

Identifying Success Factors in Construction Projects: A Case Study

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ABSTRACT

Defining “project success” has been of interest for many years, and recent developments combine multiple measurable and psychosocial factors that add to this definition. There has also been research into success factors, but little research into the causal chains through which success emerges. Following the multi-dimensionality of “success,” this article shows how success factors combine in complex interactions; it describes factors contributing to project performance by a company working on two major construction programs and shows how to map and analyze paths from root causes to success criteria. The study also identifies some specific factors—some generic, some context-dependent—none of these is uncommon but here they come together synergistically.

KEYWORDS: systems thinking; project management; complexity; project success

INTRODUCTION

This study considers “success” within projects. There has been research into the factors that contribute to success (e.g., Belassi & Tukel, 1996). The nature of success has been of interest for many years; indeed, the Project Management Institute held a whole conference dedicated to the topic (see, e.g., the paper by de Wit, 1986), looking at the multi-faceted nature of the idea of “success,” particularly where success is defined beyond the simple acceptance of a product. There has been little research, however, into the causal chains by which success in terms of these different facets emerges. This study therefore looks at these chains and their interconnectedness leading to success. By looking at the inter-connectedness, the study outlines how to identify the root causes of success factors, particularly where those root causes enable multiple success criteria simultaneously. In order to look in-depth at the complex structures of effects, a single detailed case study was used, using a causal mapping method for analysis. This article expands on the extension of the ideas of systemicity into the current predominately linear dominant discourse of project management (Cooke-Davies, 2011; Edkins, Kurul, Maytorena-Sanchez, & Rintala, 2007; Williams, 2005), by looking at a particular case of projects as practice (Blomquist, Hallgren, Nilsson, & Soderholm, 2010).

An appropriate case study for this research arose in late 2013, when a UK company was coming to the end of its involvement in two major construction programs. The company had a reputation for considerable success with these programs; and since the project teams would likely be disbanded with the end of these programs, it seemed important to reflect on this success. Was it real? What does “success” mean? And, where did this success come from? This article reports the results, mainly drawing lessons about the nature of success and the inter-relatedness and complexity of success factors, and also identifying a number of key reasons for company success—some generic, and some context-dependent—but potentially useful for other projects.

Both research and practice have been moving away from a simplistic definition of project “success” as meeting cost, schedule, and performance targets, to a more multi-dimensional definition, involving both objective and more subjective criteria. However, the inter-relationships between these criteria are less well researched. Similarly, success factors are often theorized, but there is little research into the causality; in other words, “how” these factors lead to project success. This study therefore looks at the drivers for the various success factors, to see where they inter-connect, and what the key root causes of project success are. This is interesting from an academic perspective, but is particularly important to help the practitioner understand how improving these root causes will lead to increased performance in multiple project criteria.

The article considers the method and then the case; it looks at the literature around the definition of project success and how this case compares; it looks at the literature behind success factors; then at the analysis of this case to see the interacting nature of the factors and the tracing of success outcomes back

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to root causes. Conclusions are drawn about the content of the factors but particularly about the underlying systemicity. Although there is some discussion about the success of the projects, the aim of this article is to consider root causes and systemicity within the causal chains rather than audit the programs.

Method

In order to capture the view of interconnectedness and systemicity of the factors, this study used "causal maps" (Eden & Ackermann, 1998) to plot out what caused what, and how these causal chains and combinations led to project success—a type of analysis becoming used more in project management, as analysts try to understand the complexity of projects (Edkins et al., 2007). Maps produced using Decision Explorer software (Banxia, 2013) can be seen in the figures throughout this article, where arrows represent causality; the concepts are numbered, but this is only for convenience and has no meaning other than for identification.

The first and main part of the study consisted of two workshops in which teams of managers drew up causal maps of effects in an attempt to uncover the chains of causality. The first workshop entailed staff with an overview of the construction process, including directors, project, site, and commercial managers and planners; it was not clear that there was sufficient knowledge of the later stages of a project, so the second workshop also included Facilities Management (FM). The maps were projected on a screen by the author, so all workshop participants could see the causal structure being generated and contribute explanations (all discussions were led by the author rather than using the multi-computer "Group Explorer" system, whereby all participants directly contribute to the model; Ackermann, Andersen, Eden, & Richardson, 2010).

The first part of each workshop sought to define "project success," starting from a "blank sheet of paper." Following this, the diagram was built by

chaining back in causality by asking "Why?" or "What caused this?" Again, "grounded" in the sense that no external "best-practice" or literature-initiated input was given to the workshop. Views in which possible root causes were suggested were subjected to chaining forward by asking: "So what?" or "What would the implications of this be?" to develop the richness of the diagram. Similar considerations were given to intermediary concepts. In order to help ground the discussions in actual cases, four cases were chosen as typical for this study (see as follows). The maps noted where particular cases were good examples of the concepts identified and where particular evidence could be obtained later to back up the claims made. The cases provided a useful check to looking at the causal chain developed and see whether the team recognized the effect from the case study (see as follows). These evidential and exemplar links have not been reproduced in this article but were essential to grounding the overall study in reality.

The maps resulting from the workshops, having been built visually in front of the team, were reasonably easy to read. After the workshop, the author divided the diagrams into six areas, in roughly temporal order, simply to make the diagrams readable, without changing the logic. The language in the diagrams was left as the informal language captured in the workshops. The use of the workshops was a very efficient use of the time of the teams, which was very limited; a study that sought to be fully auditable would have spent a subsequent phase revising and checking the logic of these diagrams; as they stand, however, they represent the views of the teams. The respondents felt they "owned" the maps as a group, but the sources of individual inputs are deliberately not recorded, as is normal in such studies (Eden & Ackermann, 1998).

Such workshops on single projects are not unknown, either in forensic (e.g., Delay and Disruption) claims work (Williams, Ackermann, & Eden, 2003) or

in "lessons learned" exercises (Williams, 2004). This study of a project program was more akin to the latter; workshops were fairly small, in this case approximately 8 to 10 participants, carefully chosen with an appropriate mix of skills to ensure coverage of the main knowledge areas, and provide the opportunity for participants to "piggy back" off each other's knowledge and memories, challenge views, and together develop a comprehensive overview (Ackermann & Eden, 2001). The workshops attempted to complete loops where they were found and chained up and down to the end of causal chains; however, time constraints meant that large saturated maps were not developed as in the former type of study.

The second part of the study considered the maps, looking for evidence (statistical or cases) to support or refute the statements; although this was not an "audit," it served to ensure the study was not misled by company myths. The evidence came from a wide variety of sources, including site statistics, defect data, safety statistics, externally executed employee engagement surveys, subcontractor payment statistics, customer satisfaction data, evidence of community engagement; "considerate constructor" actions taken to increase community satisfaction, such as behavior codes near a school; employee posters displayed around sites; architect selection scoring sheets, the supplier database, supplier inquiry documentation, and selected meeting minutes. The final report contained references to much of these data; however, the main aim of the study (and this article) was to uncover causality, root causes, and the systemicity within the causal chains; the case study showed *why* the programs were successful, rather than quantifying the success, but this lack of quantification should be recognized as a limitation of this article.

The Case

The 140-year-old Sewell Group (Sewell, 2013), based in Hull, United Kingdom,

has an annual turnover over UK£100 million (over US\$150 million). Its main business is in estates, covering a range of activity. The Group has carried out construction projects in and around Hull since the turn of the century under two major UK Government Public Private Partnership (PPP) programs involving complex partnership schemes. The first, Building Schools for the Future (BSF) (National Audit Office [NAO], 2009) aimed to refurbish or rebuild every secondary school in England over 15 years; the second, the Local Improvement Finance Trust (LIFT) programs (National Audit Office [NAO], 2005), involved building health facilities. From investing, through design and construction, to facilities management (FM), Sewell attempted to deal with a project from inception to operation with a seamless approach to try to maximize value for money, buildability, and customer satisfaction. (While opportunities exist in the BSF program for FM, this is not part of the core offering from Sewell, but all of the 12 completed LIFT buildings incorporate FM involvement). With these two programs coming to an end, with the expectation that teams would start to be dismantled, this seemed to be a good opportunity to try to capture where the teams' success came from, if indeed they had been successful. It became clear that there weren't one or two individual "magic bullets," rather a number of factors came together to produce success, strengthening the approach taken. The workshops looked at the programs overall, but grounded discussions in four cases—two schools and two health units—one of each being a notably larger contract than the other.

