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
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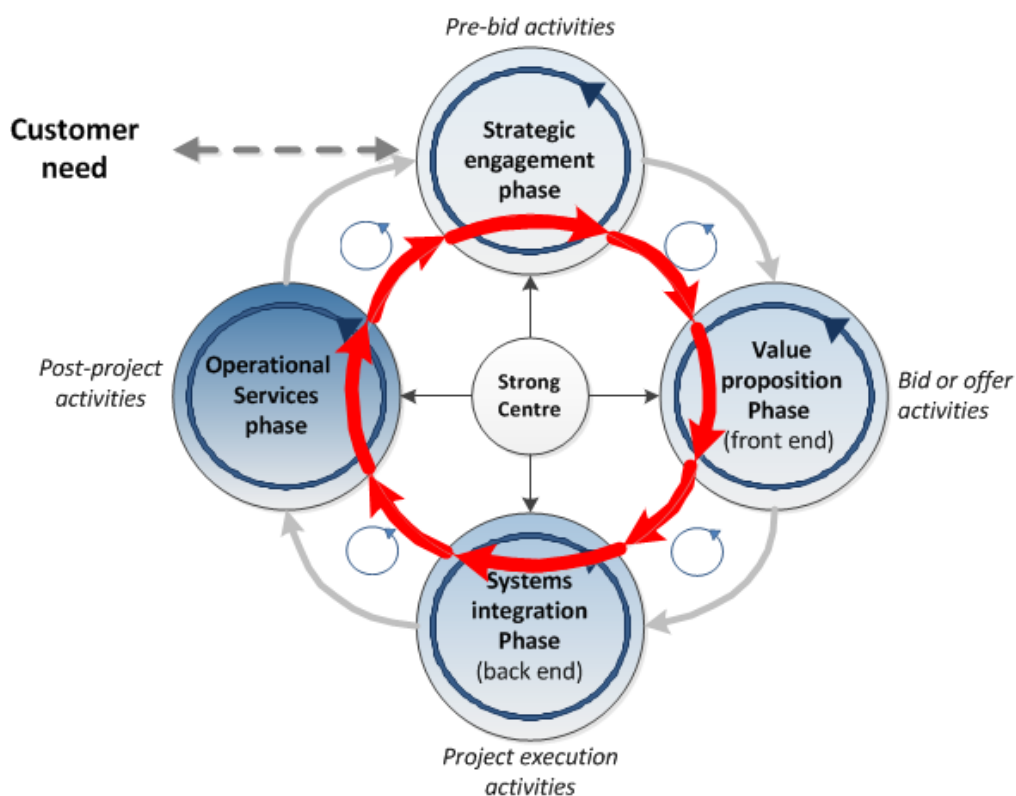
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Enacting Product-Service Business Models: The Role of Lean Thinking

Nicola Morrey



ENACTING PRODUCT-SERVICE BUSINESS MODELS: THE ROLE OF LEAN THINKING

By
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A dissertation thesis submitted in partial fulfilment of the requirements for the award of the degree Doctor of Engineering (EngD), at Loughborough University

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Peter – you are my rock.

ABSTRACT

As competitively tendering for work is becoming increasingly difficult, and with profit margins reducing, UK construction companies are looking to differentiate their offering to clients. Safely delivering on time, within budget and to the required quality standard is no longer a differentiator in a market where clients are demanding increased value, building information modelling and life cycle provision.

Construction companies are therefore looking to extend their activities into business consulting, financing and operational services, which will provide new sources of revenue in addition to their core production activities. This holistic service should provide solutions that meet their client's business needs, not just their building needs, ultimately resulting in long-standing relationships that over time yield a more predictable, long-term return.

Over half of the top 20 UK construction companies, by turnover, have stated their intent to provide 'solutions' to their clients - the case study organisation in which this research has been carried out is one of those companies. Part of a group of companies, the case study company, Shepherd Construction Ltd (SCL), has a vision to deliver integrated solutions to their clients, with the ultimate aim being that companies across the group can pool their expertise and deliver a service offering unique to the industry.

