PAPERS

Translation and Convergence in Projects: An Organizational Perspective on Project Success

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ABSTRACT

A range of theories (actor-network theory, multinodality, and sense making) are drawn together into a single model of project management processes in order to discuss project success and failure. It is argued that success and failure can be characterized in terms of a continuum between project convergence and divergence. The causes of divergence and convergence are discussed with reference to the above theories using four illustrative case studies.

KEYWORDS: actor-network theory; multinodality; sense making; project success; project failure; case studies

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INTRODUCTION

The increasing complexity of project management has led to a debate about the way in which projects are currently managed and to the search for new concepts and theories through which to understand and support the project management function. This has given rise to a number of initiatives, such as the present "Making Projects Critical" series of workshops (Hodgson & Cicmil, 2006) and the Engineering and Physical Sciences Research Council (EPSRC) "Rethinking Project Management" research network (Winter & Smith, 2006), that seek alternative perspectives to the conventional understanding of projects and project management as embodied in the standard bodies of knowledge (Association of Project Management, 2006; Project Management Institute, 2004).

This article presents some of the new thinking in this context. The article focuses on the complex social and political aspects of managing projects and identifies theories and concepts that are believed to be relevant to understanding and managing those projects (Alderman, Ivory, McLoughlin, & Vaughan, in press). The key difficulty with complex projects is that those managing them will often be "feeling their way" toward a solution rather than following a reliable blueprint or project plan. Constructing a building to a detailed specification using known technologies requires traditional planning and work breakdown (and even then there is likely to be an extensive snagging list). On the other hand, delivering an exhibition experience to mark the millennium, or a government building to capture the spirit of a country for a diverse and demanding client, or a new airport terminal deploying untried technology to serve the needs of two distinct organizations, is quite a different matter. In these cases, project managers move from a situation that is complicated to one that is genuinely complex. The management problems multiply when one considers that implementing the solution must be done in the context of suppliers, consultants, and partners who may themselves be "feeling their way" toward what is required of them. This requires new models of projects that account for the more elusive, less easily articulated, and largely tacit skills of project managers. To create those models, this article draws on the work of actor-network theorists, the principles of sense making, and the notions of organic and mechanistic styles of organization.

Projects as Actor-Networks

Attempts to engage in complex project activities involve considerable management and organizational challenges in terms of the building and maintaining of extended project networks. The idea of managing as an actor-network building-and-maintaining activity introduces a more nuanced way of thinking through the problems faced by project managers. It makes it

clear that rather than simply monitoring the execution of packages of work agreed at the outset of the project to ensure adherence to quality, time, and cost objectives, the role of the project manager (and others, human and nonhuman, that hold influence within the project) is primarily one of developing and managing relationships across an extended network of actors—human and nonhuman. The managerial competencies required to do this might include the ability to assess the likely motivations and barriers to action of a wide range of actors in different technical and organizational settings and the ability to translate that knowledge into effective influence over those actors. Actor-network theory, or ANT, (Callon, 1980; Latour, 1996; Law, 1992) addresses precisely these issues.

Actor-network theory is ostensibly a theory of innovation that has developed out of a desire to trace the interrelations between human and nonhuman (e.g., technological) actors that make possible the accomplishment of stability (be that the temporary stability of projects or the longer-term stability of "society"). Although actor-network theory is not itself a theory of projects, its interest in emerging artifacts (innovation) means that its subject matter tends to derive from projects. Callon's (1986) study of the failure of the proposed electric car system in France in the 1970s, Law and Callon's (1992) study of the failed TSR2 fighter aircraft in the 1960s in the United Kingdom, and Latour's (1996) study of the failed French transport system, ARAMIS, are now classic studies of fledgling project networks.

Actor-network theory proposes a model of coordination in the pursuit of technological goals. The actor-network approach ". . . rests on the idea that innovation and the strategies that shape it may be described in a network vocabulary that emphasizes the interrelated and heterogeneous character of all its components, whether social or technical" (Bijker & Law, 1992, p. 18). Heterogeneous actor-networks are built by the active enrollment (translation) of "actants" (human and nonhuman actors) into a single network. The work of translation is performed using intermediaries that include money, contracts, specifications, schedules, talk, and prototypes, which are deployed to encourage other necessary actors to join the network and to control them once they are in place. Critically, network builders must continually assure other actors of the benefits of their involvement in the network. Intermediaries persuade and inform by carrying the necessary information to bring actors into line with one another.

Convergence and Divergence

A particular feature of actor-networks is that they can be convergent or divergent (Law & Callon, 1992). In convergent projects, the understanding of intermediaries among actors is shared, with the result that they have predictable translation effects. Actors in convergent projects do not resist translation and such translations are, therefore, efficient. Convergent project networks typically have clear and agreed "obligatory points of passage"[1] (Law & Callon, 1992, p. 31) through which all other actors, translations, and intermediaries must pass.

In weak and divergent projects, actors do not all share a common understanding of the intermediaries circulating the network and many will fail to recognize the legitimacy of an organization or institution regarded by others as an obligatory point of passage or center of control. When this happens, they will resist the roles the network assigns to them and will respond to instructions unpredictably. As a result, key actors may begin to pursue their interests elsewhere. These networks are inefficient and will require plenty of "backstage" work (cf. Buchanan & Boddy, 1992) to keep them on track. They may survive to reach their original goals, but if they grow too divergent, they will become vulnerable to collapse. Collapse occurs when important actors cease to be mobilized by the network's intermediaries; they no longer perceive their interests to be served by the project and withdraw. As Latour puts it, in a situation surely familiar to many an overstressed project manager:

> The full difficulty of innovation becomes apparent when we recognize that it brings together, in one place, on a joint undertaking, a number of interested people, a good half of whom are prepared to jump ship, and an array of things, most of which are about to break down. (Latour, 1996, p. 58)

A network approach to projects provides a useful descriptive framework—a single vocabulary for framing and discussing projects. The usefulness of actor-network theory, and what sets it apart from other approaches to projects, is that it focuses on the efficiency of network translations rather than other ostensibly more subjective measures of success (Linde & Linderoth, 2006)—that is, the *effectiveness* of project management in building networks to bring about change, the *direction* of change not withstanding. An effective project is one in which network translations result in actor convergence around stable goals—goals that are, from ANT's perspective, held stable by the actor-network (Lee & Hassard, 1999).

Multinodality and Networks

Actor-network theory is part of a postmodern social science (though it also has roots in interactionism and relativism) that sees concrete reality as "emerging" out of a multitude of interactions within and between localities. Thus:

> . . . the image that we have got to discard is that of the social oil refinery. Society is not a lot of social products moving round in structural pipes and containers that were

[1]Also referred to as "obligatory crossing points" (Latour, 1996, p. 43) and "centres of control" (Latour, 1990).