Project Success

It is clear that without an adequate definition of project success, the performance of a company over a program of projects cannot be assessed (Müller, Martinsuo, & Blomquist, 2008). But what is project success? Steiner's (1969) definition of a project included: "Projects generally involve large, expensive,

unique or high risk undertaking which have to be completed by a certain date, for a certain amount of money, within some expected level of performance" (p. 16). This threefold criterion of success—meeting cost, schedule, and performance targets—has in the decades since become widely used as a standard success criterion often called the "iron triangle." Barnes (1988), sometimes credited with inventing the "iron triangle," states (with particular reference to construction projects) that "the client's objectives are always a combination of the objectives for performance of the completed scheme, for achieving this performance within a named cost or budgetary limit and for getting the project into use by a target date" (p. 69).

By the late 1980s a wider definition was being sought, which captured both the success of the management of the project, and the success of the project output. This was when the Project Management Institute held the conference noted earlier. Pinto and Slevin (1988) brought in both the internal (project) and the external (client) views. Morris and Hough (1987) discussed project success in terms of project functionality (did the project perform?), project management (the "iron triangle"), contractors' commercial performance, and project cancellation (where relevant). Perhaps the most influential framework seeking thus to widen the definition was developed through work with the U.S. Agency for International Development, then the United Nations and OECD (Samset, 2010, Chapter 2). This characterizes a project's success in five ways: (1) efficiency (Could the outputs have been produced in a better way? Was the project well managed?); (2) effectiveness (Were the goals achieved? Did the output meet the goals?); (3) relevance (How useful was the project to the organization in context? Was the goal aligned with the needs of the organization?); (4) impact (was the goal appropriate to the purpose of the organization? What was the sum of the anticipated/unintended effects

of the project?); and (5) sustainability (Will the positive impacts of the project continue longer term?). Thus, a project such as the Sydney Opera House or the Scottish Parliament, famously over budget and late, but producing iconic buildings, might be considered unsuccessful in efficiency but effective; Samset's (2009) Norwegian off-shore torpedo battery (on time and on budget but closed down by Parliament a week after opening) could be described as successful in efficiency terms, but unsuccessful in impact, relevance, and sustainability. Similarly, a project such as the Three Gorges Dam appears successful in terms of efficiency, effectiveness, and relevance, but has been the subject of considerable debate in terms of impact.

Shenhar and Dvir (2007) have a not dissimilar set of five measures, but broken down hierarchically (Fig. 2.1, p. 27); one of their five measures though is an internal "impact on team," a similar concept to that in Chipulu et al. (2014), discussed as follows. They also show conceptually how these measures change in relative importance over time (p. 31). A longer-term view is thus required: How the success of a project is viewed will often depend on the phase it is in, or how long it has been since the project was completed. Some projects seen as successful or unsuccessful are seen quite differently in the longer term (e.g., Orlikowski & Yates, 2006).

Different stakeholders will often have quite different definitions of success and perceptions of what constitutes project success. A comprehensive literature survey in Davis (2014) shows the evolution of the idea of project success over successive decades and shows little commonality between the definitions of senior management, project teams, and project recipient stakeholders. Research showing that project success is clearly related to an agreed on and common view of success criteria between the stakeholders (Turner, 2004) becomes (while a valuable statement) almost a truism. The

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necessity of engaging stakeholders and their view of project success become even more important in cases in which project execution requires developmental input from both the purchaser and supplier or from many stakeholders, such as the value co-creation in major defense projects (Chang, Chih, Chew, & Pisarki, 2013). Some criteria are clearly measurable but others are subjective or psycho-social (Bryde, 2005).

This case is largely involved in the construction phase of PPP projects. But the advent of PPP is a key type of a general move in construction management toward "servitized" construction, in which the contractor takes increasing responsibility for the post-construction performance of the building, as discussed in Caldwell, Roehrich, and Davies (2009). This turns the procurement activity to "procuring complex performance" (Lewis & Roehrich, 2009) rather than procuring a complex building, even if the client is not always fully aware of this. Caldwell et al. (2009) therefore discuss how complex performance can be procured in the design and construction phases of major construction buildings. They emphasize the need for informal control and the key area of "trust and mutual commitment" within such construction—in a complementary role to the formal and contractual structures (particularly within PPP; Zheng, Roehrich, & Lewis, 2008). The need is even greater if we consider

the long-term relationship between the supplier and buyer (Nixon, Harrington, & Parker, 2011).

A single definition of "success" is clearly not possible; indeed, Nixon et al. (2011) describe a definition of project failure as "unattainable" (p. 212). Müller, Geraldi, and Turner (2012) use the "iron triangle plus nine other success criteria" (p. 78), although in using these empirically they ignore one criterion and use the mean of others, hence losing richness of the 10 different potential dimensions in their definition. "Some conceptualize ['project success'] as a uni-dimensional construct concerned with meeting budget, time and quality... whereas others consider project success a complex, multi-dimensional concept encompassing many more attributes" (Mir & Pinnington, 2014, p. 203). Some look to categorize sets of criteria: Shenhar's empirical work (Shenhar, Tishler, Dvir, Lipovetsky, & Lechler, 2002) used 13 criteria divided into "meeting design goals," "benefits to customers," and "commercial success and future potential." Factor analysis can be used more formally to combine criteria, such as Chipulu et al. (2014), who empirically find two factors: one involving hard goals and project control; the other project team management and intra-organizational goals. (This is not to be confused with the Success Factor work discussed as follows, looking at the factors that create success.) The key finding

from this literature is not the content of the criteria, but the multiplicity of the factors and their overlapping nature. We need to consider all the factors and their inter-relationships to capture the concept of "success."

Project Success and the Company

The company would not necessarily have known all this academic literature; indeed the concept of the "iron triangle" is so embedded in the project management culture generally that there is a line of argument that the prevailing culture limits project managers from thinking outside of this subconcept of project success (see the Foucauldian argument of Hodgson, 2004). So what happened when the Sewell teams discussed how they viewed project success? This was a discussion with no input of content from the facilitator so should reflect on the mindsets of the managers. After considerable discussion, their definition covered four related areas, which can be broken down into 17 subsections, as shown in Table 1.

Table 1 shows a considerable appreciation for the broader concepts of project success. The "iron triangle" is there, although not highlighted as the first item (on-time and on-budget only coming into the second section)—and even the efficiency definition is richer and more subtle, including changes, disputes, contracts, and health and safety.

Was the final product good?

1. Zero defects on building handover
2. Low defects in use
3. Better FM service and resultant increased life cycle performance of the facility

Were the stakeholders satisfied with the project?

1. Happy customers
2. Happy users
3. Happy subcontractors
4. Happy Sewell team (which would of course lead to better project performance)
5. Good community relationships

Did the project meet its delivery objectives?

1. On time
2. On budget
3. Production of a legacy, not just a building

Was project management successful?

1. Good health and safety record
2. Projects set up better and better contract
3. Fewer changes
4. Fewer disputes
5. Smooth/clean/tidy site
6. Predictability and control of cost, time, quality, and risk

Table 1: Success criteria.

The need to take all stakeholders into account is clearly uppermost in the minds of these managers, including not only those with power in the project (customer, users, subcontractors, and the project team) but also the wider community. Of particular note is the long-term perspective—the desire to leave “a legacy, not just a building.” It could be argued that not all of these are ultimate “success” criteria; we will return to this point in the following discussion.

Success Factors: The Literature

What are the factors that can lead to project “success”? There has been much literature attempting to identify these factors; some of this work is popular with those looking for a “magic bullet” or simple generalizations. Belassi and Tukel (1996) summarize and classify what had been found by the mid-1990s and provide some general categories. Much of the early work was through practitioner surveys: Pinto and Slevin (1987) and Pinto and Mantel (1990) found 10 critical success factors (one of which is discussed below), which they found to be generalizable to a wide variety of applications. Cooke-Davies (2002) looks to answer not only “what factors lead to project success?” but also “what factors lead to a successful project?” and “what factors lead to consistently successful projects?” The last factor is reflected in the findings that follow. There are also a number of detailed case studies, which can provide some insights, particularly through cross-case comparisons, most notably in the seminal work of Morris and Hough (1987), which gave a framework, including 84 factors grouped under 10 headings. In more complex and ill-defined projects, such as IT systems projects, the factors-based approach has been considerably criticized, because of the difficulty in definition; lack of empirical validation; clarity between “factors” and “concerns”; prescriptiveness; and, of course, the difficulty in defining success (see specifically Sauer [1999], who

concludes that these issues “strongly suggest that the approach has not been successful,” p. 290). These criticisms also apply to construction projects.

There are essential lessons to be drawn from this literature—perhaps the needs for collaboration and communication being the most consistent (e.g., El-Sheikh & Pryke, 2010). Increasingly, however, the success of projects has come to be seen to be context-dependent, with there being no one “right” answer. Shenhari and Dvir (2007) in particular (building upon Shenhari et al., 2002, as discussed earlier), show how determining success factors in all projects is context-dependent, and build up a structure of contexts involving the extent of the project’s Novelty, Technology, Complexity, and Pace (the well-known four-dimensional “diamond” model). Williams (2005) arrives separately at a not dissimilar structure of the extent to which a project is (structurally) complex, uncertain, and time-limited.

