

Identifying success factors in construction projects - a case study

ABSTRACT

Defining "project success" has been of interest for many years, recent developments combining multiple measurable and psychosocial factors. There has also been research into Success Factors, but little research into the causal chains by which success emerges. Following the multi-dimensionality of "success", this paper shows how success factors combine in complex interactions. It describes factors contributing to project performance by a company working on two major construction programmes. It shows how to map and analyse paths from root causes to success criteria. The study also identifies some specific factors, some generic, some context-dependent, none uncommon but here coming together synergistically.

Keywords: Systems Thinking, Project Management, Complexity, Project Success

The study

This study considers "success" within projects. There has been research into what factors can bring success (eg Belassi and Tukul 1996). The nature of success has been of interest for many years - indeed , the Project Management Institute held a whole conference on the topic (see eg 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. However, there is little research into the causal chains by which success in terms of these different facets emerges. This study therefore looks at these chains and their inter-connectedness leading to success. By looking at the inter-connectedness, it outlines how to identify root causes of the success factors particularly where those root causes enables multiple success criteria simultaneously. In order to look in-depth at complex structures of effects, a single detailed case study was used, using a causal mapping method for analysis. This paper continues the extension of the ideas of systemicity into the current predominately linear dominant discourse of project management (Williams 2005, Edkins et al 2007, Cooke-Davies 2011), by looking at a particular instance of projects as practice (Blomquist et al 2010).

An appropriate case study for this research arose in late 2013, when a UK company was coming to the end of involvement in two major construction programmes. The company had a reputation for considerable success on these programmes. Since the project teams would likely be disbanded with the end of the programmes, it seemed important to reflect on this success - was it real? what does "success" mean? and whence came

success? This paper reports the results, mainly drawing lessons about the nature of success and the inter-relatedness and complexity of success factors, but 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 theorised, but there is little research into the causality, "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 are the key root causes of project success. 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 paper considers the method and then the case; it looks at the literature around the definition of project success and how this case compares; it then looks at the literature behind success factors, and at the analysis of this case to see the interacting nature of the factors and tracing of the success outcomes back to root causes. Conclusions are drawn about the content of the factors but particularly about the underlying systemicity. While there is some discussion about the success of the projects, the aim of this paper is to consider root causes and systemicity within the causal chains rather than audit the programmes.

Method

In order to capture the view of inter-connectedness 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 the Decision Explorer software (Banxia 2013) can be seen in the Figures in this paper, where arrows represent causality; the concepts are numbered, but this is only for convenience and has no meaning other than identification.

The first main part of the study consisted of two workshops in which teams of managers, together drew up

causal maps of effects in order to try 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. The maps were projected upon a screen by the author so that all the workshop participants could see the causal structure being generated, and contribute explanations (all discussion was led by the author rather than using the multi-computer "Group Explorer" system whereby all participants directly contribute to the model, Ackerman et al 2010).

The first part of each workshop sought to define "project success", starting from a "blank sheet of paper". Following this, causality 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 below). The maps noted where particular cases were good examples of the concepts identified, and where particular evidences could be obtained later to back up claims made. The cases gave a useful check to look at the causal chain developed and see whether the team recognised the effect from the case study (see below). These evidential and exemplar links have not been reproduced in this paper but were essential to ground 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 6 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 which sought to be fully auditable would have spent a subsequent phase revising and checking the logic of these diagrams, but as they stand 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 (eg Delay & Disruption) claims work

(Williams et al 2003) or in "lessons learned" exercises (Williams 2004). This study of a project programme was more akin to the latter; workshops were fairly small, in this case around 8-10 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 chain 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; while 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 behaviour codes near a School, employee posters displayed around sites, architect selection scoring sheets, the supplier database, supplier enquiry documentation and selected meeting minutes. The final report contained reference to much of this data. However, the main aim of the study (and this paper) was to uncover causality, root causes and the systemicity within the causal chains; the case study showed *why* the programmes were successful rather than quantifying the success; but this lack of quantification should be recognised as a limitation of this paper.

The case

The 140-year old Sewell Group (Sewell 2013), based in Hull, UK, has an annual turnover over UK£100M. Its main business is in estates, covering a range of activity. The Group carried out a construction projects in and around Hull since the turn of the century under two major UK Government Public Private Partnership (PPP) programmes involving complex partnership schemes. The first, Building Schools for the Future (BSF) (National Audit Office 2009) aimed to refurbish or rebuild every secondary school in England over 15 years; the second, the Local Improvement Finance Trust (LIFT) programmes (National Audit Office 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 maximise value for

money, buildability and customer satisfaction. (Whilst opportunities exist in the BSF programme 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 programmes coming to an end, in the expectation that teams would start to be dismantled, this seemed a good opportunity to try to capture where the teams' success came from, if indeed they had been successful. It became clear that there were not one or two individual 'magic bullets', but a number of factors came together to produce success, strengthening the approach taken. The workshops looked at the programmes 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 programme of projects cannot be assessed (Muller et al 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 three-fold 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 1980's 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 above. Pinto and Slevin (1988) brought in both the internal (project) and the external (client) view. 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 US Agency for International Development, then the United Nations and OECD (Samset 2010 Chapter 2). This characterises a project's success in five ways: efficiency (could

the outputs have been produced in a better way? was the project well managed?), effectiveness (were the goals achieved? did the output meet the goals?), relevance (how useful was the project to the organisation in context? was the goal aligned with the needs of the organisation?), impact (was the goal appropriate to the purpose of the organisation? What was the sum of the anticipated/unintended effects of the project?) and 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 (2009)'s 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 and 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, page 27); one of their five measures though is an internal "impact on team", a similar concept to that in Chipulu et al (2014) below. They also show conceptually how these measures change in relative importance over time (page 31). A longer-term view is thus required: how the success of a project is viewed will often depend upon the phase it is in, or how long it is since the project completed. Some projects seen as successful or unsuccessful are seen quite differently in the longer term (eg Orlikowski & Yates 2006).