> put in place beforehand. Instead, the social world is a remarkable emergent phenomenon: in its processes, it shapes its own flows. (Law, 1994, p. 15)

Nevertheless, the larger part of lived project experience is of repeatedly having to accommodate already existing organizations, technologies, and bodies of knowledge—existing pipes and containers. Action at one locality, noted Latour (2007), is always conditioned by action that has occurred at other previous localities. In the case of complex projects, the pipes and containers that condition action at other localities key to the project may need to be reshaped (translated) to accommodate new project objectives—a process that they may well resist. To describe these potential pockets of resistance in a project context, it is helpful to borrow the notion of multinodality from Wynne (1988).

The concept of multinodality draws attention to the open-textured and dispersed nature of most technologies, particularly to their distribution in different locations. Wynne observes that technologies are rarely the unitary stand-alone objects we imagine them to be. Rather, they are fragmented and dispersed across distant and imperfectly understood contexts—never more so than when they are part of extended supply chains. Attempts to build extended project networks comprising multiple organizations, geographical locations, and "business cultures" (obdurate self-reproducing pipes and containers, in ANT terms) result in a multitude of uncertainties and imperfect understandings. Different nodes, which have their own entangled reward systems and operating procedures that may not be entirely appreciated by project managers and others at the outset of the project, are included in the network with unpredictable consequences. We use the notion of multinodality to account for what we see as the inevitably "brownfield" nature of projects as they emerge in the context of multiple pre-existing nodes, in the sense that they are built on what is already there. This is unproblematic when those organizations are already well aligned with the aims of the new project, but in many complex projects this will not be the case.

Achieving alignment in the context of multinodal project networks requires issues of localized sense making (Weick, 2001) to be addressed. Project participants engaging in sense making (making sense of client requirements, interpreting design briefs, finding solutions to problems, and so on) can do so from the perspective of existing ways of working and thinking that may be at odds with the requirements of the project center. In the context of dispersed sense making, it is not always easy for actors operating from distant nodes to accurately assess what is required of them. Specifications, particularly, though by no means exclusively, those that deal with broad performance parameters rather than technical details, are not a foolproof guide to what the customer actually wants.

The concept of sense making as espoused by Weick (1995) and others captures the problem. Sense making is a group accomplishment that constrains and directs thinking and makes the apprehension of new phenomena by group members sometimes difficult. Sense-making perspectives have a long history in the study of management and organizations. The origins of this approach to the study of organizations rests primarily in the work of Karl Weick (1979, 1993, 2001), Wiley (1988), and Gephart (1993). Insights derived from the concept have only latterly been applied to projects and project management (Thomas, 2000).

An understanding of projects from a sense-making perspective focuses far more on the processes of organizing projects rather than on the structure of projects or the capabilities and resources required to execute them. In this perspective, more concern is placed on the social aspects of project management:

> . . . the deliberate social interaction occurring between humans working together to accomplish a certain task. . . . Thus a sense making focus on project management directs us to look at the processes of action and interaction that enable individuals to make sense of organizational activities and how they interact to effect the emergent projects. Researchers are directed to explore ways to facilitate the inter-subjective sense making to reduce communication failures and confusion. (Thomas, 2000, p. 42)

Sense making may appear as a counter to the mainstream understanding of project management, which has a focus on tools and techniques in the narrower view and a focus on the contingent relationship between the initiating business context and the different means by which projects might be delivered in the broader view. However, Thomas (2000), at least, argues that sense making adds the insight that both project initiation and delivery are socially negotiated phenomena and that the project itself is an emergent entity and not "given" at the start of the process or as something composed of external components (e.g., technology), which act independently of the sense-making process. This is a vital insight.

Conventional views of project management see managing projects successfully in terms of gaining access to the right information, while uncertainty, or weak management, is seen in terms of a lack of information. However, the sense-making perspective invites us to view information itself as ambiguous and equivocal and as filtered and reconstructed through different "frames of reference" (Weick, 1995). In this view, the role of the project manager, rather than being one of responding to unambiguous inputs, is one of attempting to deal effectively with

ambiguity—to build and exert influence over other actors without reliable intermediaries.

What the sense-making approach highlights in the context of project-based forms of organizing—especially where these take on the properties of complex projects—is that different groups and communities do not necessarily view the projects they are working on in the same terms as one another. Localized sense making (conditioned, for example, by locally adopted measures of success and reward) can thus disrupt the ability of actors in that node to act in unison with other nodes in the project.

Sense making can make a strong contribution to an understanding of the translation process in actor-networks. The concept of sense making draws attention to the inherently inter-subjective nature of interpreting reality and its objects (which can include intermediaries such as specifications, project schedules, and contracts) and the consequences for building and maintaining project networks. Specifications, however clearly written from the perspective of one group, will be subject to variable interpretation by actors working with alternative sense-making frames. As projects grow more complex, the project network expands and more actors are enrolled into those networks, differences of understanding will also be drawn into the network. The result will be further unanticipated translations and outcomes.

Organizational Styles in the Context of Complexity

Our central proposition, based on ideas from actor-network theory, is that successful projects will be those that, in network terms, are convergent. We also suggest that convergence is created not just by a convergence of interests (i.e., political convergence), but also by a convergence of sense making around what the end goals of the project are (cognitive convergence). A dogged focus on a stable set of goals can be crippling for an organization (Kaynes, 2005), but it is essential for projects. While actor-network theorists are keen to point out that projects all too readily fragment into multiple trajectories (e.g., Law & Callon, 1992), it is precisely the job of keeping projects on a single trajectory that project managers must achieve. Failure to do so, even if it is not the undoing of the project, is at the very least a source of great inefficiency. Effective project management will therefore be associated with convergence (i.e., the project's various nodes will have achieved convergence around a commonly understood set of goals).

Convergence is desirable because it ensures efficiency and unified responsiveness to challenges. Convergence in projects is akin to what Burns and Stalker (1961) referred to as the *organic organizational form*. Organic organizations thrive in uncertain environments because they are able to respond without fragmenting to unstable, shifting demands. Organic organizations achieve this by encouraging close interaction and communication across the organization (vertically, horizontally, and diagonally) and by allowing, on the basis that everyone knows what they should be doing, the devolvement of decision making across the organization. In organic organizations, the authority to act emerges from the possession of expertise relevant to a particular task or problem, rather than from position in a hierarchy. Close and ongoing communication means that workers and managers have repeated opportunities to mold their understanding around what the organization is trying to achieve; at the same time, they are made aware, and make others aware, of any changes that are occurring in the organization to which they or others might need to adjust. Such interaction also provides managers with opportunities to increase their own understanding of the issues facing distant parts of the organization.