PPP projects exhibit particular attributes due to the long relationships involved. Liu, Love, Smith, Regan, and Davis (2014) analyzed the normative literature on PPP success factors to derive a set of factors within the different lifetime phases of PPP infrastructure projects, with different success factors within the initiation/planning phase, the procurement phase, and the partnership phase. The case discussed in this article was largely concerned with the first of these two phases.

Beyond these attempts at making a taxonomy of contexts, however, the literature now often draws conclusions about the success or failure of projects within their specific contexts and histories, which is how we will look at these projects in the following section. This also aligns with the increasing concern to research “projects as practice” looking at the praxis, the practitioners, and the practices within the situated context (Blomquist et al., 2010; Cicmil, Williams, Thomas, & Hodgson, 2006).

Looking at the situated context is also important, because research can

be seen to have often identified and sometimes theorized success factors; however, there is little discussion about the “how”—looking at the causality of producing project success. To take one example, Nixon et al. (2011) claim that “leadership performance is significantly important in determining project outcome,” but without seeing the relationships, “further research [is] necessary to better understand....” (p. 3). Some look at moderating factors—looking at the same variables, Müller et al. (2012), for example find that project complexity has a moderating effect between leadership and success. For this article, the earlier discussion about the multiple-interacting criteria within the definition of project success, would suggest that there are likely to be multiple-interacting causal chains of factors producing project success in this richer definition. This will guide the case study.

Case Findings

To show how the various factors come together, the workshop maps show diagrams of factors, the arrows showing causality. The workshop “success” definition (see above) is shown in these diagrams as highlighted shadowed boxes. The maps, shown in Figures 1 through 6, consisted of six areas, roughly in causal order. Company culture was seen above to be a key factor and is the subject of the first diagram; the second concentrates on a smaller area, the “Single Team”; the third map covers the project setup, which was also seen above as important; then two smaller areas have been put into separate maps for ease of reading: customer satisfaction and subcontractors and the construction site; the final map covers post-handover.

Company Culture

The start of the causality lies within the company culture, as shown in Figure 1. Sewell has a family business ethos rather than that associated with big corporations. With a flat structure and lean form, the company considers that it exhibits a bias for action, openness,

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and expedient decision making, and publicly declares a "no blame" environment. The company culture starts with leadership from the managing director, exhibiting similar characteristics and similar causal outcomes as those described in Pillai and Meindl (1998). The team of project managers appeared distinct from project management skills, known to be an important factor in project success (Nixon et al., 2011). However, there are other external factors at work, which can be seen to be roots of

causality and that might not appear in the general literature. One is the locality of the company: it is based in (and well-known in) the city; Hull is an east-coast city, somewhat geographically isolated within the United Kingdom, meaning that there is a strong sense of

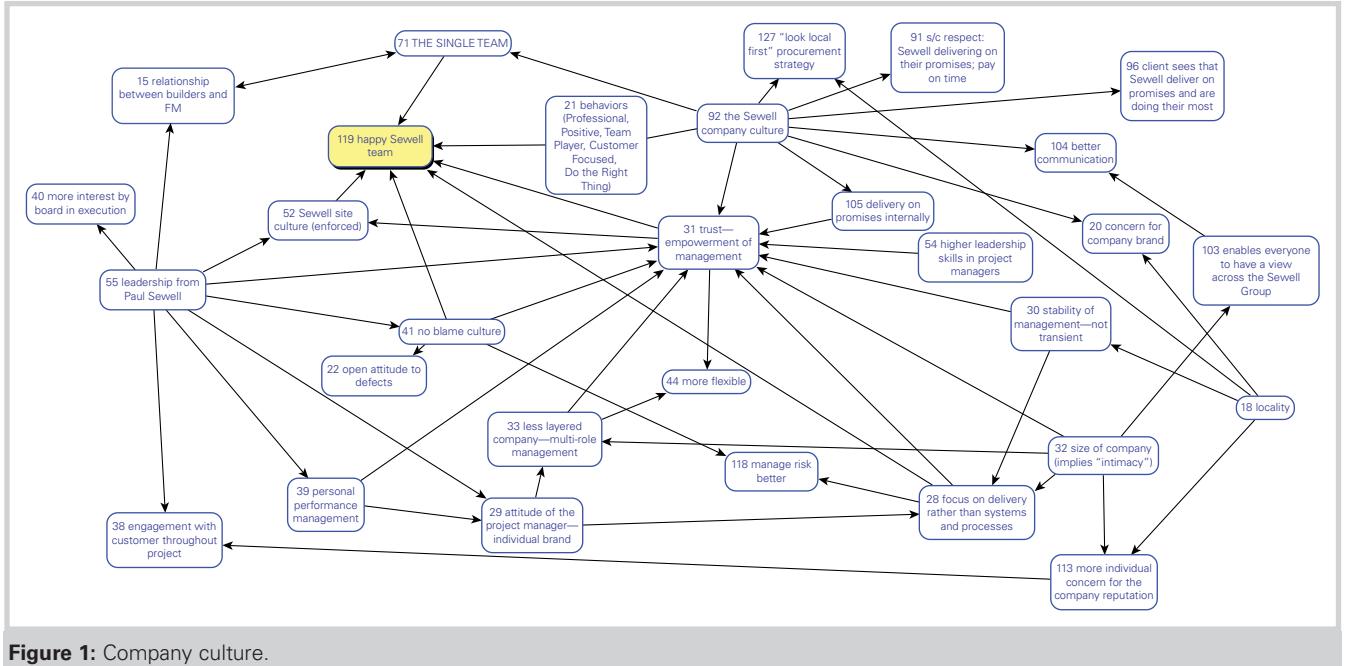


Figure 1: Company culture.

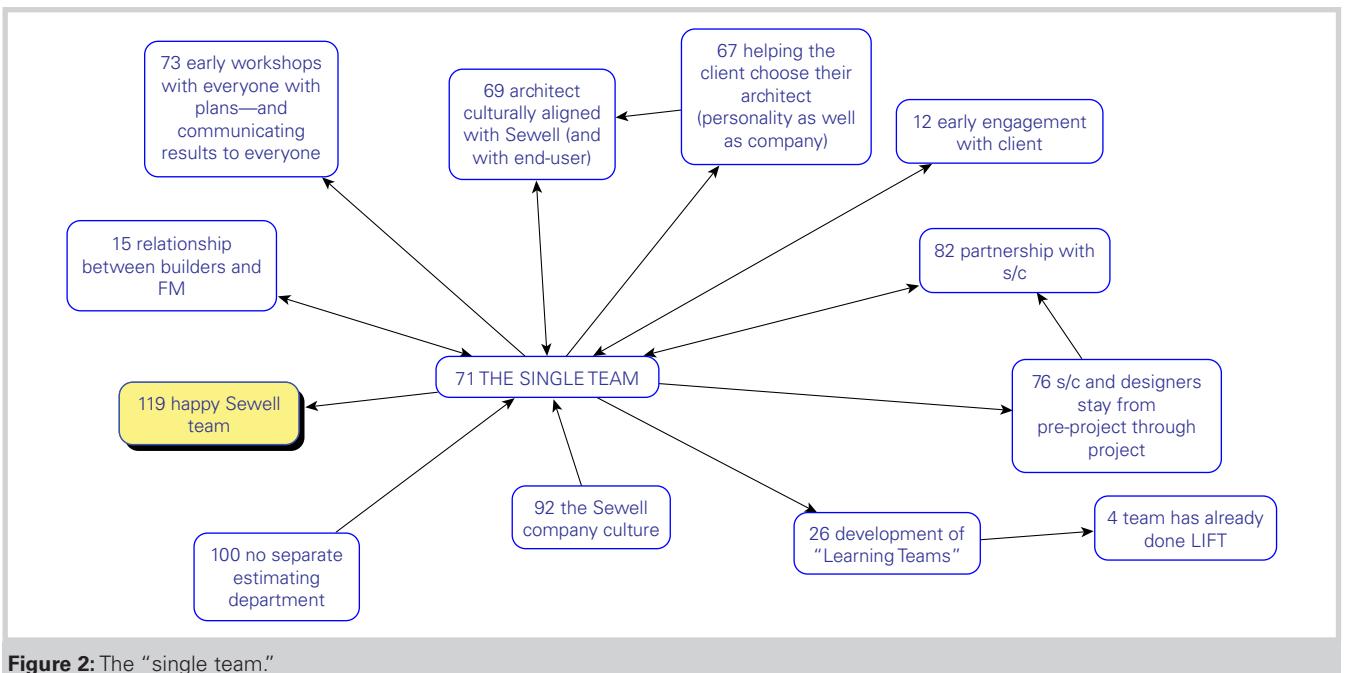


Figure 2: The "single team."

identification with the city and a close-knit community; the effect of being a local company in Hull is greater than that in a less isolated city. A second effect is the size of the company: big enough to take on these projects, yet small enough that members of the management team all know each other and the workforce has a sense of intimacy.