Existing literature states the characteristics that integrated solutions providers need to possess, and proposes models for how an organisation needs to structure itself to deliver a service. However, the applicability of these models to SCL was unknown, and along with current literature on 'how' to enact the transition pathway being vague, highlighted an area for investigation.

Since the aim of integrated solutions provision is the delivery of a service to the client that adds value, it was proposed that lean thinking could provide a means of enacting the P-S

transition: “the starting point for lean thinking is value” (Womack & Jones, 2003). Lean thinking principles (Womack & Jones, 2003) state that value needs to flow through the value stream – the series of actions that transform inputs into the completed output – raising the further proposition that flow is required through the stages of the integrated solutions lifecycle (the value stream) in order to successfully deliver all aspects of the client’s value proposition, i.e. the desired solution.

As a long established main-contractor, or product provider, SCL’s challenge to transition from products-to-services was set against a backdrop of inconsistent performance and loss of continuity of service at crucial pinch-points in the delivery process. The action research carried out therefore sought to understand these problems and develop practices based on lean thinking that could be implemented in the company to enable consistent delivery of integrated solutions, i.e. enable the products-to-service transition, and in doing so provide the basis for the wider group vision.

An abductive approach was taken to the research strategy; the experiences of the participants involved in the changes prompted by the action research process were used to inform the development of new theories and practices, and evaluate them once implemented. The methods used for collecting data and accounting for the experiences of people in the company included observation, both participant and non-participant, semi-structured interviews and analysis of company records.

The research findings show that lean thinking has a role to play in enabling an organisation to transition from the provision of products to services. Standard processes and tools, based on lean thinking and developed through the action research framework, are shown to be the basis for consistent and repeatable performance within the phases of the integrated solutions lifecycle. Flow of information through and between phases of the lifecycle is then shown to be essential to ensuring the client’s value proposition is realised and information is not lost

during the transitions between lifecycle phases. The ‘operational framework for service delivery’, one of the practices developed, itself a form of standardised work, draws on lean thinking to provide a structured, yet flexible, means of developing a plan for service delivery that is focused on the client and ensuring the client’s definition of value flows through the integrated solutions value stream and is therefore continually understood, and ultimately delivered, by the whole team as the project progresses.

The practices developed through the research – the standard company management system, ‘operational framework for service delivery’, ‘service delivery plan’ and ‘maturity assessment’ – are shown to have improved consistency and company performance, and to have contributed to improved customer satisfaction (the ultimate aim of delivering a service) such that the company is starting to be perceived in the marketplace as an integrated solutions provider.

This research also contributes to existing theory by evidencing that the transition pathway from products-to-services isn’t as smooth as current literature portrays. In trying to implement current models in a construction setting, the products-to-service transition has been problematised and deficiencies in existing characteristics and models identified. Along with showing that lean thinking provides a theoretical framework for enacting the products-to-service transition, the hybrid model of the integrated solutions lifecycle developed, along with the maturity assessment, provide new theoretical insights, such as the need for feedback loops between all phases of the lifecycle.

KEY WORDS

Construction, flow, integrated solutions, lean, path dependency, service, transition

PREFACE

This thesis presents the research carried out between 2009 and 2013 as part of an Engineering Doctorate (EngD) undertaken at the Centre for Innovative and Collaborative Engineering (CICE), Loughborough University which was funded by the EPSRC and sponsored by Shepherd Construction Ltd, a UK construction company.

The EngD is a full time postgraduate qualification aimed at fully integrating academic research with performance improvements in industry. Central to the qualification is the solution of a business problem that is being experienced by the sponsor organisation, the solution of which will not only yield business benefits but also make a contribution to academic knowledge.

The industrial sponsor, Shepherd Construction Ltd, is a main contracting organisation delivering complex construction projects to clients in a variety of sectors in the United Kingdom. Part of the Shepherd Group, the company was looking to make the transition from delivering products to services, supporting the Group vision of pooling its expertise in the built environment to deliver unique solutions to clients.

The EngD is examined on the basis of a 20,000 word thesis that is supported by publications that have been independently refereed throughout the course of the 4 year programme. This thesis should therefore be read in conjunction with the 2 journal papers and 2 conference papers that are included as appendices.

