118km high-capacity commuters’ train to open by 2017; the cost and schedule targets evolved commensurately. Context: Construction could not start before the promoter acquired from the Parliament the power to force land sales. Planning unfolded under pressure to submit a proposal to Parliament before the 2005 elections; in 2008 Parliament gave the UK government authorization to proceed. | **Cost evolution**  2001, ~£4.7bn  2003, ~ £9.8bn  2007/8, ~ £10.9bn  Final (as of 2016) ~£14.0bn |
| **Contingency funds**  2006/7, ~£5.0bn  2010, ~£4.0bn (~ £1.0bn removed after financial crisis)  2016/7, no contingency left |
| **Completion date evolution**  2000, fully open in 2012  2003,fully open in 2016  2008, fully open in 2017  2016: fully open in 2019/20 |
| **Olympic park:** Main planning effort: occurs between 2001 and 2007. Prior history: The idea of hosting the 2012 Olympics in London emerged in 1995 after the third loss for the UK loss of the Olympics contest. In 2001 the UK government formed a coalition to promote the scheme with the London government and the British Olympic Association. Performance baseline: In 2002, the International Olympic Committee (IOC) opened the contest; the UK was given two years to develop an intermediate bid and six more months to submit the final bid; the scope and cost forecasts evolved during the bidding process and afterwards. Facing an immovable deadline, the promoter spent 18 months after winning the contest to refine the plan and produce a performance baseline (‘Yellow book’), which was updated in 2009 (‘Blue Book’). Context: after London gained the contest, Parliament rushed to give government the power necessary to force land sales; and LOCOG, a IOC’s watchdog, joined the promoter organization and gained veto power on the top governing board. | **Cost evolution**  2002, ~ £1.1bn  2004, ~ £4.9bn  2006/7, ~ £6.1bn  Final,~£8.1bn (*includes post-games conversion*) |
| **Contingency funds**  2006/7, ~£2.0bn  2013, no contingency left |
| **Completion date immovable**  *But some planning disputes were only temporarily resolved for the Games in 2012* |
| **Heathrow Airport T2**. Main planning effort: occurs between 2005 and 2009. Prior History: The goal of consolidating all operations by Star Alliance, a network of over 20 airlines, in a new terminal was announced in 2005; in that same year BAA, the private airport owner, started building Terminal 5 to consolidate the operations of One World, a rival alliance; Performance baseline: The initial goal was to replace the old T2 building with a new building so-called ‘Heathrow East’; BAA also aimed to complete planning by 2008 to coincide with the end of the regulatory cycle, but the end of planning was later delayed to 2009. During planning, the T2 goal evolved into a modern T5-like campus to develop in two stages; the first stage would open by 2013 and the second by 2018. The first phase opened in 2014; as of 2017, no plan exists to start the second phase. Context: Construction could not start before the performance baseline was approved by the regulator. By regulation BAA had to treat all airlines the same way; the opening of T5 put BAA under pressure to open T2 | **Cost evolution**  2005, ~ £1.3-1.8bn  2006, ~ £2.0bn  2008, ~ £2.4bn  Final (2015): ~£2.8bn |
| **Contingency funds**  2008, ~£200m |
|  |
| **Completion date evolution**  2005, open in 2012  2008, open in 2013  Actual completion (1st phase): 2014; 2nd phase put on hold |
| **High-speed 2** Main planning effort occurs between 2009 and 2017 (first phase) and 2009-2020 (second phase) (*as of 2017*). Prior history: The idea to develop a new national railway gained momentum in 2008 after the financial crisis. In 2009 the UK government created HS2 Ltd, a public agency tasked to plan the scheme. Performance baseline: The initial goal was to open the first phase connecting London and Birmingham (225km) by 2026 and open a second phase connecting Birmingham to various Northern cities (248km) by 2032/3; in 2015, scope shifted between the two phases and pledges were made to develop more railway lines. Context: Construction could not start before government acquired from the UK Parliament the power to force land sales. Planning unfolded under pledges that the plans for the first phase would be approved by Parliament before the 2015 general elections; the plans for the first phase were finally approved two years late in March 2017. | **Cost evolution**  (10/11 prices)  2010,~ £22.7bn  2012,~ £22.7-27.6bn +£5.8bn (train cars)  2014,~£28.2bn+£6.0bn(train cars)  2017,~£37-40bn+£6.5bn(train cars) |
| **Contingency funds** (10/11 prices)  2010, ~£7bn  2013, ~ £14.4bn  2017, ~£ 5.0-8.0bn |
| **Completion date evolution**  2010, planning (1st phase) done by 03/2015  2015, planning (1st phase) in 2016  2017, planning (1st phase) ends  Opening dates unmoved |