From these factors follow many ramifications (see Figure 1):

- One implication of the locality, as a fairly isolated city, is that the management of the company has been stable rather than transient. Combined with the size and the culture of the company and its top-level leadership, this has important ramifications. The company is less layered than usual, with teams reporting directly to the Board, meaning that more trust is placed in the empowered site based project managers and managers can work flexibly, sometimes doing work that properly lies in each other's territories.
- Arising from these factors is a focus on delivery rather than systems and processes. Although the company has embraced Quality Systems (BS5750, ISO 9001, Six Sigma), each employee has Performance Agreements that go beyond his or her role profile. There is more individual concern for the company reputation within employees (as indicated by company questionnaires), and individual managers feel a personal investment in the projects, leading to more customer engagement. The company has established "behaviors" upon which the company hires/fires and rewards: "Professional, Positive, Team Player, Customer Focused, Do the Right Thing"; all staff are required to buy into these fully. The locality of the company means there is a strong concern for the company brand among management.
- There is a noticeably high interest within the Company Board in project execution, known to be a success factor in projects (Thomas, Delisle, & Jugdev, 2002).
- Externally, clients appear to see the company delivering on promises and doing its utmost in projects. The company engenders respect from subcontractors as they are seen to be delivering and averaging payment times markedly lower than tender expectations, resulting in the company being able to demand performance from subcontractors and their best (even requesting named) operatives.
- The concept of the "Single Team" is an important part of the culture as we will see as follows.
- The size and nature of the company enable management to have a view across the Group, leading to better communication. All staff members are encouraged to participate in top-level business planning, including a regular balanced scorecard. Weekly "huddles" are held across business units to review issues encouraging feedback, with cross fertilization from members attending other huddles.
- A "no blame" culture leads to an open attitude to detection and discussion of defects and a better ability to manage risk. However, mediocre performance is not accepted; Personal Improvement Plans are used, and if performance is not improved, employees are required to exit the company. At a site level, the use of warnings or even indefinite expulsions enables identification of operatives not performing to the site induction's expected levels.
- Finally, company culture leads to a site culture, including "skip level" management where each employee is encouraged to meet with the Managing Director, without his or her line management. This is supported by each director participating in advertised "back to the floor" days and attending sites across the company estate to work actively within the business at the site level.

The "Single Team"

The idea of the "single team" is an important part of the company culture; this covers a range of issues as shown

in Figure 2. LIFT and BSF allowed the company to follow the ethos of the influential Latham Report (Latham, 1994), which called for partnering (which "includes the concepts of teamwork between supplier and client, and of total continuous improvement. It requires openness between the parties, ready acceptance of new ideas, trust and perceived mutual benefit" (p. 62), and the later Egan Report (Egan, 1998), which also emphasized integrated process and teams. The single team approach covers subcontractors and designers staying from pre-project throughout the project; it includes early engagement with the client and a close relationship between construction teams and those carrying out FM. It includes helping the client choose their architect (personality as well as company) and helping to get an architect culturally aligned with the company and end-user. It obviates the need for a separate estimating department that prepares bids and then "hands the project over" to the team (a well-known issue; e.g., Verner, Overmyer, & McCain, 1999). Through this greater collaboration and consistency, "learning teams" were formed, which naturally gel together and improve the product, from which, when rolled from scheme to scheme based on performance, bring continuous improvement to a program of work such as that in LIFT or BSF (avoiding learning loss when teams are disbanded post-project; Williams, 2008). Innovation in small, project-based construction firms is known to come from "learning on the job" (Barrett & Sexton, 2006).

Project Setup

The culture enables a range of effects in project setup—often considered the stage crucially determining success (Williams & Samset, 2012). Figure 3 shows some of these effects. In this figure, two key concepts—numbers 92 ("the Sewell culture") and 71 ("the single team")—are removed to make the diagram readable; however, the ramifications of these two concepts can be seen

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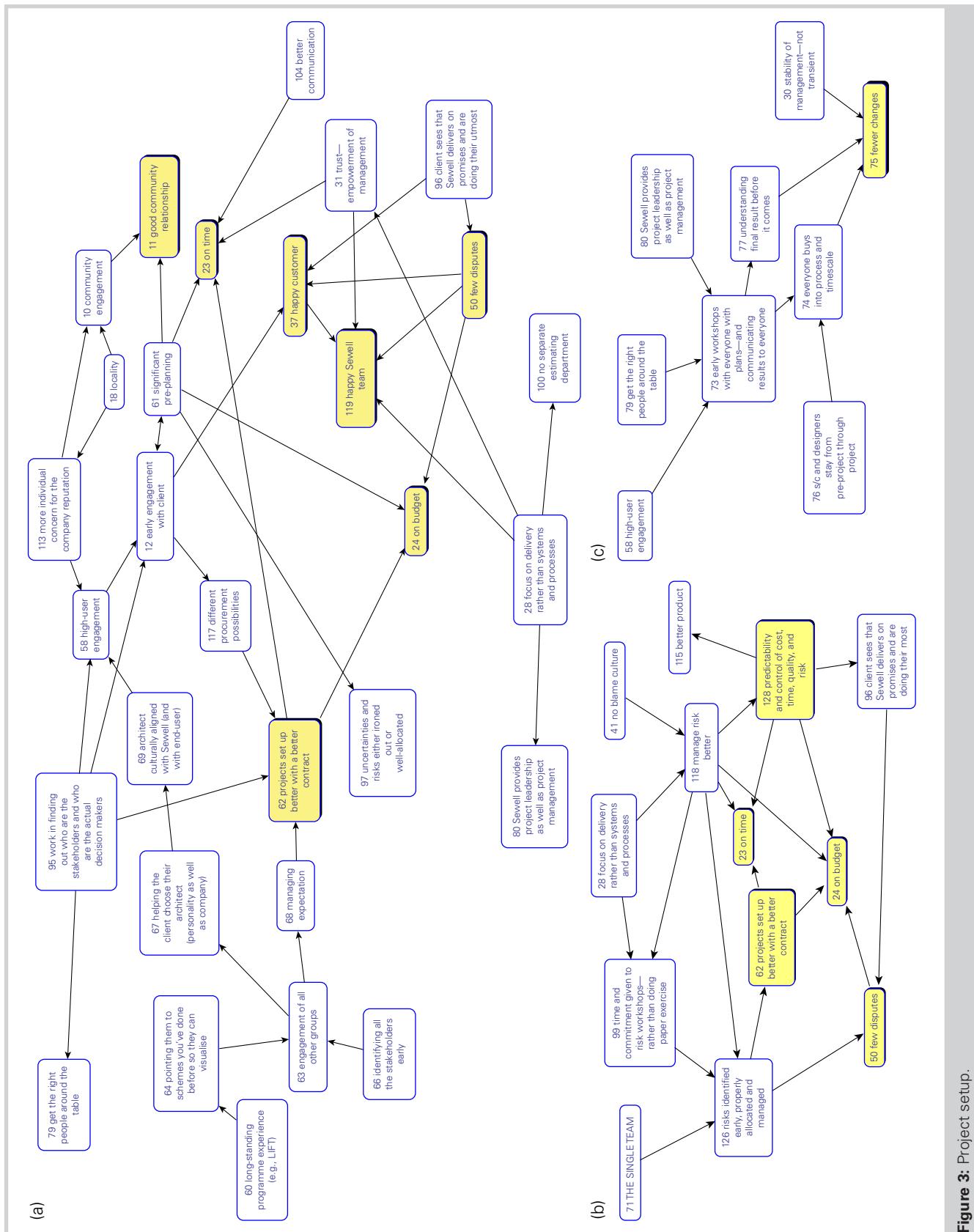


Figure 3: Project setup.

throughout the diagram. There are also two other inputs to this diagram, specific policies pursued by the company as part of stakeholder management: identifying all the stakeholders early, and work in finding out who the actual decision makers and stakeholders are (see, e.g., Sutterfield, Friday-Stroud, & Shivers-Blackwell, 2006, for the dangers of not doing this). Figure 3 has been divided into three parts to help readability: Figure 3(a) contains most of the material but interlinked with these are specific parts separated into Figure 3(b,c). There are many “causal chains” here, which feed into the various project success criteria, outlined as follows.