Organic management is efficient and effective because it distributes the demands of decision making to where those decisions are best made. Although Burns and Stalker (1991) do note the prodigious use of committee meetings to facilitate "catching up," this is arguably preferable to concentrated centralized systems of management and decision making that "lock out" important actors.

The alternative to organic organization is mechanistic organization. Mechanistic organization, argue Burns and Stalker (1991), emerges in response to stable, long-run demand. As a consequence of this stability, mechanistic organizations focus on control for efficiency rather than responsiveness. Workers and managers focus on their specialist roles and loyalty is local (e.g., to departments) rather than to the organization as a whole. Workers and managers have little knowledge of, or interest in, decisions taken elsewhere in the organization, and are isolated from strategic decision making. This is a highly efficient and effective means of management, so long as demand is stable. Communication within the organization can pare down to the purely quantitative (how many widgets, by when). However, if there is a sudden shift in technology or markets, such organizations struggle to respond.

The delivery of complex projects is best achieved through fluid organic organizational forms. However, the creation of organic forms emerges out of the work of translating actors into a single convergent network. Multinodality in projects implies that project managers will often have to work hard to gain an awareness of the sense-making styles that are likely to be manifest in more distant parts of the project network if they are to be successful convergent network builders.

The notions of translation, convergence, node, sense making, and organic organization provide the possibility of shedding an alternative light on the interpretation of project success. In the next section, we attempt to apply these ideas to a reinterpretation of a number of high-profile projects that have been widely recognized as either

successful or as having failed in some way (paradoxically, sometimes both). The material for these cases is all drawn from public domain documentation and sources, rather than reflecting original empirical research. The projects considered are the Millennium Dome in London, Heathrow Airport's Terminal 5, the Scottish Parliament Building in Edinburgh, and the Eden Project in Cornwall. All were multimillion-pound projects and all involved considerable complexity.

Case Studies

The case studies presented are constructed from official documents, existing case studies available in the academic literature, contemporary press reports, and transcripts of government committee hearings. The construction and interpretation of the case studies has been completed by the authors to illustrate the ideas presented earlier.

The Millennium Dome

The Millennium Dome and its associated exhibition were planned as the centerpiece of the UK millennium celebrations of 2000. The Dome opened its doors on December 31, 1999, and closed them a year later. The aims of the project were not just to create a landmark building, but also to create a "world profile for the celebration of the millennium" that would "involve, engage and transform visitors and participants" and to do so on time and within budget (National Audit Office [NAO], 2000, p. 16). The project succeeded in creating a landmark building but failed to deliver against these latter aims, running over budget and failing to attract the visitors required by the business plan. Here, we argue that the project should have been conceived as an extended actor-network that failed to converge around a single agreed-upon set of outputs.

From its earliest conception, the Millennium Dome project was undermined by divergent views and a lack of clarity regarding what it was meant to deliver. The Dome was originally conceived of by the outgoing Conservative government but was taken on by the Labour government in 1997. For the Conservatives, the project was about "selling ourselves and our country" (Heseltine, cited in McGuigan & Gilmore, 2002, p. 4). For Labour representatives, the project needed less of a business focus and more of a reflection of the British "spirit of confidence and adventure" (Blair, cited in McGuigan & Gilmore, 2002). Ultimately, the exhibition failed to reflect either vision consistently, leaving visitors confused as to what the exhibition was about and the press unable to print favorable reviews (McGuigan & Gilmore, 2002).

The Dome also suffered to some degree from the influence of ideology in its execution. In keeping with the political focus of the day, the intention had been to place control of the project in private hands. However, it proved impossible to attract a private organization willing to shoulder the level of risk involved (NAO, 2000), and The New Millennium Experience Company (NMEC) was subsequently set up as a proxy for private control. The company, financed with lottery funding, had a single shareholder in the form of a Minister, Lord Falconer, answerable to Parliament for the performance of the NMEC. The project was allocated a net budget of £399m (NAO, 2000).

The project had two streams of activity, both run by the NMEC: the creation of a suitable building and coordination of the attraction it would house. The building, designed by the Richard Rogers Partnership and engineers Buro Happold, was state of the art and a great success; it has gone on to become a major London landmark, currently as the O^2 Arena. It was handed over within the 15 months specified and under budget at £43 million.

The attraction, which the Dome housed, did not fare so well. The opening night was regarded by the press as a fiasco of poor planning (in particular, the public transport to the Dome), and the attraction itself did little subsequently to win journalists over (McGuigan, 2003, pp. 670, 675). It was variously described in the press as "vain, vapid and patronising" (Nutt, 2002). Visitor figures, though perhaps influenced by the press, bore this out. While the Dome needed 11 million visitors to break even, ultimately only 4.5 million paying visitors came to the exhibition throughout the year (Nutt, 2002), and the project required a further four injections of National Lottery money amounting to £179m (NAO, 2000).

The failure of the attraction had its roots in the structure and focus of the project (NAO, 2000) and in the failure of the project to articulate and control the role that zone sponsors played in shaping the attraction (McGuigan & Gilmore, 2002). The National Audit Office notes that the management of the project was focused intensively on capital delivery and insufficiently on the quality of the attraction or its technical operational requirements. With respect to this latter issue, there was, for example, no single team responsible for maintenance (resulting in numerous extended breakdowns) and a string of operational failures (e.g., the long queue for the Body Zone despite much lower than expected visitor numbers). There was a lack of experience in these matters within the project (NAO, 2000), also reflecting this lack of focus.

If operations were undermined by a lack of operations focus, then the exhibition itself was a victim of further divergence regarding what the project was meant to be about. Taken together, the exhibition zones provided a confused array of ideas that made impossible the delivery of a "wow" factor (Nutt, 2002). This outcome can be traced back to a failure to create a consistent vision for the service delivery aspect of the project. For instance, the project's original director, Jennie Page, kept with Labour's vision in her treatment of the exhibition as something other than a sponsor-dominated "logo-land." Her replacement, Disneyland Paris's P.Y.

Gerbeau, was more than happy to see sponsorship come to the fore in shaping the experience—not least in the form of clear and visible company logos and PR messages (McGuigan & Gilmore, 2002).