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| --- | --- | --- | --- | --- |
| Table 1 - Description of the Sample of Cases, Interviewees, and Archival Database | | | | |
| Cases | London 2012 | Heathrow T2 | London Crossrail | UK High-speed 2 |
| System-level goal | Build an Olympic park to host Games and catalyse urban regeneration | Build a new terminal campus to create a dual-hub at Heathrow airport | Connect the East and West outer London with a new high-capacity train system | Build a cross-country railway to increase national transport capacity |
| Membership of the promoter | Coalition: *UK and London governments; BOA(§); LOCOG(§)* | Solo:  *BAA (regulated airport owner)* | Coalition: *UK and London Governments* | Solo:  *UK Government* |
| Outcome of the planning effort | Formal performance baseline  *Yellow book (2007)*  *Blue book (2009)* | Legal contract setting performance targets  *5-year capital investment plan* | Legal contract setting scope and assurances  *Parliamentary bill* | Legal contract setting scope and assurances  *Parliamentary bill* |
| Interviews | 36 (11 disputes) | 19 (5 disputes) | 33 (9 disputes) | 35 (12 disputes) |
| Number and description of organizations interviewed | 8:  *London2012 (bid company) ODA (promoters’ agent); LOCOG (games operator); OPLC (park operator); Transport for London ; CLM (programme manager); Land Lease (private developer); Network Rail (owner of rail infrastructure)* | 5*:*  *STAR Alliance, Air Canada, BAA,*  *HETCo and Balfour Beatty (private design and build companies)* | 8*:*  *CLRL (promoters’ planning agent);Crossrail, (promoters’ delivery agent); Network Rail; UK Treasury; Transport for London (TfL);Canary Wharf (private funder);*  *Bechtel, Transcend (consultants)* | 11*:*  *HS2 Ltd (promoter’s agent); Manchester City Council (MCC); Greater London Authority (GLA);Transport for London (TfL); Borough of Camden; Transport for Greater Manchester (TfGM); Network Rail; UK Treasury; Manchester Airport; CH2MHill, AECOM (consultants)* |
| Archival data  Documents on the planning effort organised by categories: (news articles in the press not included) | Total number of documents: 134  *Strategy and planning documents: 84*  *Financial reports: 6*  *Formal communication: 5*  *Newsletters and PR documents: 17*  *Design documents: 7*  *Meeting minutes: 15* | Total number of documents: 114  *Strategy and planning documents: 74*  *Financial reports: 6*  *Formal communication: 19*  *Newsletters and PR documents: 8*  *Design documents: 4*  *Meeting minutes: 3* | Total number of documents: 122  *Strategy and planning documents: 74*  *Financial reports: 2*  *Formal communication: 6*  *Newsletters and PR documents: 23*  *Design documents: 9*  *Meeting minutes: 8* | Total number of documents: 101  *Strategy and planning documents:46*  *Financial reports: 6*  *Formal communication: 20*  *Newsletters and PR documents:12*  *Design documents: 12*  *Meeting minutes: 5* |

*(§)BOA - British Olympic Association; LOCOG, London Organising Committee of the Olympic and Paralympic Games and International Olympic Committee (IOC)’s watchdog;*

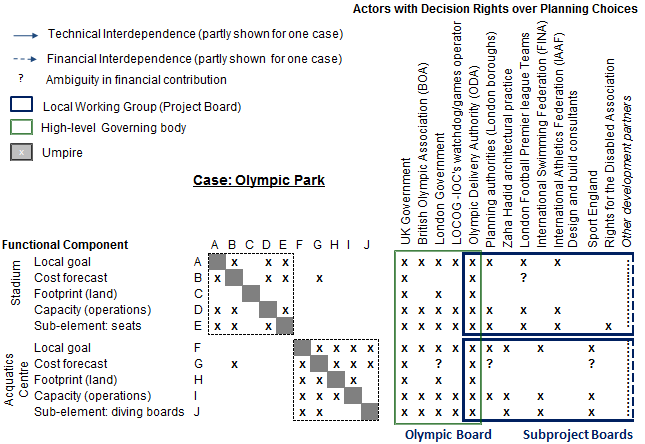
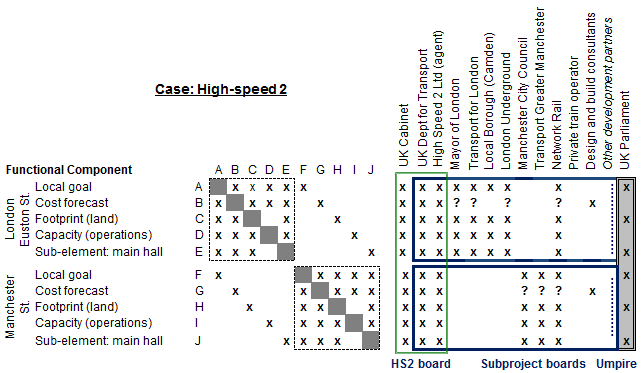
**Figure 1 – Stylised representation of different infrastructure architectures**