Different stakeholders will often have quite different definitions of success or 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 she 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 and common view of success criteria between the stakeholders (Turner 2004) becomes (while a valuable statement) almost a truism. The necessity to engage stakeholders and their view of project success becomes even more important in the cases where project execution requires developmental input from both purchaser and supplier, or from many stakeholders, such as the value co-creation in major defence projects (Chang et al 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 towards "servitized" construction, where the contractor takes increasing responsibility for the post-construction performance of the building, as discussed in Caldwell et al 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 phase of major construction buildings. They emphasise 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 et al 2008). And this is even more if we consider the long-term relationship between supplier and buyer (Nixon 2011).

A single definition of "success" is clearly not possible (indeed, Nixon (2011) describes a definition of project failure as "unattainable" (p. 212)). Muller et al (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 the others so do not use the dimensional richness. "Some conceptualise ['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 categorise sets of criteria: Shenhar's empirical work (Shenhar et al 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-organisational goals. (This is not to be confused with the Success Factor work below, looking at the factors which create success). But 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 of 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. And indeed the concept of the

"iron triangle" is so embedded within project-management culture generally that there is a line of argument that the prevailing culture limits project managers' thinking outside of this sub-concept of project success (see the Foucauldian argument of Hodgson 2004). So what happened when the Sewells teams discussed how they saw project success? This was a discussion with no input of content from the facilitator, so should reflect the mind-set of the managers. After considerable discussion, their definition covered four related areas, which can be broken down into seventeen subsections as shown in Table 1.

Table 1: Success criteria

<p>Was the final product good?</p> <ul style="list-style-type: none"> i) zero defects on building handover ii) low defects in use iii) better FM service and resultant increased lifecycle performance of the facility 	<p>Did the project meet its delivery objectives?</p> <ul style="list-style-type: none"> i) on time ii) on budget iii) production of a legacy, not just a building.
<p>Were the stakeholders satisfied with the project?</p> <ul style="list-style-type: none"> i) happy customer ii) happy users iii) happy subcontractors iv) happy Sewell team (which would of course lead to better project performance) v) good community relationships 	<p>Was project management successful?</p> <ul style="list-style-type: none"> i) Good health and safety record ii) projects set up better and better contract iii) fewer changes iv) few disputes v) smooth / clean / tidy site vi) Predictability and control of cost, time, quality and risk.

Table 1 shows a considerable appreciation of the wider 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. 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, and we will return to this point in the discussion below.

Success factors: literature

But what are the factors that can lead to project "success"? There has been much literature attempting to identify factors. This work can be popular with those looking for a "magic bullet" or simple generalisations. Belassi and Tukel (1996) summarise 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 & Mantel (1990) found 10 critical success factors (one of which is discussed below) they found to be generalisable 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 reflected in the findings below. 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 criticised, 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 particularly Sauer (1999), who concludes that these issues "strongly suggest that the approach has not been successful" (p.290). These criticisms apply also to construction projects.

There are essential lessons to be drawn from this literature - perhaps the need for collaboration and communication the most consistent (eg El-Sheikh & Pryke 2010). But increasingly the success of projects has come to be seen to be context-dependent, with there being no one "right" answer. Shenhar and Dvir (2007) in particular (building upon Shenhar et al (2002) above) 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 4-dimensional "diamond" model). Williams (2005) comes separately to 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 et al (2014) analysed the normative literature on PPP success factors to derive a set factors within different life-time 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 current paper was largely concerned with the

first of these two phases.

But beyond these attempts at making a taxonomy of contexts, the literature now often draws conclusions about the success or failure of projects within their specific contexts and histories, and that is how we will look at these projects below. 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 et al 2006).

Looking at the situated context is also important because research can be seen to have often identified and sometimes theorised success factors, but there is little discussion about the "how" - looking at the causality of producing project success. To take one instance, Nixon et al (2011) claims 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, Muller et al (2012) for example find that project complexity has a moderating effect between leadership and success. For this paper, the discussion above about the multiply-interacting criteria within the definition of project success, would suggest that there are likely to be multiply interacting causal chains of factors producing project success in this richer definition, and this will guide the case study.

Case Findings

To show how the various factors come together, the workshop maps show diagrams of factors, arrows showing causality. The workshop "success" definition (see above) is shown in these diagrams as highlighted shadowed boxes. The maps, shown in Figures 1-6, 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 set-up 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 & the construction site; the final map covers post-handover.

(i) Company culture

The start of the causality lies within the company culture, as in Figure 1. Sewell has a family business ethos

rather than those associated with big corporations. With a flat structure and lean form, the company considers that it exhibits a bias for action, openness and expedient decision making, and publically declares a "no blame" environment. The company culture starts with the leadership from the Managing Director, exhibiting similar characteristics and similar causal outcomes to those described in Pillai and Meindl (1998). The team of project managers appeared to exhibit higher leadership skills (as 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 which might not appear in general literature. One is the locality of the company: it is based in (and well-known in) the city; Hull is a East coast city somewhat geographically isolated within the UK, meaning that there is a strong sense of identification with the city and a close-knit community; the effect of being a local company in Hull is greater than in a less isolated city. A second is the size of the company: big enough to take on these projects but small enough that the management team all know each other and the workforce has a sense of intimacy.