The varied and uncoordinated nature of the private sector's involvement in the Dome created a confused message ranging from a commentary on national identity to an unrestrained promotion of private interests. Thus, while some companies, such as M&S (the Self Portrait Zone), took a back seat in terms of their zone's content, others ensured that their brand and influence were predominant (such as Manpower's much-disliked Work Zone). Other sponsors had a less straightforward relationship with their zone, such as Marconi, which saw an opportunity to rebrand itself, and BAE Systems, which sought to frame itself as a promoter of engineering education.

Ultimately, the variable visibility of corporate interests mixed uncomfortably with the zone's simultaneous focus on education and the social commentary of works displayed elsewhere, such as the much-praised "Boy" and Peter Gabriel's show depicting the negative effects of industrialization. Arguably, this lack of project convergence around a clearly articulated set of themes contributed strongly to the weak impact of the attraction (McGuigan & Gilmore, 2002). The attraction's failure, therefore, can be justifiably framed in terms of NMEC's failure to anticipate and control the shaping effects of its multiple nodes (i.e., corporate sponsors).

The net result was that visitors, and the press, were unclear as to what sense they should take from the Dome (McGuigan & Gilmore, 2002). While around 86% of visitors reported being satisfied with the attraction (NAO, 2000), it has been suggested that this response reflects a dogged determination to enjoy the event despite press criticism (McGuigan & Gilmore, 2002). Opening night technical failures, along with a somewhat flat exhibition, ensured that the press, key to the project's success, were never on board.

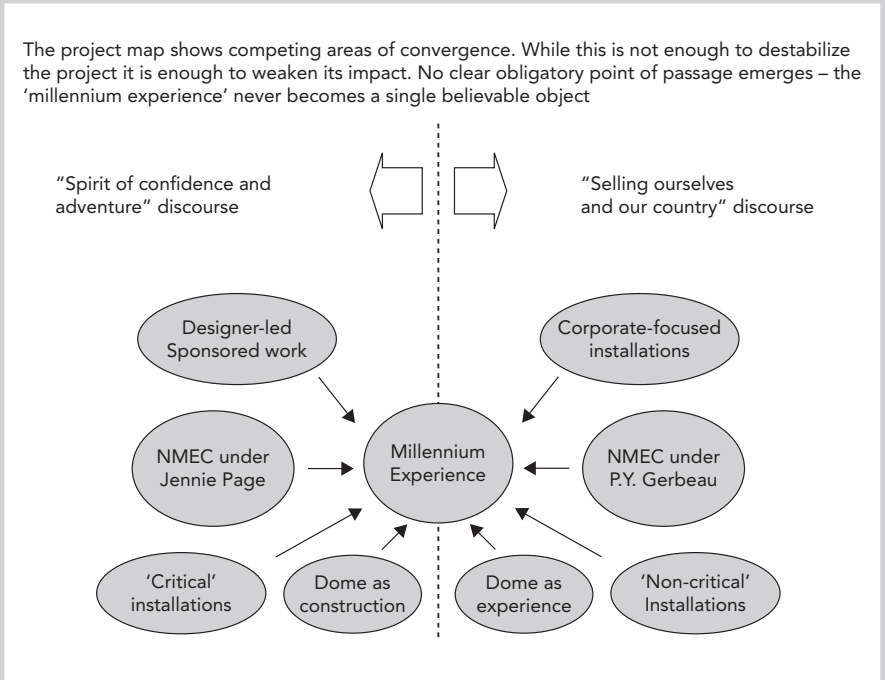

Figure 1: Millennium Dome project.

In characterizing the event's failure, it is clear that a lack of focus on operations (as opposed to the completion of "the project" as defined by the building) and a lack of convergence around a clear vision of what the project was supposed to be resulted from a failure to tackle the project's multiple and divergent nodes. In network terms, there was a divergent, weak, and disaggregated network, split between a construction phase and a service phase and split by the presence of alternative or competing discourses (Figure 1). In Burns and Stalker's terms, there was a project organization that failed to crystallize into an organic whole both through a lack of management effort to create opportunities for that to happen and as a consequence of the varied and divergent interests of the private sector.

The Eden Project

The Eden Project is the culmination of one man's extraordinary vision for a project that would "promote the understanding and responsible management of the vital relationship between plants and people and resources leading to a sustainable future for all" (Eden Project Mission, quoted in Prance, 2002). The brainchild of Tim Smit, an entrepreneur and the man behind the rediscovered Lost Gardens of Heligan, which became one of the leading tourist attractions in Cornwall, the Eden Project consists of a series of gigantic geodesic glasshouse structures situated within the crater of a disused china clay pit that house a series of representations of different ecological habitats from around the world.

The project was at the cutting edge of architectural design and construction technologies and required the building of a complex partnership of funders, commercial interests, architects, biologists, educators, and others to bring the project to fruition. That it came together at all speaks volumes for the networking skills and persuasive powers of the inspirational Smit. In his telling of the story of the Eden Project, Smit places great emphasis on the networking activity necessary to build support for the project, referring to having to make "dozens of presentations throughout

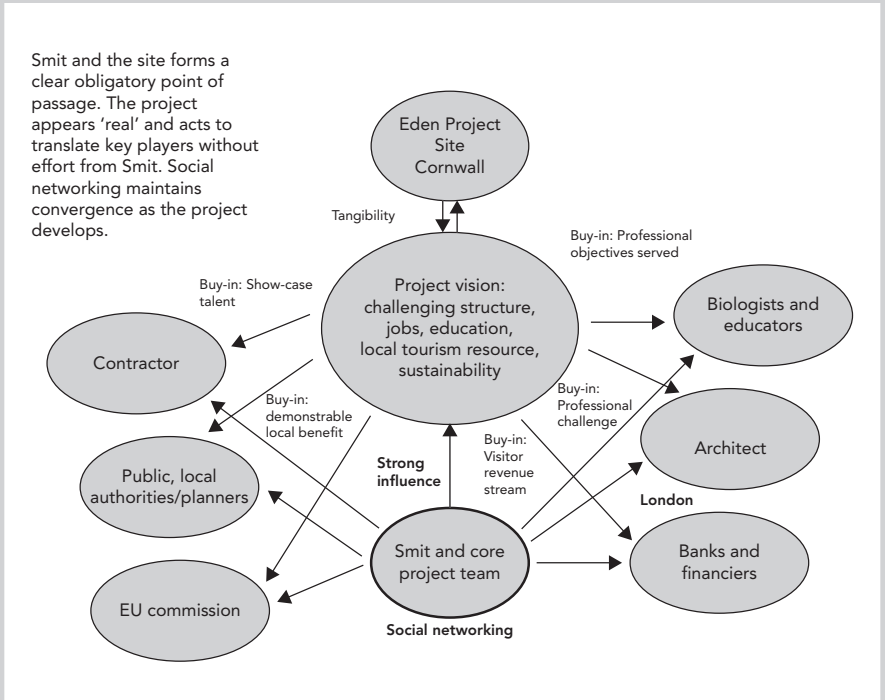

Figure 2: The Eden Project.