The focus on delivery rather than systems and processes (and project leadership as well as project management) leads to a number of initial meetings (initial representation of organizations’ board of directors establishing the right attendees); early workshops with all stakeholders with plans (and the results communicated to everyone); and time and commitment given to risk workshops. Pre-planning means that risks are either resolved or well-allocated; stakeholders “buy into” the

process and timescale; users and clients understand the final result in advance; there are fewer changes (see Figure 3c) as the project proceeds; many issues are avoided rather than retrospectively addressed (thus, blame is avoided); and people are encouraged to help resolve arising issues. One of Pinto and Mantel’s (1990) 10 critical success factors was “Communication, consultation, and active listening to all impacted parties.”

The engagement of all groups helps to manage expectations, which leads to better project setup and contracts. Consistency of personnel—across the company, supply chain, and client teams, for the duration of the project, with minimal changes, all buying into the design, program, financial position, risks, and construction method—helps lead to greater collaboration. Fewer disputes, significant pre-planning, better project setup and contract, better communication, and better management of risk all help to create confidence in the “iron triangle.”

Figure 3(b) shows the treatment of risk (a critical success factor in Liu et al., 2014). As is good practice (Association of Project Management, 2004), risks

are identified early, properly allocated by the “single team,” allocated on the basis of who is the most appropriate to accept or manage that risk, assigned the proper action (management, mitigation, or removal) and costed with the benefit of that action remaining with the owner of the risk. This leads to a good project setup with a better contract and fewer disputes. Predictability and control of cost, time, quality, and risk help to lead to delivery on bid and community promises.

Long-standing program experience enables the company to point users to previous schemes to help visualize the product, which enhances engagement and helps the client choose the architect. High early user engagement shows the client the different procurement possibilities. Early engagement with the client and visible efforts to achieve delivery on promises keeps the client satisfied and results in fewer disputes.

The locality and the individual concern for the company reputation lead to close community engagement, which combined with the high level of pre-planning leads to good community

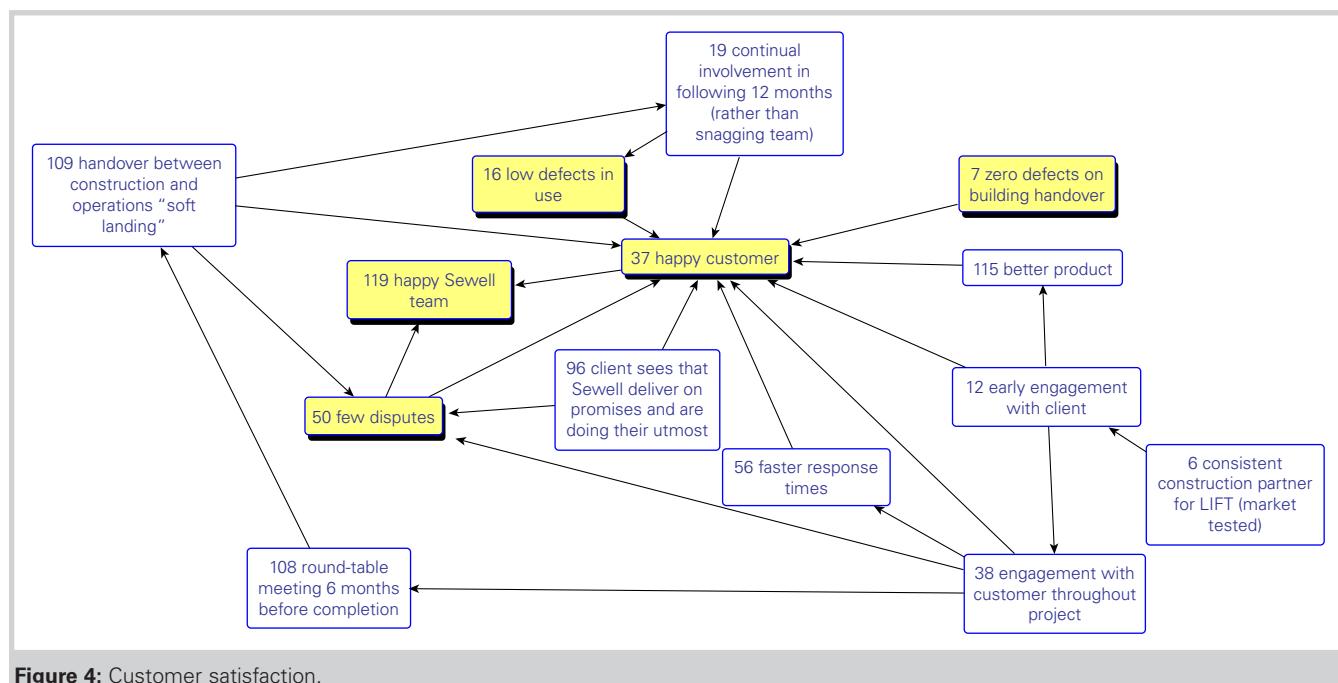


Figure 4: Customer satisfaction.

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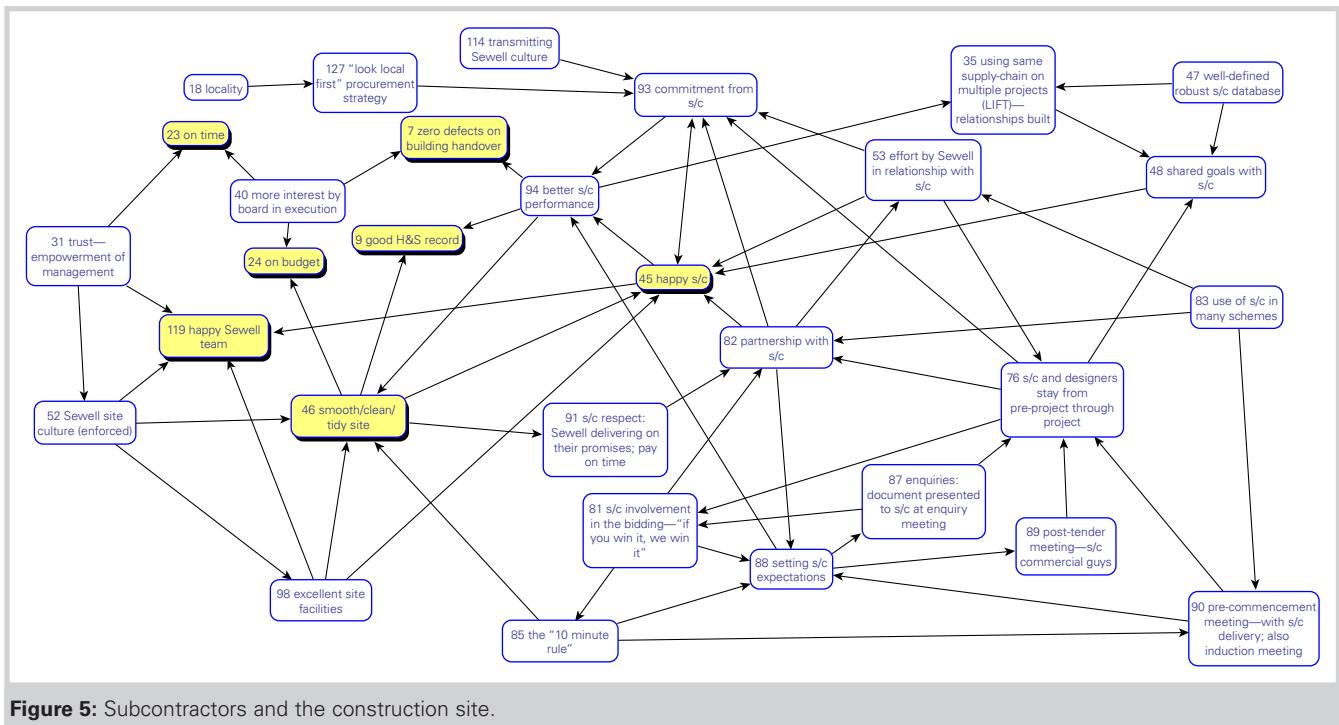


Figure 5: Subcontractors and the construction site.

relations. This is increasingly recognized as an important success factor: Smit (2001) in describing his Eden project says “[a] mountain of paperwork, a design team from heaven and some up-country big cheeses count for nothing in Cornwall without local support” (p. 103). Key site statistics are clearly displayed on the site board giving openness on key performance indicators (KPIs) (e.g., accident rates, recycling, program position, apprentice numbers, local labor, and local spend. Investment in better-than-expected site facilities creates an experience and sets the tone of what is expected from those entering the site.