FIGURE 1 HERE

From these factors follow many ramifications, as Figure 1 shows:

- One implication of the locality, as a fairly isolated city, is that the management of the company has been stable rather than transient. This combined with the size and the culture of the company, and its top-level leadership have important ramifications. The company is less layered than usual, with teams reporting directly into the Board, meaning more trust is placed in the empowered site based project managers; and managers can work flexibly, sometimes doing work that in each other's territories.
- Arising from these factors is a focus on delivery rather than systems and processes. Whilst the company has embraced Quality Systems (BS5750, ISO 9001, Six Sigma), each employee has Performance Agreements which go beyond their 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 'behaviours' upon which the company hire/fire and reward: "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 amongst management.
- There is a noticeably high interest within the Company Board in project execution, known to be a success

factor in projects (Thomas et al 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 have average payment times markedly lower than tender expectations, resulting in the company being able to demand performance from sub-contractors and their best (even requesting named) operatives.
- The concept of the 'Single Team' is an important part of the culture as we will see below.
- The size and nature of the company enables management to have a view across the Group leading to better communication. All staff 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 fertilisation from members attending other huddles.
- A "no blame" culture leads to an open attitude to defects and a better ability to manage risk. However, mediocre performance is not accepted, with the use of Personal Improvement Plans and exits failing improvement. 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 their 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 site level.

(ii) The "Single Team"

The idea of the 'single team' is an important part of the company culture; this covers a range of issues as 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 emphasised 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. It includes 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 avoids having a separate estimating department that prepares bids and then "hands the project over" to the team (a well-known issue, eg Verner et al 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 programme 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" (Barret & Sexton 2006).

FIGURE 2 HERE

(iii) Project set-up

The culture enables a range of effects in project set-up - 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 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 are the actual decision-makers and stakeholders (see eg Sutterfield et al 2006 for the dangers of not doing this). Figure 3 has been divided into three parts to help readability. Figure 3a contains most of the material but interlinked with these are specific parts separated out into Figures 3b and 3c. There are many 'causal chains' here feeding into the various project success criteria, outlined as follows.

FIGURES 3a, 3b, and 3c HERE

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 organisations' board 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 (and blame avoided) and people are encouraged to

help resolve arising issues. (One of Pinto & Mantel (1990)'s 10 critical success factors was "Communication, consultation, and active listening to all impacted parties").

Engagement of all groups manages expectations leading to better project set-up 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, programme, financial position, risks and construction method, helps lead to greater collaboration. Fewer disputes, significant pre-planning, better project set-up and contract, better communication and better management of risk all help confidence in the "iron triangle".

Figure 3b shows 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 and costed with the benefit of proper management, mitigation or removal remaining with the risk owner risk. This leads to a good project set-up with a better contract, and fewer disputes. Predictability and control of cost, time, quality and risk helps to lead to delivery on bid and community promises.

Long-standing programme experience enables the company to point users to previous schemes to help visualise the product, enhancing engagement and helping the client choose the architect. High early user engagement shows the client different procurement possibilities. Early engagement with 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 leads to close community engagement, combined with the high level of pre-planning leads to good community relations. This is increasingly recognised 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" (page 103). Key site statistics are clearly displayed on the site board giving openness on key KPIs eg accident rates, recycling, programme position, apprentice numbers, local labour & 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.

(iv) Customer Satisfaction

In terms of the theory of Treacy and Wiersma (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 (see 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 £20M - around half of the projects studied in the current study fall into this). Secondly, 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 helps customer satisfaction, as does the client seeing the company delivers 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 which functions better, for various reasons; there is a round-table meeting 6 months before completion and a handover between construction and operations to provide a 'soft landing' and a continual involvement by the project team (rather than a snagging team) in the 12 months after handover, leading to very low numbers of defects on hand-over and in use.

FIGURE 4 HERE

(v) 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 missed 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 programme, building good relationships and enabling realisation 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 project. The subcontractor is involved in the bidding, helping to build shared goals. At the enquiry 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 sub-contractor being well placed to continue working throughout the programme. 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, 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 leads to better "iron triangle" performance but also a much better health and safety record than the industry average (from government statistics (Health and Safety Executive 2012)) and fewer defects.

FIGURE 5 HERE

(vi) Post handover

After building hand-over is shown in Figure 6. Concentration on the capital delivery with insufficient attention to later operation has been identified as the reasons for poor quality in for example the Millenium Dome (National Audit Office 2000). A long term maintenance responsibility beyond completion could be expected to encourage design and build quality. In the 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-recognised importance of this as a success factor).

With long-standing programme 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 at handover. Engagement with the customer throughout the project, and the emphasis on customer satisfaction, helps to minimise disputes during and after construction, helped in part by enhanced client training during the soft landing period, and the "no blame" philosophy. The locality of the company and the 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'. The open attitude towards defects and the personal investment by the project manager in the project all makes this process open and efficient in ensuring the minimum of disruption due to defects post handover.

Success in the longer term, as discussed above, includes a measure of how the client and end user feels after one year in the new building; the low levels of contractual penalties incurred by the company perhaps shows how that manifests itself in reality. In the case of the LIFT buildings, the landlord carries out regular customer feedback surveys and these are used to improve further the facilities management (FM). Using an 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 6-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 'helpdesk' staff during execution of the project (the smaller company helps preserve these relationships rather than a distant unknown 'helpdesk') all leads to a 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.