1995, lunching until we dropped and drinking for Britain, creating a background of support" (Smit, 2001). It is easy to see the actor-network in action here in a very conscious attempt at enrollment and network building.

Achieving translation, of potential funders in particular, involved numerous intermediaries—the initial design sketches, models of the glasshouse structures, and other preliminary items—but perhaps the most important intermediary was the very site itself. Smit recounts the visit of a group of officials from the European Commission who were enrolled in the project through a site visit that involved a hair-raising ride through the mud in a four-wheel-drive vehicle (Smit, 2001). Later, interest and support from another crucial set of stakeholders, the paying public, was stimulated by inviting people to view the progress of the project from the vantage point of the visitor center, and many returned subsequently to witness the completed project. The site became a guarantee of the "realness" of the project—the likelihood of completion and other actors' commitment, for the financiers, and the observable benefits as a local resource for local people.

Project success also required translation of local stakeholders through the securing of support from local residents, local authorities, and development agencies. As Smit puts it: "[a] mountain of paperwork, a design team from heaven and some up-country big cheeses count for nothing in Cornwall without local support" (2001, p. 103). Achieving this required Smit and his partners to:

> trust in the democratic process and not simply pay lip-service to it. This is hard work, requiring endless talking and numberless meetings, but there is no short cut to creating a constituency of support . . . without their [the local district council] support the project would not have happened. If your local community won't back you, everyone else has an exit. (Smit, 2001, pp. 61–63)

Thus, it can be argued that Smit instinctively perceived the need to build a convergent and organic project organization, a project in which everyone had a stake and not just a role, while at the same time recognizing the tireless work required to achieve this.

Smit similarly recognized the need to build and maintain external support for the project—a "global" network to use Law and Callon's term (1992, p. 21). The project required national bodies to be brought on board, particularly those being asked to provide the funding for the project. What was central to achieving this was mobilizing the underlying vision for the project. While this helped local actors to converge around the project aims, it also inspired confidence in the project's stability and apparent convergence among potential investors. This, arguably, is where Smit's strength as an entrepreneur, innovator, and visionary leader (Mullins, 2007) was critical. Under such circumstances, holding the network together was a continual process and at various points during the project considerable effort from Smit and his team was necessary to keep funders on board and key actors aligned around the project vision. In early 2000, the project needed additional financing, and considerable political maneuvering was required to persuade the banks to provide further loans in a context where future viability had to, to some extent, be taken on trust. Smit talks about a period when it was necessary to decamp from Cornwall to London to negotiate with the key project partners (Smit, 2001, p. 223ff). Without such deliberate activity to maintain the convergence in the project network, the Eden Project might well have gone the way of many other such endeavors.

The crucial feature of the vision he created for the Eden Project was that it served the interests of different parties in different ways, while still retaining the overarching attributes of environmental education and sustainability (Figure 2). It made sense to the different

stakeholders, viewed through their particular cognitive frames. For the local development agency, it represented a regeneration opportunity in a severely depressed part of Cornwall following the decline of the tin and china clay industries. For the banks, it represented a viable investment vehicle given the convincing arguments for visitor numbers Smit was able to make. For the architects, it represented the opportunity to apply their interests in geodesic designs, to showcase environmentally sensitive design principles, and to cement their reputation as architects. For the construction companies, it was an opportunity to showcase their capabilities and to be associated with a project that had the potential to break new ground. Indeed, the Eden Project was awarded the accolade of "Project of the Decade" in 2007 at the Construction News Quality in Construction Awards. As Smit (2001, p. 159) says: "Eden was never about plants and architecture, it was always about harnessing people to a dream and exploring what they are capable of." We would add that, once work began, Eden formed a cluster of tangible benefits and as such became, alongside Smit, a tireless actor in the work of translation.

Heathrow Terminal 5

Our interpretation of the project to open a fifth terminal (T5) at Heathrow Airport stresses again the importance of project stability and convergence around a stable frame. Critically, these frames tell project participants which trade-offs and risks are acceptable and which are not. In the case of T5, it was clear that what appeared to be a stable frame around which a project network had coalesced (the desire to create a smooth passenger experience as the terminal opened and British Airways [BA] flights were migrated in) was in fact in conflict with other demands. These, as we shall argue, related to the organizational prestige of the airport owner, BAA Airports Limited (BAA), and the broader operating requirements of BA. These requirements destabilized the project by prompting an ill-advised decision to open the inadequately tested terminal, leading to disastrous PR for both organizations when the baggage handling system failed. The eventual result of the failure was not only measured in terms of short-haul UK flights cancelled or the 28,000 bags that were placed in temporary storage, but also in terms of intense political embarrassment for those involved, particularly for senior staff at BAA.

The building of a new terminal at Heathrow Airport was a project of national prestige and importance, designed to ensure that Heathrow cemented its place as one of the world's premier airports. The terminal's construction was a complex project designed to handle 30 million passengers per year through the provision of 60 new aircraft stands. The £4.3 billion project involved 13 km of bored tunnels, two new terminal buildings, a new spur road linking to the M25, a new air-traffic control tower, a 4,000-space multistory car park, a 600-bed hotel and a host of other buildings. Planning for the project was begun in 1989 and construction began in 2002. The terminal opened slightly ahead of time on March 27, 2008, three days ahead of schedule, and was delivered to cost (Brady & Davies, 2010b). Within a month of opening,, the terminal was functioning beyond expectations at a level it was not anticipated to reach until three months into its operation (House of Commons Transport Committee [HCTC], 2008).

From the perspective of many, however, the most notable output of the T5 project was its disastrous first day. The opening was described by one MP as a "national embarrassment": "You are a very large organization, a foreign-owned organization, and you made a fool out of this country" (HCTC, 2008, p. 20). The opening was also savaged in the press. The project's main failing occurred in the baggage handling system, which was overwhelmed by a number of otherwise minor failures. Security staff, arriving earlier and in greater numbers than the system expected, were not able to get into the car parks. Baggage handlers, not only late for work, were also insufficiently familiar with the equipment. This unfamiliarity slowed the unloading rate. The integrated monitoring system, recognizing the potential for a "logjam," did what it was programmed to do and refused to accept any more check-ins. Software designed to read BA baggage labels did not recognize transfer baggage from other airlines—an unanticipated occurrence. Short-haul BA flights were cancelled to take pressure off the system, and 400 volunteers and managers had to work around the clock to fix things.