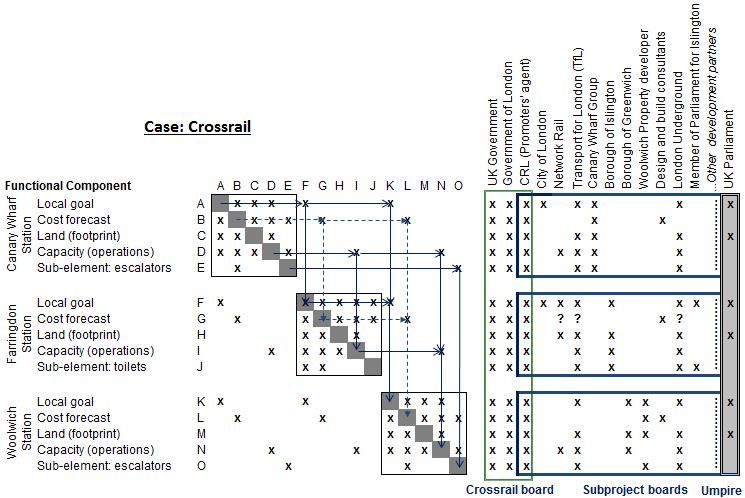
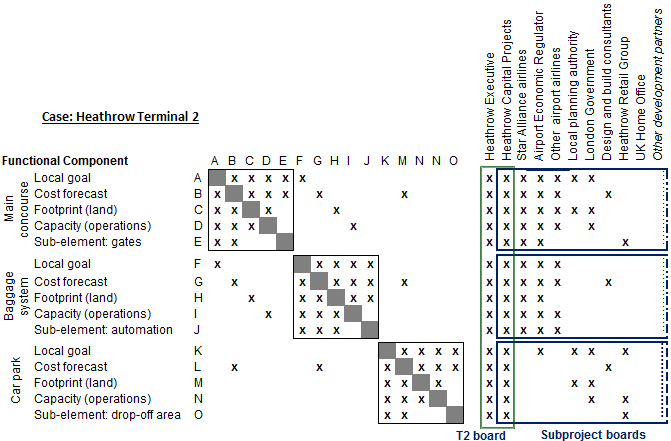