FIGURE 6 HERE

Success

The aim of this paper 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 programme was significantly criticised by the incoming government as being "characterised by massive overspends, tragic delays, botched construction projects and needless bureaucracy" (BBC 2010) and unstarted projects in the programme were stopped. A more independent study however by the National Audit Office the following year however concluded that while the programme 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 programme", 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 National Audit Office (2009), page 6-7). In this case we did not have access to financial data. But in terms of the multiple inter-linked criteria of Table 1, evidence of good success was seen much of which has been mentioned above: 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 & safety record and smoothly run projects - as well as the standard "iron triangle" of on time/cost/budget; and the emphasis on consistent teams that learned on long-run programmes would support the last of the National Audit Office findings above. This study shows why this company might have performed better and has some identified some "root causes" and their combination, as discussed in the Conclusion below.

Analysis of map

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

Firstly, the twelve "tails" (roots of causality) of the map can be seen exogenously initiating chains of causality. Three of these we have identified as important facilitators to success: the company locality; the company size; and the long-standing programme experience. Four deal with the type of company that has developed: the company culture; the leadership from the Managing Director; the company "Behaviours"; and the higher leadership skills possessed by the project managers. Four others identify key principles in how projects are carried out: identifying all stakeholders early; work in finding out who are stakeholders and actual decision-makers; "engagement with schools", and a well-defined robust subcontractor database. Finally, there is strategic decision of a carefully planned expansion with BSF / LIFT.

Similarly, the seven "heads" (the ends of the causal chains) can be analysed. These might be expected to be the (shaded) "success criteria", but these are inter-linked and so 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 & control of cost, time, quality & 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 leaves a good Health & Safety record, happier subcontractors, 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 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 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 (for instance) shows examples of reinforcing loops of behaviours: 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 programme (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 firstly to explore the multi-faceted nature of success. The study illustrates the increasingly recognised nature of project success as being multi-dimensional, with different criteria, only some clearly measurable. However, the causal approach (as in Eden & Ackerman 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.

Secondly, 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 theorised success factors, but rarely looked at the interacting causal chains. This paper has demonstrated some factors, but more importantly shown how they interact, and how to map out, analyse and understand these causal paths. Searching for success factors which does not recognise this complexity, risks over-simplistic 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 recognised 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 paper has taken methods that can be used in individual projects (Williams 2004) and taken it to encompass the project management practice within an organisation overall, over a programme of projects. This moves the discourse from learning from one project to the next, onto considering the organisation as a learning organisation and considering the organisational, cultural and environmental factors that can lead to success or failure over a programme of projects, This analysis can complement the more focussed 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 the 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 paper did not explore these concepts quantitatively, and this must be considered a limitation. Further research could go further in the modelling "cascade" of Howick et al 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.

However, the study did show 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 organisations, while some are context dependent for the company in its current situation.

- Organisational culture. Performance was reasonable on the 'hardware' of systems, process, structure, etc, 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 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 programmes, 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 appears to be important and gives 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 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 were 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 programme 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. However, on these projects (Sewell's Building Schools for the Future and NHS SIFT Programmes 2008-2013), multiple good practices and principles, and context, appear to have come together in a combination where 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.