Brady and Davies (2010b) argued that the failure of the baggage handling system constitutes what Perrow (1984) called a "normal accident": an accident that stems from the multilinearity and unpredictability of highly complex systems. The difference with this example, however, is that the problems were predicted (though not in their specific form) by the baggage handlers' union.

The outward confidence displayed by BAA managers in the technology and their own achievements prior to the opening of the terminal (Brady & Davies, 2010b) was viewed as arrogance and complacency by MPs and the press. "Surely a company faced with real competition would be less likely to make basic and complacent mistakes such as leaving staff without an overflow car park on the most important day for Heathrow for a decade," complained the then Shadow Transport Minister (Villias, reported on theyworkforyou.com). This confidence was all the more surprising given that no airport has achieved trouble-free start-up of baggage handling systems, and that BAA was well aware of this fact from its own research.

Brady and Davies (2010b) also explained the failure as one of a lack of integration in the final stages of the

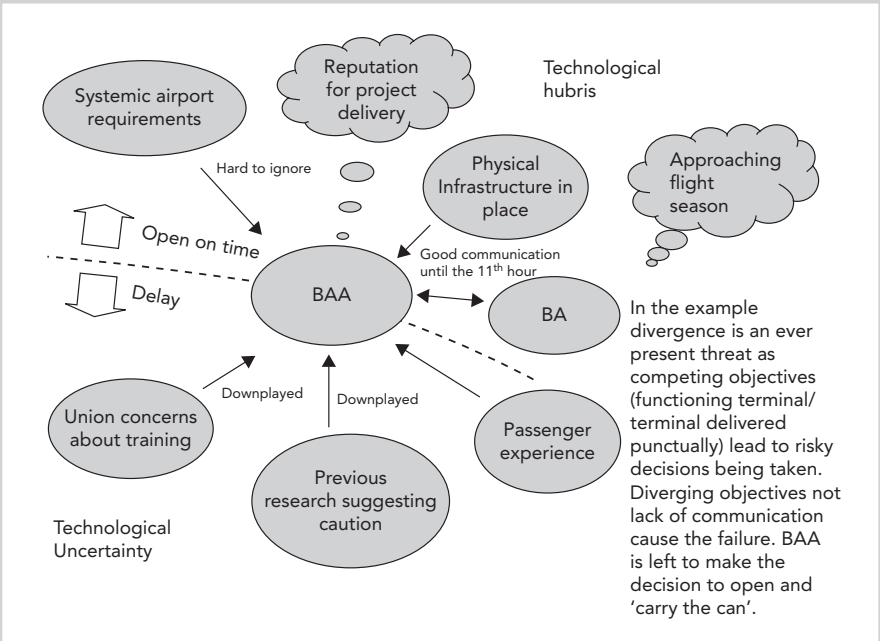

Figure 3: Terminal 5 project.

project's delivery. Colin Mathews (BAA, CEO) stated: "however well the airport operator and the airline operator, BA, are working, it is also vital that the two are absolutely integrated. . . . Around about or just prior to the opening of T5 it seems that that togetherness deteriorated." He also reported to the committee that, given his time again, he "would focus resolutely and determinedly on keeping British Airways and BAA in the same room tightly together" (Select Committee on Transport, 2008). BAA, in effect, took its eye off the ball, but it is not clear why.

Certainly up until just prior to the opening of T5, BAA's project management had been exemplary. They had for some time been developing an "integrated teams" approach to construction and applied this rigorously to the T5 project (HCTC, 2008). Integrated teams were based around partnering-style arrangements with contractors and designers to develop teams that would work together on particular aspects of projects over five-year periods, moving from project to project and learning to work more effectively (Brady & Davies, 2010a; Ivory, 2002). BAA also encouraged co-location of contractor and supplier staff to their project sites and even took responsibility for career development and training. All of this was designed to encourage the sense that BAA *was* the employer (Ivory, 2002). In T5, BAA, following the lessons gleaned from its own research into failed projects, also elected to take on the lion's share of the financial risks of the project.

BAA was thus well versed in the advantages of working closely with partners and developing strong communication, group working, and trust. Yet this seemed to evaporate as opening day approached. Mathews was keen to stress his regret over this deterioration in "togetherness" but did not explain why the deterioration occurred. The explanation may lie in another aspect of complex technology systems—their ability to carry contradictions.

Law (2000) has shown how tight integration through the centralization of control in complex technology systems may not solve operational conflicts. Complex systems carry conflicts such as those between safe operation and efficient operation, which can lead to catastrophic failures. Failures can occur as those within the system, forced to continually work within the compromises, begin to make poor and overly risky decisions to keep the system functioning. As argued in Ivory and Alderman (2005), this observation can usefully be applied to projects. The T5 project had a similar problem with conflicting objectives, although these conflicts were not evident at the outset. The reluctance to delay the opening, despite the potential operating problems that BA and BAA were aware of, came from the top of BA, the main stakeholder in the terminal: "In reality the idea of delaying things by a month was not necessarily an option that was available to us. I think, in reality, what we would have been considering was a delay of a season, which is March to the end of October" (Chief Executive BA, HCTC, 2008). T5 was not a project in isolation, but part of a transport system with its own rhythms—in this case, creating pressure to open before the main traveling season. Further pressure to open on time came from the fact that T5 was also part of a larger program of projects surrounding the modernization and growth of Heathrow. The late opening of T5 would have meant delays and extra costs for that program. T5 was also a highly visible exemplar of BAA's competence as a project managing organization, and BAA was under pressure from its political enemies on the right, many of whom (such as Villias) saw the breakup of BAA as essential for competitiveness. This was not a time to hesitate. T5 was thus bound up in what Suchman (1994) referred to as a "web of effects," a web from which it could not really escape. Although throughout the HCTC hearing BAA repeatedly referred to the passenger as being at the heart of what the project was about, this focus was not strong enough to resist the influence of these contrary demands: the perceived reputational and financial damage of not opening on time simply trumped the perceived risks of so doing (Figure 3).

The Scottish Parliament Building

The new Scottish Parliament Building at Holyrood in Edinburgh, prompted by the result of the devolution referendum in September 1979, achieved considerable notoriety in both political and public circles as a project bedevilled by both time and cost overruns on a massive scale. Three years late, the original estimate of a build cost of between £40 million and £50 million (Fraser, 2004) had risen by an order of magnitude to £431 million by the time the parliament opened its doors to Scottish ministers in September 2004 ("Holyrood Opens for Business," 2004). Yet long after the debacle concerning the escalating costs of the project and criticisms over its management, the building itself won the Stirling Prize for 2005 from the Royal Institute of British Architects, and by November 2004 had exceeded 100,000 visitors (Scottish Parliament, 2009) and completed a process of regeneration of part of the Old Town of Edinburgh (Scottish Parliament, 1998). In retrospect, what the project achieved was a landmark building for Scotland's Parliament.