**Table 3 – Excerpt of the Evidence on the Resolution of Planning Disputes: Outcomes and Implications to Performance Targets**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Case** | **Embedded dispute** | | **Dispute resolution mechanism** | **Outcome** | **Implications to the Local Performance Targets** | | |
| **Extra scope** | **Completion date** | **Cost** (final prices unless stated) |
| High-speed 2 | Euston St | #1, Low local goal congruence    *Utilitarian vs. ‘world-class’ station* | Umpire  *UK Parliament (Land use regulator)* | Mutual compromise facilitated by umpire (after 4 major design cycles)  *The principle. ..that all the works …are on the HS2 credit card has been accepted [TfL official]* | Yes  *Commitment to fully redevelop Euston station* | Relaxed  *Dispute was resolved in 2017 ; completion of works delayed from 2026 to 2033* | Relaxed  *2010, ~£2.0bn (09 prices)*  *2011, ~£1.1bn (11 prices)*  *2014, ~£2.2 bn (11 prices)*  *2015, ~£4.5bn (TfL forecast)* |
| Crossrail | Woolwich St. | #2 Low local goal congruence  *Divergences over the business case* | Umpire  *UK Parliament (Land use regulator)* | Mutual compromise facilitated by umpire (after 2 major design cycles)  *Parliament rules that station should be built, but asks for local finance* | Yes  *Construction of the station agreed* | Relaxed  *Dispute only fully resolved in 2013 after 7 years of planning talks* | Relaxed  2005, £0m (no station)  2008, £150m (local claimant pays)  2013, £166m (£16m from promoter) |
| Heathrow T2 | Main Concourse | #3, Low goal congruence  *Modern campus vs. facility replacement* | Planning talks  *Airport economic regulator mediated planning talks* | Mutual compromise (after 3 major design cycles)  *Future expansion of main concourse building is actively safeguarded* | Yes  *Extra capacity for future expansion (tunnels, basements)* | Relaxed  *Dispute pushed back the end of the planning in one year* | Relaxed  2005, ~£666m (final prices)  2008,~ £1bn (£200m in safeguards)  2015, £1.2bn |
| #4 Rilvary over local planning choice  *Open versus closed gates* | Planning talks  *Independent director arbitrated planning talks* | Mutual compromise (2 major design cycles)  *Gates can be open, but only if new boarding technology is adopted* | Yes  *Flexible building grid to leave both options open* | Stable  *Dispute resolved during the planning process* | Relaxed  2008, ~£5m extra |
| London Olympic c Park  *London 2012* | Aquatics centre | #5, Low goal congruence  *Small vs. massive aesthetically sophisticated venue* | Planning talks  *Long series of meetings between project participants* | Mutual compromise ( after 3 major design cycles)  *Sophisticated roof stays, but venue shrinks to a third of its original size* | Yes  *Temporary 15,000- seats added just for the games* | Stable  *Dispute resolved during the first two years allotted for planning talks* | Relaxed  *2004, ~£128m*  *2007, ~ £236m*  *Final (2010): ~£262m* |
| Stadium | #6, Low goal congruence  *Football vs. athletics venue in legacy* | Planning talks  *Long series of meetings between project participants* | Mutual compromise (after 4 major design cycles)    *2007, potentially demountable venue*  *2013, dual-use venue* | Yes  *Retractable seating added in 2013* | Relaxed  *Goal dispute resolved after 6 years of talks in 2013* | Relaxed  *2004,~ £468m*  *2008, ~£541m*  *Final (2015): ~£706m* |

**Figure 2- Excerpts of the Design Structure Matrices of the Planning Problem and Corresponding Organizational Matrices**

## Figure 3- Contingent Framework on Project Organization Design-Performance Logic

|  |  |  |
| --- | --- | --- |
| **Internal Slack for Resolving Disputes** | **External Umpire for Resolving Disputes** | |
| **Not available** | **Imposed by the Environment** |
| **Limited** | Organizational design allows for moderate slippages in the performance targets    Organizational design encourages shared accountability for slippages in the performance targets  *Example: Heathrow T2* | Organizational design creates high risk of major slippages of the performance targets *in the public eye*  Organizational design creates high risk of impasse if slippages of the performance targets are ruled out    *No example: Scenario discouraged*  *by UK public policy* |
| **Substantial** | Organizational design creates real risk that performance targets will slip until there is no more slack left  Organizational design allows to mask slippages in the performance targets from the eyes of third parties  *Example: Olympic Park* | Organizational design creates real risk that performance targets will slip until there is no more slack left *and* umpiring process is completed  Organizational design allows to mask slippages in the performance targets from the eyes of third parties  *Example: HS2, Crossrail* |

1. I In 2012 BAA changed its name to Heathrow Ltd; we keep to the BAA name for the sake of simplicity [↑](#footnote-ref-1)
2. According to the Oxford English Dictionary *umpire* and *referee* are synonyms to denote the actor in power to exercise the final authority [↑](#footnote-ref-2)
3. The UK Government Cabinet includes the Prime Minister and the most senior ministers [↑](#footnote-ref-3)
4. All cost figures are presented in final (cash) prices for the sake of simplicity [↑](#footnote-ref-4)
5. Kelso, P. 2008. Olympics 2012 chiefs willing to spend money like water, say MPs. Guardian, 30 April [↑](#footnote-ref-5)
6. *Supplementary Green Book guidance-Optimism bias*, a recommendation issued by the UK Treasury [↑](#footnote-ref-6)
7. Includes £971m (venues); £89m (conversion costs); £640m (Olympic infrastructure); £1040m (non-Olympic infrastructure); £700m (local transport schemes); £766m (land) plus VAT (NAO 2007) [↑](#footnote-ref-7)