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Figure 1

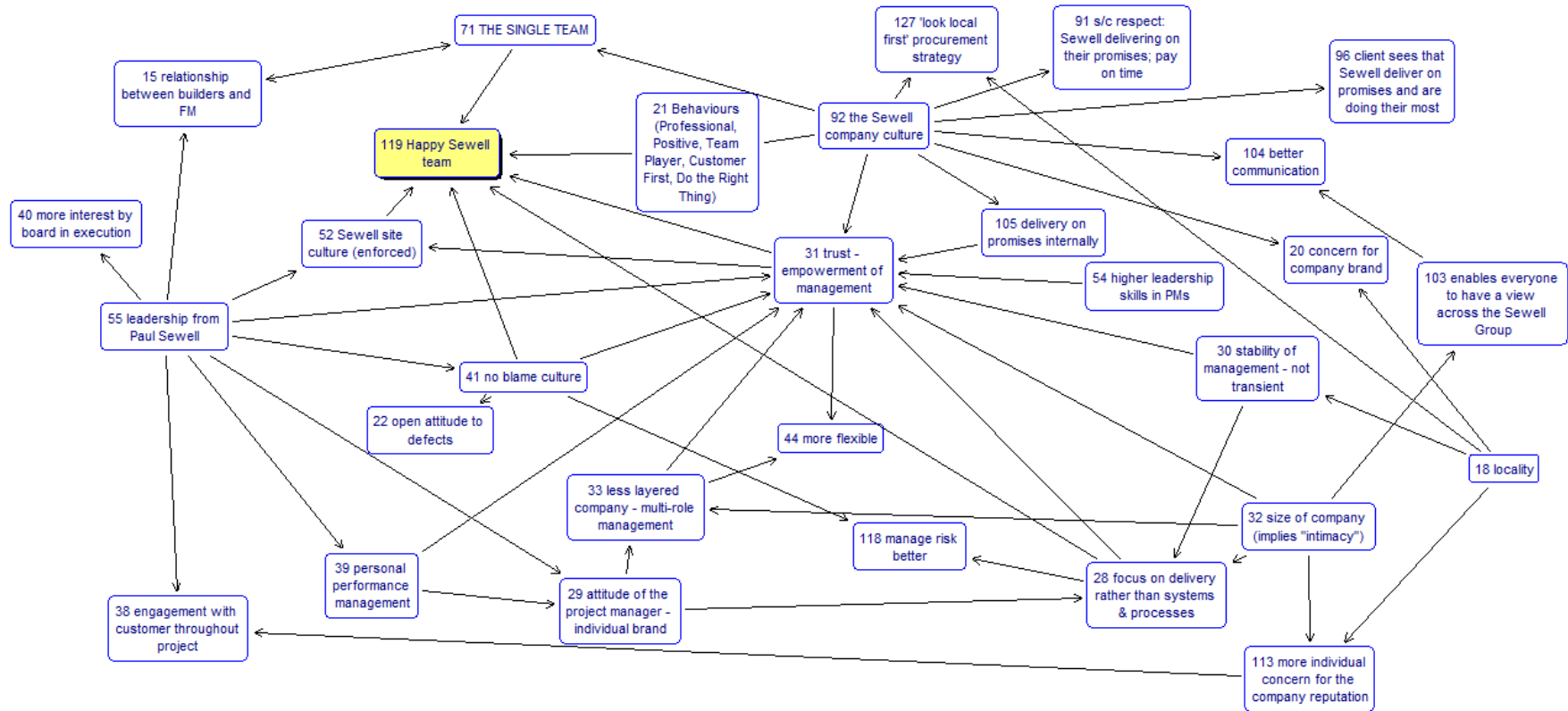