Customer Satisfaction

In terms of the theory of Treacy and Wiersema (1993), the company has progressed through excelling at “customer intimacy” while being above standard in operational excellence and product leadership. Customer satisfaction comes from a combination of factors (Figure 4). First is engagement with the customer throughout the project and subsequent response times. This agrees with the findings in Demirag

and Khadaroo (2010) that “satisfaction levels in school PFI projects relate to the extent of involvement with the scheme” (p. 18); although again, this is partially context dependent since the authors continue: “bigger PPP schemes may militate against this because compromises are more likely to be made in the bigger schemes” (p. 18) (“bigger” here means those above £20 million [US\$30 million]—approximately half of the projects studied in the current study fall into this category). Second, the long exclusive relationship with LIFT over a number of projects enables an early engagement with the client and a better product. Few disputes on the project help customer satisfaction, as does the client seeing the company deliver on promises and doing its utmost (mirroring the importance of trust in the work of Roehrich, Lewis, Caldwell et al., discussed above). A final factor is a product that functions better, for various reasons; there is a round-table meeting six months before completion and a handover between construction and operations to provide a “soft landing” and continual involvement by the proj-

ect team (rather than a snagging team) in the 12 months after handover, leading to very low numbers of defects on handover and in use.

Subcontractors and the Construction Site

The way the company procures and treats subcontractors and the way it keeps construction sites, flow from many of the ideas above (see Figure 5). Again, the “company culture” has been left off this diagram to aid readability, but the consequences of the culture can be seen throughout the diagram. The company puts much effort into subcontractor relationships; it has a good subcontractor database and has been using the same supply-chain on multiple projects in each program, building good relationships, and enabling the realization of efficiencies. With the locality of the company, there is a “look local first” procurement strategy. This helps to build close partnerships, with subcontractors staying from pre-project through the end of the project. The subcontractor is involved in the bidding, helping to build shared

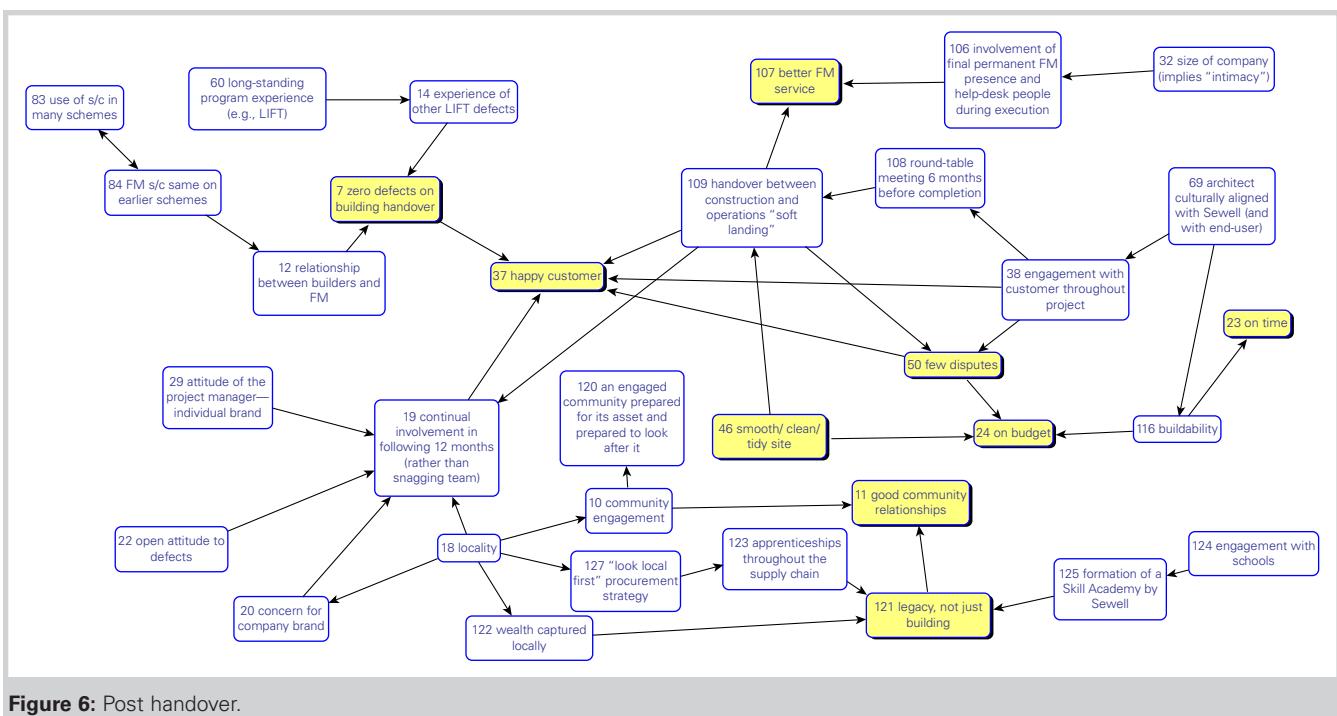


Figure 6: Post handover.

goals. At the inquiry stage a document is presented to the subcontractor to help establish expectations, and there is a post-tender meeting with the subcontractor commercial team. For the subcontractor delivery team, there is a pre-commencement meeting and site-specific induction meetings, all helping build the “single team,” with the company culture transmitted throughout. This partnership leads to commitment and respect from subcontractors, helping performance; along with the company ethos, this results in the subcontractor being well placed to continue working throughout the program. Company sites are notably clean and tidy (a rule enforced is that the last 10 minutes of the day are spent tidying the site), which helps promote pride and commitment to the project and makes work more efficient and mutually reinforcing. Better subcontractor performance and the smooth, clean, tidy site, combined with the interest by the board in execution and the empowered project management, all lead to better “iron triangle” performance and also a much better health and safety record

than the industry average (from government statistics [Health and Safety Executive, 2012]) and fewer defects.

Post Handover

The after building handover is shown in Figure 6. Concentration on the capital delivery with insufficient attention to later operation has been identified as the reason for poor quality in, for example, the Millennium Dome (National Audit Office [NAO], 2000). A long-term maintenance responsibility beyond completion could be expected to encourage design and build quality. In light of this, the company tries to “feel” like the end-user through FM; this team is part of the single team throughout the process, giving the client confidence. Liu et al. (2014) discusses the often under-recognized importance of this as a success factor.

With the long-standing program experience of typical defects, plus the relationship between the construction and FM teams (either from the company group, or known from earlier schemes), there are minimal defects during handover. Engagement with the

customer throughout the project and the emphasis on customer satisfaction, help minimize disputes during and after construction, aided in part by enhanced client training during the soft landing period, and the “no blame” philosophy. The locality of the company and management’s concern for company brand means there is continual involvement in the project during the 12 months following handover, rather than sending in a “snagging team” (a separate team that rectifies minor faults). The open attitude toward defects and the personal investment by the project manager in the project make this process open and efficient in ensuring minimum disruption caused by defects post-handover.

Success in the longer term, as discussed above, includes a measure of how the client and end-user feel after one year in the new building; the low levels of contractual penalties incurred by the company perhaps show how that manifests itself in reality. In the case of the LIFT buildings, landlord carries out regular customer feedback surveys and these are used to further improve facilities management (FM). Using an

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architect culturally aligned with the company and end-user helps produce a buildable design and enhances engagement with the customer during the project. The meeting six months before completion establishes issues, and the tidy site helps the "soft landing." This combined with the involvement of the final permanent FM presence and "help desk" staff during execution of the project (the smaller company helps preserve these relationships rather than a distant unknown "help desk") all lead to better FM service.

We have already seen the importance placed on good community relationships: an important effect of this post-handover is that it leaves an engaged community prepared for its asset and prepared to look after it. It is important for the community that what is left is a legacy, not just a building. In the case of these projects, this includes the company's "look local first" procurement strategy, wealth captured locally, apprenticeships throughout the supply chain, and engagement with schools leading to the formation of a skills academy.

Success

The aim of this article is to show the systemicity within the causal chains leading to success, rather than an audit of whether these were actually "successful" projects; however, the second part of the study looked for evidence (statistical or cases) to support or refute the statements. BSF as a program was significantly criticized by the incoming government as being "characterized by massive overspends, tragic delays, botched construction projects, and needless bureaucracy" (BBC, 2010) and unstarted projects in the program were stopped. A more independent study by the National Audit Office the following year, however, concluded that, while the program was "overly optimistic in their assumptions of how quickly the first schools could be delivered" and that "the costs of establishing the first [Local Education Partnerships] have

been high," the majority of the increase in estimated total costs from the original estimates was "because the Department has increased the scope of the program," and "the total capital cost of each BSF school...is similar to most other schools"; furthermore, "early evidence shows that having a [Local Education Partnership] can lead to time and cost savings on repeat procurements" ("key findings" in NAO, 2009, pp. 6-7). In this case, we didn't have access to financial data, but in terms of the multiple inter-linked criteria of Table 1, evidence of good success was seen in much of what was mentioned above. This include low defects both on building handover and in use; good FM service; stakeholder satisfaction across the spectrum of stakeholders (customer, user, subcontractor, project team, and considerable support from the local community); good buildings provided; good health and safety record and smoothly run projects, as well as the standard "iron triangle" of on time/cost/budget. Furthermore, the emphasis on consistent teams that learned on long-run programs would support the last of the National Audit Office findings above. This study shows why this company might have performed better and has identified some "root causes" and their combination, as discussed in the Conclusion below.