The Scottish Parliament Building was championed by the then Secretary of State for Scotland, Donald Dewar. The White Paper of July 24, 1997, made it clear that this was to be a landmark building "of such a quality, durability and civic importance as to reflect the Parliament's status and operational needs" (Scottish Parliament, 1998, p. 2) and this was encapsulated in the design brief issued to prospective design teams. It seems almost certain that these aspirations had a significant influence on the eventual selection of the Spanish architect Enric Miralles, famous for his work in Barcelona, Spain, and Utrecht, Holland, who, in the words of Donald Dewar at the time of the announcement, "impressed the panel with his energy, imagination and creative approach to designing a Parliament building within the World Heritage site at Holyrood" (Scottish Parliament, 2009).

Miralles subsequently came to have a significant influence over the project, in particular through his unwillingness to compromise on quality. The introduction to Lord Fraser's inquiry report records a handwritten note by Ian McAndie, a partner at cost consultants Davis, Langdon & Everest, from March 1999: "Nobody tells Enric to think about economy with any seriousness" (Fraser, 2004, p. 8). Miralles was clearly a potentially disruptive node within the project network, whose way of working was not consistent with the needs of a client with a strict timetable and what subsequently transpired to be a vastly overoptimistic budget.

The inquiry conducted by Lord Fraser devoted most of its attention to the conventional project management approach to managing a complex undertaking like this one. In particular, Lord Fraser questioned the form of contract adopted, Construction Management, which in his view left the client open to far too much risk in terms of cost. It also focused on the conventional triumvirate of time, cost, and quality, concluding that quality and completion were both preferred over cost. What is clear is that the desired quality and iconic statement of the building could never have been achieved within the original budget. On the other hand, if this was the primary objective, the cost overruns should not have been considered problematic. Either such a landmark building was worth paying for or it was not.

An actor-network perspective, however, suggests other factors also had a significant impact on the project. The choice of architect was clearly controversial and led to a number of allegations of excess, such as the widely quoted reception desk that cost £88,000 alone (Design Build Network, 2009). In fact, the design contract went not to Enric Miralles alone, but to a joint venture between his architectural practice, EMBT, and the Edinburgh architects RMJM. The main interface with the project occurred through RMJM in Edinburgh, and the conceptual design work took place in Barcelona. For the project manager appointed, this dislocation between cities proved difficult to manage.

The evidence given to the Inquiry makes it clear that the architectural joint venture experienced difficulty in making the arrangement work, owing to a clash of personal and organizational styles: "there is an entirely different cultural approach to the delivery of buildings between Spain and the United Kingdom. Enric himself had a particular way of designing that was less structured than one might find in a major practice in the United Kingdom, and those cultural differences create operational tensions" (Fisher, quoted in Fraser, 2004). It is also clear that the design brief issued to the competing design teams failed in its role as an intermediary, in that Miralles chose to ignore a number of the key requirements outlined in the brief—notably, adherence to budget.

For the appointed project manager, Bill Armstrong, this cultural difference proved an impediment that his conventional project management experience was ill equipped to handle. The Inquiry report states that the project manager employed a highly structured approach to project management and attempted to impose that on other members of the project team. In a conventional UK construction context, this would have been understood by architects and contractors alike. However, it was not appreciated by the Spanish architecture practice and by Miralles in particular. With regard to the communication problems that were evident between the project manager and the architects, the following exchange is highlighted:

> **Mr. Campbell QC:** I am trying to find out, Mr. Armstrong, how much dialogue there was between the appointed designer, who succeeded in a competition in July 1998, and you, the Project Manager, charged with evolving the brief for the building, which that designer was going to design.

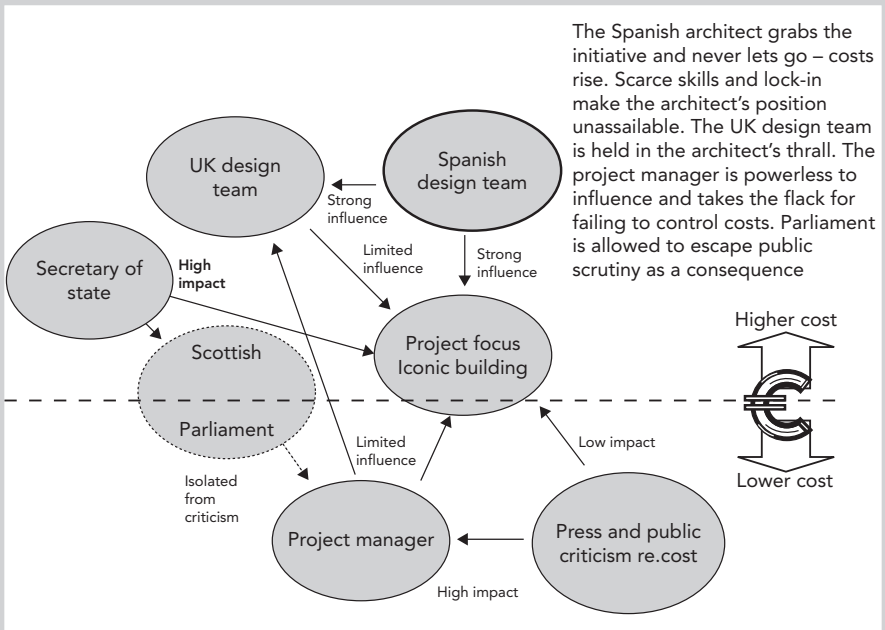

Figure 4: The Scottish Parliament.

> **Mr. Armstrong:** Very little.
>
> **Mr. Campbell QC:** Looking back on it, do you think that was the right way to go about it?
>
> **Mr. Armstrong:** It was not my choice.
>
> **Mr. Campbell QC:** That was not what I asked you.
>
> **Mr. Armstrong:** I think that is my answer. (Fraser, 2004)

The project manager appears to have been ill equipped to deal with the issue of aligning the architect with the client's timescale and budget requirements. His strong-arm project management approach is reflected in the evidence of the civil servant Robert Gordon, according to whom the project manager "was taking a pretty firm line with EMBT/RMJM and was sending them increasingly strong letters. Now I think that has a significant part to play in robust project management, but I was a bit concerned that he did not seem to have a backup strategy and that the proposition he was making was that we would have to go for the nuclear option of sacking the Design Team, or at least sacking the EMBT part of it if we did not get responses" (Fraser, 2004). The project sponsor, the civil servant Barbara Doig, under questioning, expressed the position thus:

> **Mrs. Doig:** Well, project managers are replaceable.
>
> **Mr. Campbell QC:** But architects are not?
>
> **Mrs. Doig:** The architect in this case was not.