Figure 2

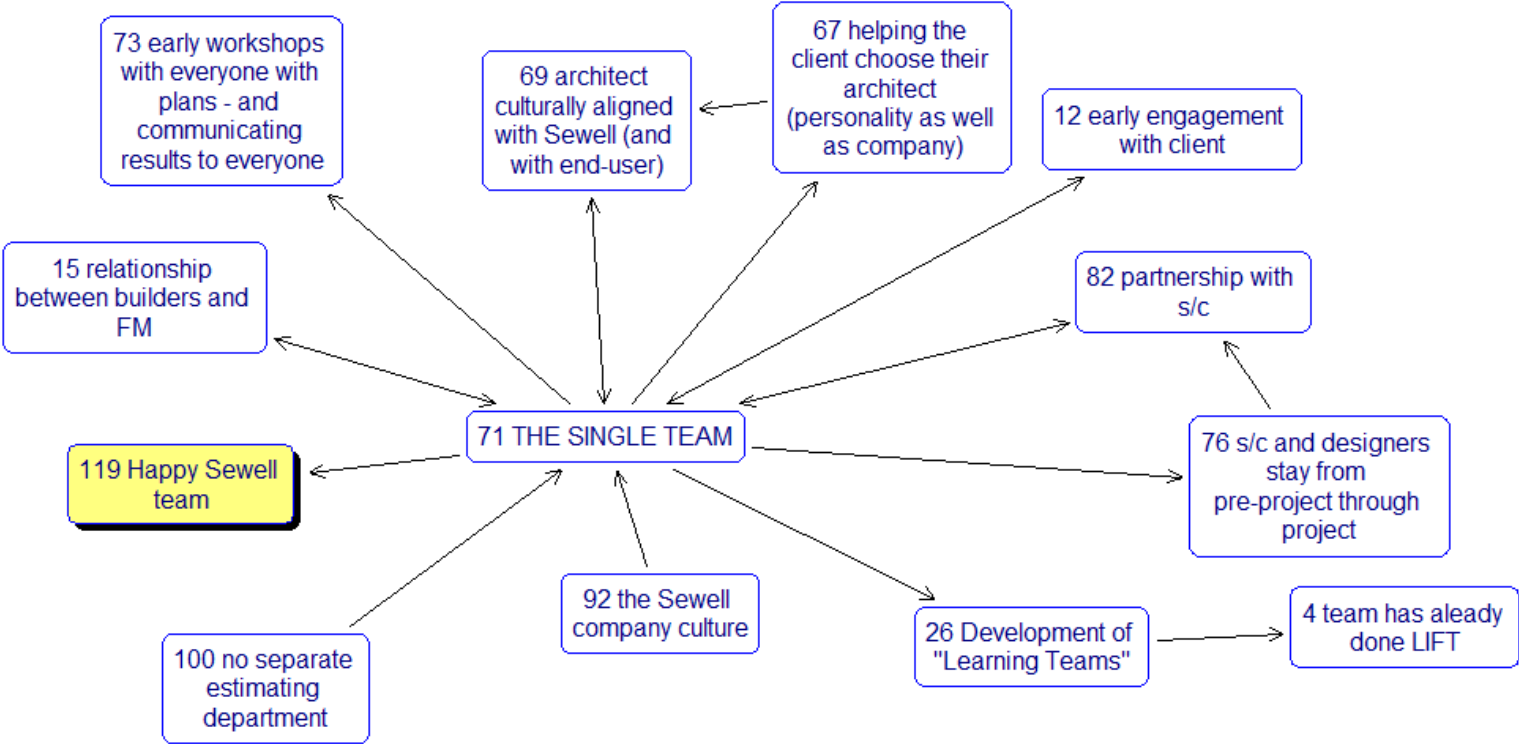


Figure 3a

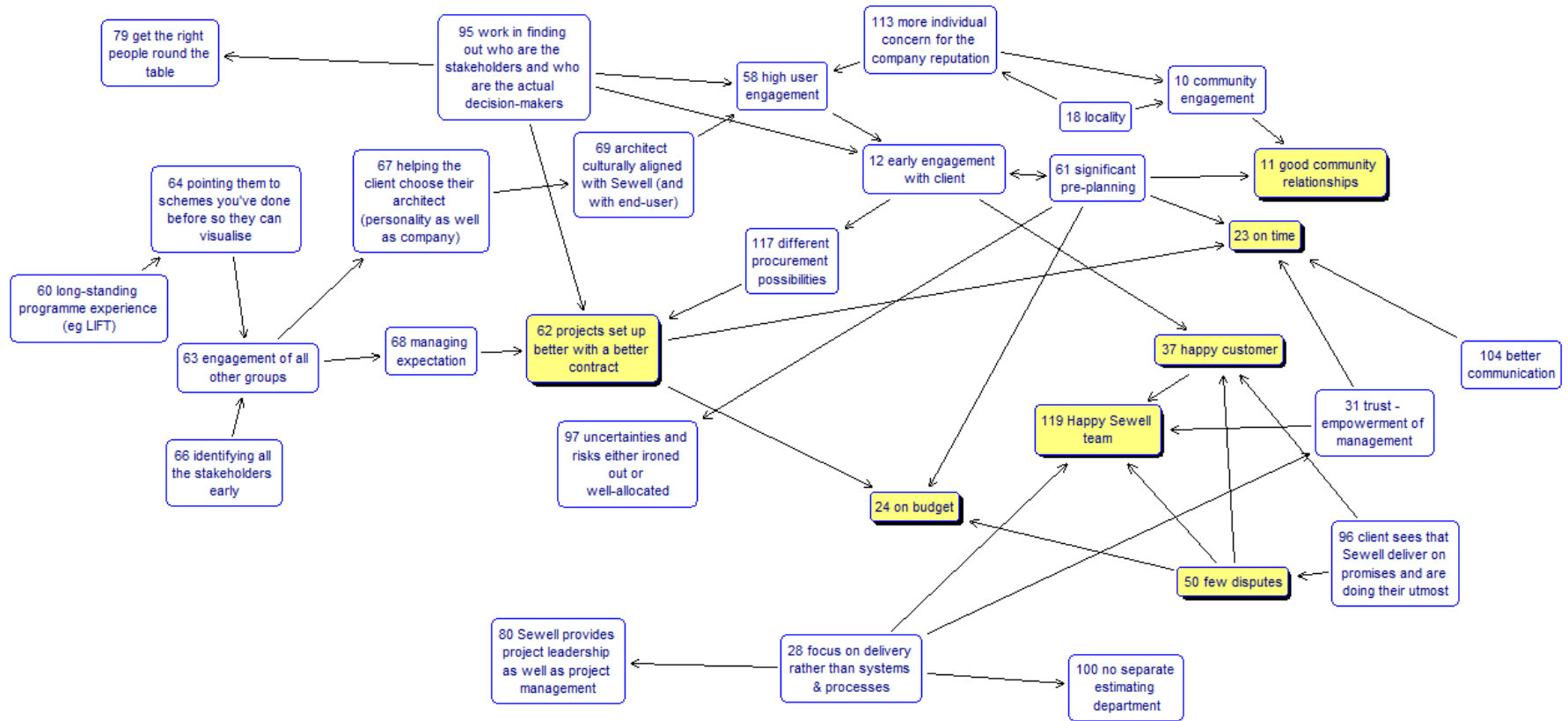