Analysis of the Map

A formal analysis of this complex map of causality provides some useful results. The analysis and clustering methods within Decision Explorer (Eden & Ackermann, 1998) are used here to carry this out.

First, the 12 "tails" (roots of causality) of the map can be seen exogenously initiating chains of causality. We have identified three of these as important facilitators to success: the company locality; the company size; and the long-standing program experience. Four deal with the type of company that has developed: the company culture; the leadership from the managing director; the

company "behaviors"; and the higher leadership skills possessed by the project managers. Four others identify the key principles in how projects are carried out: identifying all stakeholders early; work in finding out who the stakeholders and actual decision makers are; "engagement with schools" and a well-defined robust subcontractor database. Finally, there is a strategic decision of a carefully planned expansion with BSF/LIFT.

Similarly, the seven "heads" (the ends of the causal chains) can be analyzed. These might be expected to be the (shaded) "success criteria," but these are inter-linked and thus not all "heads." It could thus be argued that not all of these are ultimate "success" criteria. For example, "projects set up better with a better contract" or "predictability and control of cost, time, quality, and risk" lead to many other good outcomes, so could be argued to be important determinants of success, but not actual success criteria. Even a "smooth/clean/tidy site" ultimately does not matter—but having such a site during the project produces a good health and safety record, happier subcontractors, and a more efficient project. Using this multi-criteria definition of success facilitated the identification of this causality. Interestingly, there is one "head" that is not a success criterion: "an engaged community prepared for its asset and prepared to look after it," which is an explanation of reasons for wanting one of the success criteria ("good community relations").

"Centrality" analysis indicates the influence of concepts within the causal structure. This is not a definitive measure of concept importance, but gives an indication and is useful for initiating a discussion. The most central concept in this map was the "Single Team." This might be a function of the way the workshops were facilitated, but probably does indicate the importance placed upon this concept by the team. The next most central concepts, interestingly, were trust/empowerment of

management, and a happy company team followed by the company culture. This shows the importance of the company culture and its management for developing success. The next two most central concepts were a “happy customer” and early engagement with the client, showing the importance of customer engagement to the company performance of projects. Following these in the list of centrality were many concepts together, not surprisingly in the context of a highly inter-related map.

Finally, a standard analysis of such maps is to look for feedback. Partly due to the fairly loose, informal, data collection, there are thousands of loops in the data. But even an informal analysis of Figure 5 shows examples of reinforcing loops of behaviors: keeping the same subcontractors from pre-project through execution; increasing subcontractor satisfaction and partnering, leading to better performance and more frequent use on the same program (which leads to the “learning teams”); mutual respect between contractor and subcontractor, and so on.

An analysis of such maps can thus show the root causes of project success, and how these feed through causal chains to produce that success—often ideas and linkages difficult to see conceptually. Analysis can indicate the most important factors and why these factors are important. And where positive “virtuous circle” feedback can be observed, this provides useful areas for management to concentrate upon.

Conclusions and Discussion

This study set out first to explore the multi-faceted nature of success. The study illustrates the increasingly recognized nature of project success as being multi-dimensional, with different criteria, only some clearly measurable. However, the causal approach (as in Eden & Ackermann, 1998; Edkins et al., 2007) showed in this case how the criteria are not independent but come together in complex causal interactions. This is important conceptually, but also

practically as we try to measure the performance of project teams.

Second, the case showed that in the same way that success is defined by multiple interacting criteria, success is achieved by multiple interacting factors. Previous research has often identified and sometimes theorized success factors, but rarely looked at the interacting causal chains. This article has demonstrated some factors, but more importantly shown how they interact, and how to map out, analyze, and understand these causal paths. Searching for success factors that do not recognize this complexity; risks arriving at oversimplistic conclusions, which might not lead to success in this wider definition and might indeed inhibit some of the success criteria.

Learning lessons from individual projects is increasingly recognized as an important element in improving project-management practice (Williams, 2008), but the root causes of project success/failure can be difficult to discern even in individual projects. This article has taken methods that can be used in individual projects (Williams, 2004) and has used them to encompass the project management practice within an organization overall, in a program of projects. This moves the discourse from learning from one project to the next, onto considering the organization as a learning organization and considering the organizational, cultural, and environmental factors that can lead to success or failure in a program of projects. This analysis can complement the more focused analysis on an individual project.

The analysis described here can provide management with useful and sometimes unexpected insight. Analysis can show the important concepts driving the causal structure and explain how (for example) “management empowerment” actually leads to more success in projects. Identification of positive feedback loops illustrate areas where promoting concepts will be particularly beneficial (for desirable “virtuous circles”) or where these concepts need

to be inhibited (for unwanted “vicious circles”).

The article did not explore these concepts quantitatively, and thus must be considered a limitation. Further research could go further in the modeling “cascade” of Howick, Eden, Ackermann, and Williams (2008) to try to model these interactions. Nor did the study fully audit all of the statements and causal links in the case, as it was seeking explanations and indications rather than a forensic audit.

The study did show, however, important aspects that resulted in project performance success for this particular company and why these root causes are important. Some of these are generic lessons applicable to other organizations, whereas some are context dependent for the company in its current situation.

- Organizational culture. Performance was reasonable on the “hardware” of systems, process, structure, and so forth, but was particularly strong on the “software” or leadership aspects of culture, communication, and stakeholder engagement. It may be difficult to replicate this by initiative or policy; this may be easier in a family type of company or where a longer-term view may prevail over the need for shorter-term results.
- The company’s sense of locality and size. The Sewell company is large and sophisticated enough to pre-qualify and be appointed to these national programs, but small and local enough to care about the community served that it would call its own; this produces an acute sense of brand reputation and hence a motivation to keep promises and leave a legacy beyond the buildings. The sense of “place” and consequent ownership appear to be important and give a more holistic, long-term approach.
- The adoption of Latham’s “single team” approach, from project inception to building operation. This expanded the definition of “project” to a wider

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and longer concept. The supply chain was procured on more than purely a commercial basis, producing mutual respect and a sharing of long-term aims and values. Facilities Management was part of the single team and ensured stakeholders' views were represented, helping to guarantee design and build quality. The frequent fragmentation of design, build, and FM, which produces friction at the interfaces, was absent, allowing risks to be better managed.

- The study also brought out (a little less strongly) the main aspects of Latham (1994) and Egan (1998) in having the luxury of a pipeline program of projects to encourage "learning teams" to pursue demonstrable continual improvement and be kept together and appointed for the following project.

None of these is uncommon in the literature or practical rhetoric. In these projects, however, (Sewell's Building Schools for the Future and NHS SIFT Programs, 2008–2013), multiple good practices and principles, and context, appear to have come together in a combination in which the total effect is much greater than the sum of the parts—a "perfect storm" perhaps of good fortune and good practice, to the benefit of clients, end-users, and the community served.