When he subsequently resigned, the project manager reliably predicted the financial chaos and delays that followed. He understood the implications of the actions of an uncontrollable project node but appeared to lack the leverage to manage the situation, which reflected the very different framing and sense-making approaches of the architect and the project manager.

Of course, the tribulations of the project should not be ascribed to a failure to align the chosen architect with the goals of the project. Indeed, arguably the architect was aligned with the project vision, which was itself incompatible with the more conventional economic and temporal constraints placed on it by a client concerned more with political considerations than with project management implications. But as with many politically motivated projects, the lack of realism in the original budget may well have reflected the desire and need to build political support if the project was ever to get off the ground (cf. Flyvbjerg, Bruzelius, & Rothengatter, 2003), rather than to rely on conventional economic arguments that could have led to a solution within budget and on time but which failed to provide the landmark iconic emblem of a new Parliament that "reflected the aspirations of Scotland as a nation" (Scottish Parliament, 1998).

This was an ostensibly divergent network in which the two primary nodes, the architect(s) and the project manager, both tried to construct themselves as the obligatory points of passage for the project as a whole (Figure 4). Both continued to function and both tried to force the project through entirely different "frames"—cost and time on the one hand and quality on the other. But this divergence, paradoxically, was the source of the project's stability. So long as it had a project management structure, which was apparently seeking to "gain control" and "rein in costs," the project's potential enemies (the press, members of the Scottish Parliament, public opinion) were held in check while the project drew on more and more resources. The client, then, likely saw the design team as the obligatory point of passage rather than its own project manager. The project remained stable so long as everyone played their roles. The project manager, realizing he was caught in the project's web, and without a "nuclear option," felt compelled to resign.

Discussion

Our reinterpretation of the four cases through the lenses of actor-network theory, sense making, and organizational structure reveals the role that translation plays in achieving convergence and, hence, relative stability for the project. The successful translation

Project	Vision	Organization	Outcome	Network
Millennium Dome	Weak and inconsistent	Mechanistic	Failure	Divergent
Eden Project	Clear and shared	Organic	Success	Convergent
Terminal 5	Focused and shared, but with inherent contradiction	Organic on the surface—actually mechanistic	Initial failure (ultimate success)	Convergent then diverged
Scottish Parliament	Strong, but contradictory	Mechanistic	Success at a cost	Divergent

Table 1: Case summary.

of actors in distant nodes underpins success, while failure to do so exposes the project to the effects of decisions and actions potentially at variance with the needs of the project (as defined by the project management team, project sponsor, or client). It is also clear that conventional mechanisms for exchanging knowledge, such as design briefs, contracts, and the like, are not up to the task of translation, as competing frames override the intentions of those issuing them. The process of translation needs active, often face-to-face, management. Management styles that bring project actors together, both in physical and in conceptual space, are required.

In Table 1, we summarize the four case studies in terms of our interpretation of the strength of the project vision, the organizational characteristics of the project, and the nature of the network, whether convergent or divergent and in terms of the perceived outcomes. It is clear from this that outcomes are highly contingent, but that weaknesses in one aspect of the project can be overcome through expenditure of effort elsewhere. Thus, a strong vision for the Scottish Parliament building produced the iconic structure requested in the brief, albeit at substantial cost and despite a divergent network. Here a mechanistic organization worked to the project's advantage. On the other hand, last-minute divergence in the Terminal 5 network led to initial failure, but the groundwork had been done to ensure ultimate success. The Millennium Dome exhibited both a weak vision and a divergent network, and the mechanistic organization was unable to compensate. It is tempting to conclude that the strong shared vision, organic organization, and convergent network of the Eden Project provides the recipe for success, but it is clear that this was only obtained through continual and substantial effort on the part of the main protagonists.

Managing Complexity

If we accept that divergence is the enemy of effective project completion, then we can begin to formulate some tentative ideas regarding the approaches managers might take to encourage convergence:

1. **Clear, consistent, and stable vision from the outset.** While visions might change over time, management should not allow visions to fragment into competing versions of what the project is about (e.g., the Dome). While complete convergence around a single vision might be impossible (arguably the Eden Project is a notable exception), the project vision should provide a relatively stable narrative that frames how these competing demands should be ordered in terms of priority. Changes in focus can be disastrous, as the T5 case showed. Questions around good project management would concern an examination of the circumstances under which maintaining a stable vision is possible.
2. **Encouragement for convergent, organic organizations.** Convergent networks are analogous to Burns and Stalker's (1961) description of the organic organization. Organic organizational forms, in contrast to mechanistic forms, stress the importance of communication and coordinated responsiveness to changing demands. This is something that BAA's integrated teams have sought to achieve. One of the critical aspects of organic organizations, and what allows them to function so effectively even in unstable environments, is the shared and unswerving focus of its managers on the goals of the organization. Regular and frequent meetings, as Burns and Stalker note, are essential in order to maintain that shared focus.
3. **Identifying and acting on likely points of divergence.** Once there is a clearly definable vision of what the project is about, then project nodes should be considered in terms of their likely divergence and what might be done about this. BAA has sought a form of administrative vertical integration through integrated teams to prevent nodes forming. Others have reached out to distant nodes using visual media to reshape how they think about the project, or have acted to bring those making decisions at a distance literally to the project (as with the Eden Project). In network theory, this is referred to as "control at a distance"; it is the key role of the mobile network intermediary.

Achieving convergence, we should stress, is a continual process. A convergent project does not reach an end state but has to be continually "managed" in order to hold the project network in alignment and to prevent countervailing tendencies toward divergence. Convergence is thus an inherently

unstable achievement that requires ongoing management vigilance and intervention (i.e., network building).

Conclusion

In this article, we have suggested that concepts and propositions from a number of areas of theoretical development in the social sciences offer the potential to inform project management reform in ways that could shed light on managing complex projects. While a growing number of contributions in the literature apply one or another of these perspectives, this article suggests that a combination of these ideas can provide a richer picture of the operation of complex projects. It is suggested that different actors have to be enrolled (or translated) into the project network, but that this only results in genuine convergence when sense making between those actors is brought into alignment. It follows that the sense that is made of new requirements and knowledge needs to be clearly articulated and then re-articulated throughout the life of the project. This article has outlined a number of means for achieving this.

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