Figure 3b

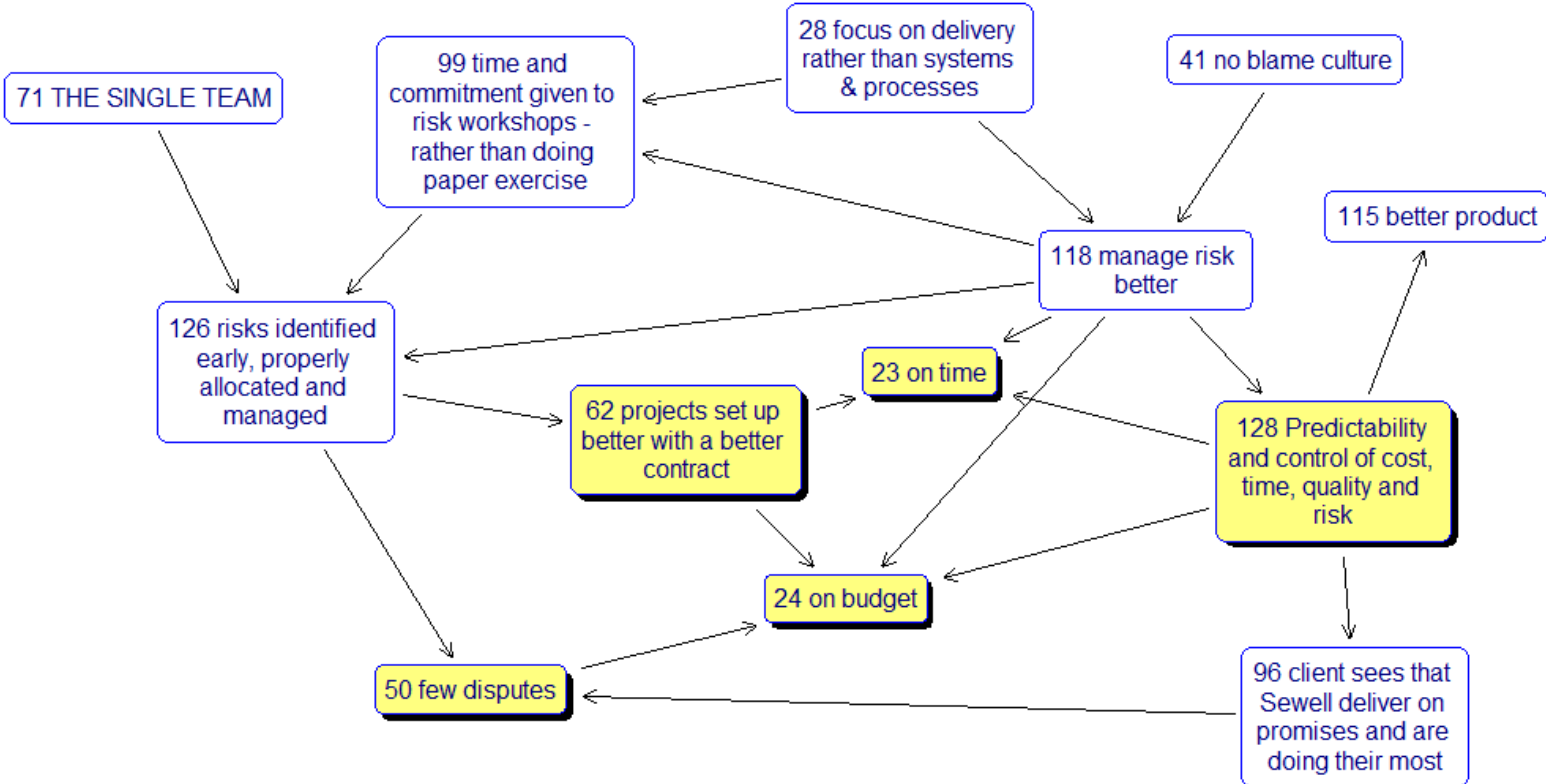


Figure 3c

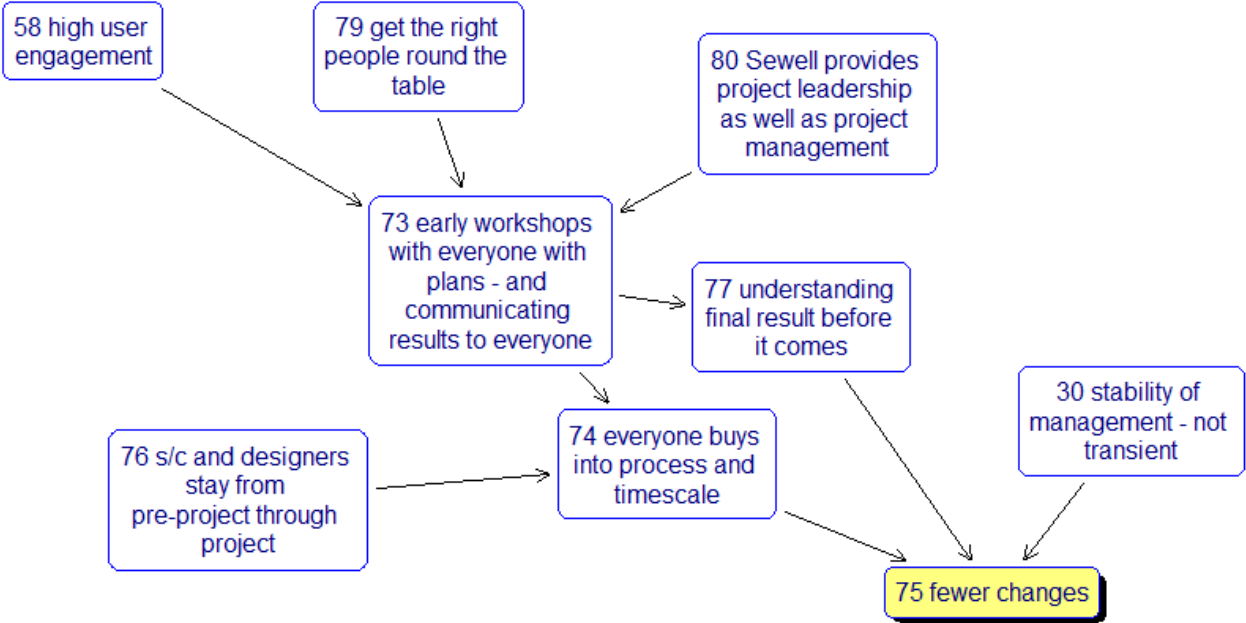


Figure 4