References

- Ackermann, F., Andersen, D. F., Eden, C., & Richardson, G. P. (2010).** Using a group decision support system to add value to group model building. *System Dynamics Review*, 26(4), 335–346.
- Ackermann, F., & Eden, C. (2001).** Contrasting single user and networked group decision support systems. *Group Decision and Negotiation*, 10(1), 47–66.
- Association of Project Management (2004).** Project risk analysis and management guide (2nd ed.). High Wycombe, England: APM.
- Banxia. (2013).** *Decision explorer*. Retrieved from <http://www.banxia.com/dexplore/> downloaded February 2013.
- Barnes, M. (1988).** Construction project management. *International Journal of Project Management*, 6(2), 69–79.
- Barrett, P., & Sexton, B. (2006).** Innovation in small, project-based construction firms. *British Journal of Management*, 17(4), 331–346.
- BBC. (2010).** *School building scheme scrapped*. BBC News website, Retrieved from <http://www.bbc.co.uk/news/10514113>
- Belassi, W., & Tukel, O. L. (1996).** A new framework for determining critical success/failure factors in projects. *International Journal of Project Management*, 14(3), 141–151.
- Blomquist, T., Hallgren, M., Nilsson, A., & Soderholm, A. (2010).** Project-as-practice: In search of project management research that matters. *Project Management Journal*, 41(1), 5–16.
- Bryde, D. J. (2005).** Methods for managing different perspectives of project success. *British Journal of Management*, 16(2), 119–131.
- Caldwell, N. D., Roehrich, J. K., & Davies, A. C. (2009).** Procuring complex performance in construction: London Heathrow terminal 5 and a private finance initiative hospital. *Journal of Purchasing and Supply Management*, 15(3), 178–186.
- Chang, A., Chih, Y.-Y., Chew, E., & Pisarki, A. (2013).** Reconceptualising mega project success in Australian defense: Recognizing the importance of value co-creation. *International Journal of Project Management*, 31(8), 1139–1153.
- Chipulu, M., Ojiako, U., Gardiner, P., Williams, T., Mota, C., Maguire, S., ... Marshall, A. (2014).** Exploring the impact of cultural values on project performance. *International Journal of Operations and Production Management*, 34(3), 364–389.
- Cicmil, S., Williams, T., Thomas, J., & Hodgson, D. (2006).** Rethinking project management: Researching the actuality of projects. *International Journal of Project Management*, 24(8), 675–686.
- Cooke-Davies, T. (2002).** The "real" success factors on projects. *International Journal of Project Management*, 20(3), 185–190.
- Cooke-Davies, T. (2011).** *Aspects of complexity*. Newtown Square, PA: Project Management Institute.
- Davis, K. (2014).** Different stakeholder groups and their perceptions of project success. *International Journal of Project Management*, 32(2), 189–201.
- de Wit, A. (1986, September).** Measuring project success: An illusion. *Measuring success, proceedings of the 18th annual seminar/symposium of the Project Management Institute*, Montreal, Canada (pp. 13–21). Newtown Square, PA: Project Management Institute.
- Demirag, I., & Khadaroo, I. (2010).** Costs, outputs and outcomes in school PFI contracts and the significance of project size. *Public Money & Management*, 30(1), 13–18.
- Eden, C., & Ackermann, F. (1998).** *The journey of strategic change*. Chichester, England: Sage.
- Edkins, A. J., Kurul, E., Maytorena-Sanchez, E., & Rintala, K. (2007).** The application of cognitive mapping methodologies in project management research. *International Journal of Project Management*, 25(8), 762–772.
- Egan, J. (1998).** *Rethinking construction: Report of the construction task force*. London, England: HMSO.
- El-Sheikh, A., & Pryke, S. D. (2010).** Network gaps and project success. *Construction Management and Economics*, 28(12), 1205–1217.
- Health and Safety Executive. (2012).** *Annual statistics report 2011/2012*. Retrieved from <http://www.hse.gov.uk/statistics/overall/hssh1112>
- Hodgson, D. E. (2004).** Project work: The legacy of bureaucratic control in the post-bureaucratic organization. *Organization*, 11(1), 81–100.

- Howick, S., Eden, C., Ackermann, F., & Williams, T. (2008).** Building confidence in models for multiple audiences: The modelling cascade. *European Journal of Operational Research*, 186(3), 1068–1083.
- Latham, M. (1994).** *Constructing the team*. London, England: HMSO.
- Lewis, M. A., & Roehrich, J. K. (2009).** Contracts, relationships and integration: Towards a model of the procurement of complex performance. *International Journal of Procurement Management*, 2(2), 125–142.
- Liu, J., Love, P. E. D., Smith, J., Regan, M., & Davis, P. R. (2014).** Life cycle critical success factors for public-private partnership infrastructure projects. *Journal of Management in Engineering*. doi:10.1061/(ASCE)ME.1943-5479.0000307
- Mir, F. A., & Pinnington, A. H. (2014).** Exploring the value of project management: Linking project management performance and project success. *International Journal of Project Management*, 32(2), 202–217.
- Morris, P. W. G., & Hough, G. H. (1987).** *The anatomy of major projects: A study of the reality of project management*. London, England: Wiley.
- Müller, R., Gerald, J., & Turner, J. R. (2012).** Relationships between leadership and success in different types of project complexities. *IEEE Transactions on Engineering Management*, 59(1), 77–90.
- Müller, R., Martinsuo, M., & Blomquist, T. (2008).** Project portfolio control and portfolio management performance in different contexts. *Project Management Journal*, 39(3), 28–42.
- National Audit Office. (2000).** *The millennium dome*. Report by the comptroller and auditor general. HC 936 session 1999–2000. London, England: The Stationery Office.
- National Audit Office. (2005, May 19).** *Innovation in the NHS: Local improvement finance trusts*. Report by the comptroller and auditor general, HC 28 session 2005–2006. London, England: The Stationery Office.
- National Audit Office. (2009, February 12).** *The building schools for the future programme: Renewing the secondary school estate*. Report by the comptroller and auditor general, HC 135 session 2008–2009. London, England: The Stationery Office.
- Nixon, P., Harrington, M., & Parker, D. (2011).** Leadership performance is significant to project success or failure: A critical analysis. *International Journal of Productivity and Performance Management*, 61(2), 204–216.
- Orlikowski, W., & Yates, J. (2006).** ICT and organizational change: A commentary. *Journal of Applied Behavioral Science*, 42(1), 127–134.
- Pillai, R., & Meindl, J. R. (1998).** Context and charisma: A “meso” level examination of the relationship of organic structure, collectivism, and crisis to charismatic leadership. *Journal of Management*, 24(5), 643–671.
- Pinto, J. K., & Mantel, S. J. (1990).** The causes of project failure. *IEEE Transactions on Engineering Management*, 37(4), 269–276.
- Pinto, J. K., & Slevin, D. P. (1987).** Critical factors in successful project implementation. *IEEE Transactions on Engineering Management*, 34(1), 22–27.
- Pinto, J. K., & Slevin, D. P. (1988).** Project success: Definitions and measurement techniques. *Project Management Journal*, XIX(1), 67–72.
- Samset, K. (2009).** *Projects, their quality at entry and challenges in the front-end phase*. In T. M. Williams, K. Samset, & K. Sunnevåg (Eds.), Making essential choices with scant information: Front-end decision-making in major projects, Chapter 2. Basingstoke, England: Palgrave Macmillan.
- Samset, K. (2010).** *Early project appraisal*. Basingstoke, England: Palgrave Macmillan.
- Sauer, C. (1999).** *Deciding the future for IS failures: Not the choice you might think*. In W. L. Currie & R. Galliers (Eds.), Rethinking management information systems: An interdisciplinary perspective (pp. 279–309). Oxford, England: Oxford University Press.
- Sewell. (2013).** *Sewell....powered by you*. Retrieved from <http://www.sewell-group.co.uk/>
- Shenhar, A. J., & Dvir, D. (2007).** *Reinventing project management: The diamond approach to successful growth and innovation*. Boston, MA: Harvard Business School Press.
- Shenhar, A. J., Tishler, A., Dvir, D., Lipovetsky, S., & Lechler, T. (2002).** Refining the search for project success factors: A multivariate, typological approach. *R&D Management*, 32(2), 111–126.
- Smit, T. (2001).** *Eden*. London, England: Corgi Books.
- Steiner, G. A. (1969).** *Top management planning*. New York, NY: MacMillan.
- Sutterfield, S., Friday-Stroud, S. S., & Shivers-Blackwell, S. L. (2006).** A case study of project and stakeholder management failures: Lessons learned. *Project Management Journal*, 37(5), 26–35.
- Thomas, J., Delisle, C. L., & Jugdev, K. (2002).** *Selling project management to senior executives: Framing the moves that matter*. Newtown Square, PA: Project Management Institute.
- Treacy, M., & Wiersema, F. (1993).** Customer intimacy and other value disciplines. *Harvard Business Review*, 71, 84–93.
- Turner, J. R. (2004).** Five conditions for project success. *International Journal of Project Management*, 22(5), 349–350.
- Verner, J. M., Overmyer, S. P., & McCain, K. W. (1999).** In the 25 years since The Mythical Man-Month what have we learned about project management? *Information and Software Technology*, 41(14), 1021–1026.
- Williams, T. M. (2004).** Identifying the hard lessons from projects—easily. *International Journal of Project Management*, 22(4), 273–279.

Identifying Success Factors

Williams, T. M. (2005). Assessing and moving on from the dominant project management discourse in the light of project overruns. *IEEE Transactions on Engineering Management*, 52(4), 497–508.

Williams, T. M. (2008). How do organisations learn lessons from projects—and do they? *IEEE Transactions on Engineering Management*, 55(2), 248–266.

Williams, T. M., Ackermann, F. R., & Eden, C. L. (2003). Structuring a delay and disruption claim. *European Journal of Operational Research*, 148(1), 192–204.

Williams, T. M., & Samset, K. (Eds.). (2012). *Project governance: Getting investments right*. Basingstoke, England: Palgrave Macmillan.

Zheng, J., Roehrich, J. K., & Lewis, M. A. (2008). The dynamics of contractual and relational governance: Evidence from long-term public-private procurement arrangements. *Journal of Purchasing and Supply Management*, 14(1), 43–54.

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