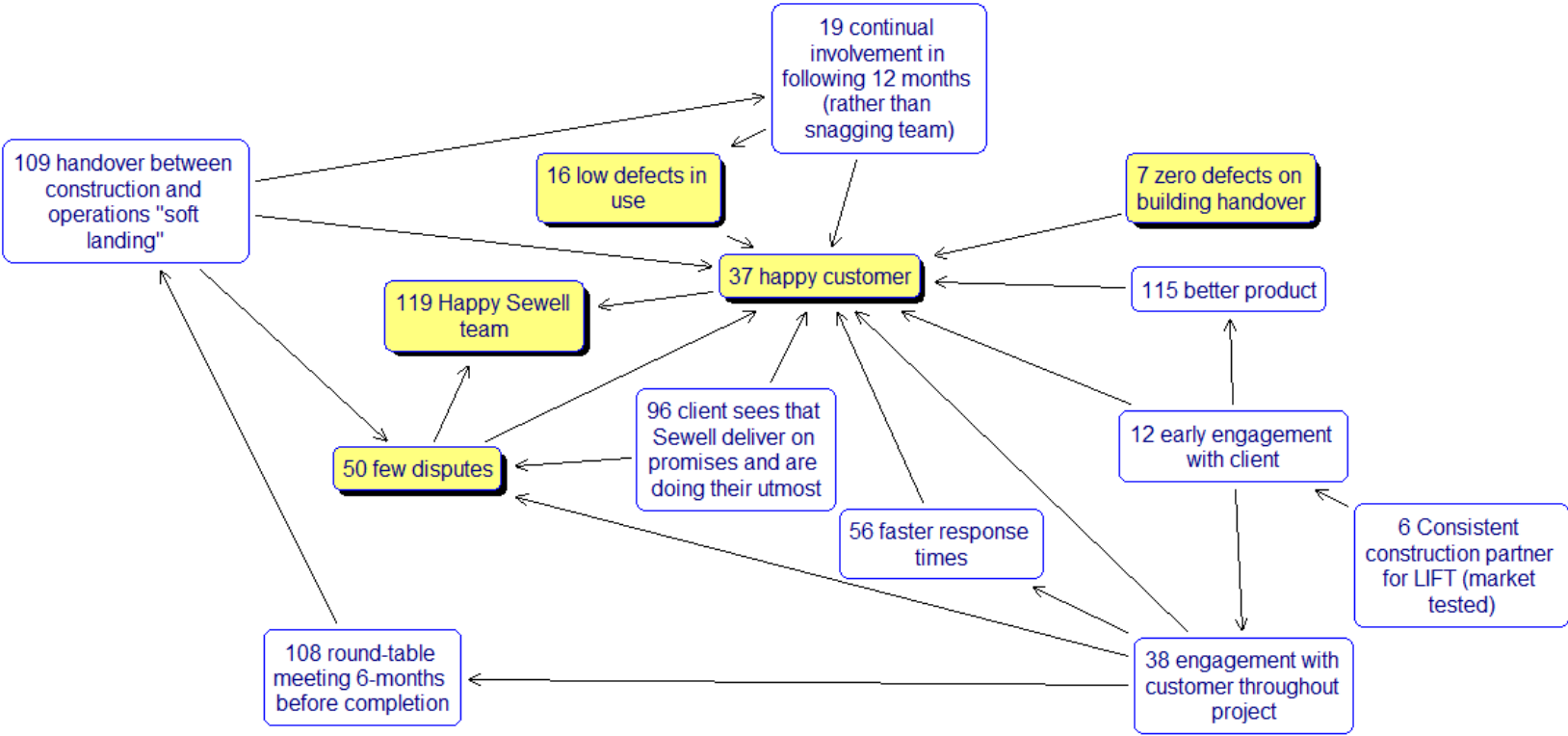


Figure 5

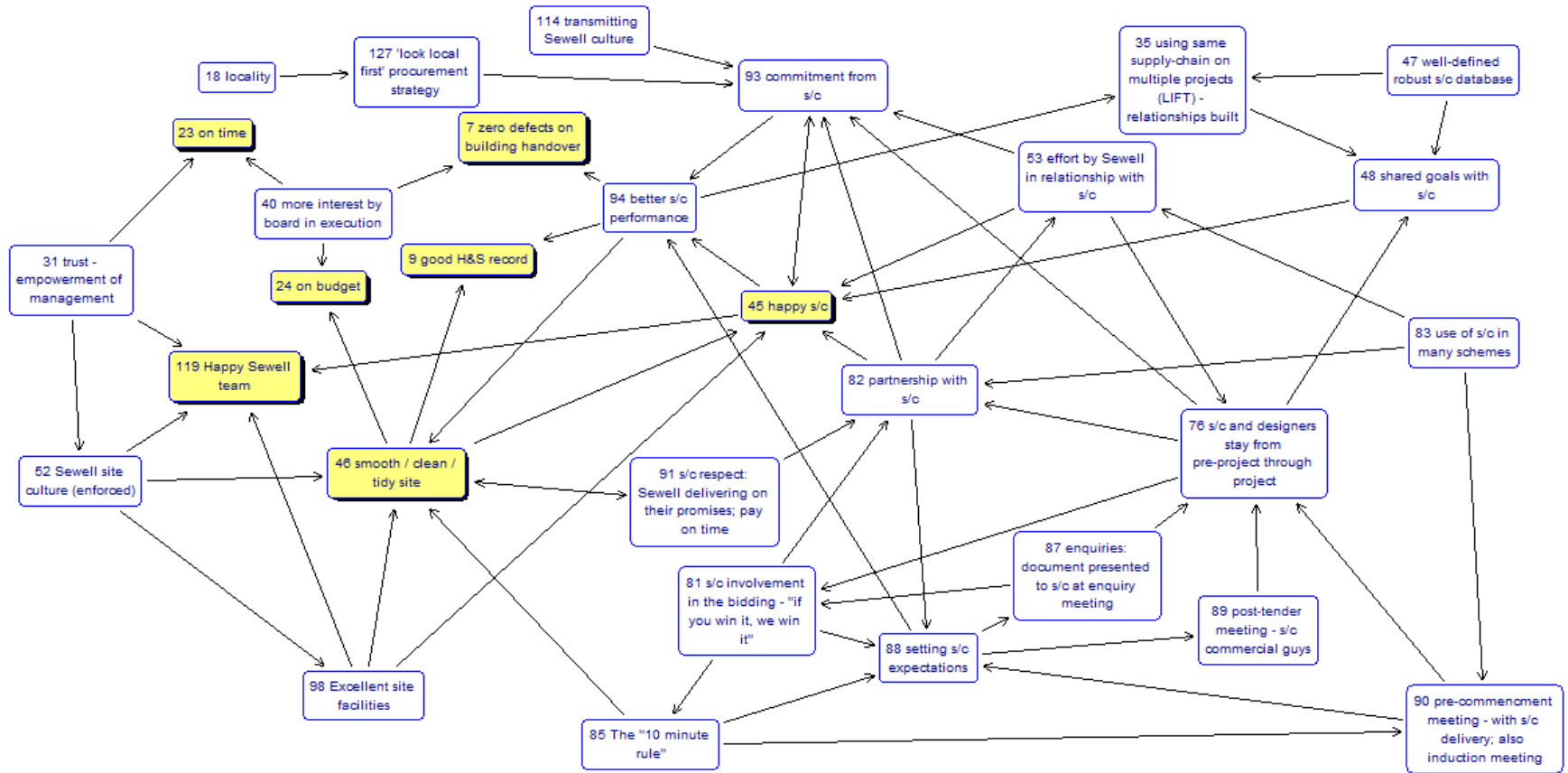


Figure 6