In addition to this thesis, the taught element of the EngD has also been satisfied through the attainment of 180 credits gained through the completion of 6 modules, including a 90 credit research project, plus a 40 credit exemption for post graduate courses already completed.

USED ACRONYMS / ABBREVIATIONS

3D	3 Dimensional
BIM	Building Information Modelling or Management
BSI	British Standards Institution
BSRIA	Building Services Research and Information Association
BRE	Building Research Establishment
BREEAM	BRE Environmental Assessment Method
CCS	Considerate Constructors Scheme
CDS	Company Database System
CICE	Centre for Innovation and Collaborative Engineering
CIRIA	Construction Industry Research and Information Association
CLIP	Construction Lean Improvement Programme
ECM	Enterprise Content Management
EngD	Engineering Doctorate
EPSRC	Engineering and Physical Sciences Research Council
ERP	Enterprise Requirements Planning
FM	Facilities Management
HR	Human Resources
IGLC	International Group for Lean Construction
ICT	Information Communication Technology
IS	Information Systems
ISO	International Standards Organisation
ISP	Integrated Solutions Provider
IT	Information Technology

KPI	Key Performance Indicator
LCI	Lean Construction Institute
MS	Microsoft
PC	Practical Completion
PD	Path Dependency
PFI	Private Finance Initiative
PRISM	Pre-fabricated Integrated Service Modules
P-S	Products-to-Service
PSS	Product Service Systems
QA	Quality Assurance
RE	Research Engineer
SCL	Shepherd Construction Ltd
SES	Shepherd Engineering Services Ltd
SHE	Safety, Health and Environment
SFM	Shepherd Facilities Management
SGBE	Shepherd Group Built Environment
SMMT	Society of Motor Manufacturers and Traders
TVF	Transformation Value Flow
UK	United Kingdom
VHS	Video Home System

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LIST OF PAPERS

The following papers, included in the appendices, have been produced in partial fulfilment of the award requirements of the Engineering Doctorate during the course of the research.

PAPER 1 (SEE APPENDIX K)

Morrey, N., Dainty, A.R.J., Thomson, D.S., and Pasquire, C., (2013). Problematism of the shift from products to services. *In: Smith, S.D. and Ahiaga-Dagbui, D.D. (Eds) Proceedings 29th Annual ARCOM Conference, 2-4 September 2013, Reading, UK. Association of Researchers in Construction Management*, (1), 655-665.

PAPER 2 (SEE APPENDIX L)

Morrey, N., Pasquire, C., & Dainty, A.R.J., (2011). Developing a strategy to enact lean. *Journal of Engineering, Project, and Production Management*, 3(1), 35-45.

PAPER 3 (SEE APPENDIX M)

Morrey, N., Pasquire, C., & Dainty, A.R.J., (2010). The impact of path dependencies on lean implementation within a construction company. *Lean Construction Journal*, 2010 Issue, 86-96.

PAPER 4 (SEE APPENDIX N)

Morrey, N., Pasquire, C., Dainty, A.R.J. and Thomson, D.S., (2012). Path dependency to path creation: Enabling strategic lean implementation. *Proceedings of the 20th annual conference of the International Group for Lean Construction, San Diego, USA, 2012*, 241-250.

1 BACKGROUND TO THE RESEARCH

This first chapter outlines the industry context that has informed this research, introduces the industrial sponsor and discusses the general subject domain of integrated solutions provision. Also introduced is the encompassing subject domain of lean thinking.

1.1 THE CONTEXT OF THE RESEARCH

Competitively tendering for work is yielding increasingly low profit margins. UK construction companies are looking for ways to differentiate themselves in an environment where safely delivering on time, within budget and to the required quality is a given. Clients are increasingly expecting more value for money in addition to having requirements with respect to life cycle costs, Building Information Modelling (BIM) and the environment. Over half of the top 20 UK construction companies, including the industrial sponsor, therefore now state that they offer “solutions” to their clients. Through the additional offerings of business consultancy, operational services and financing, these businesses are aiming to open up new, long-term revenue streams in addition to the core production (construction) activity.

The industrial sponsor, Shepherd Construction Ltd (SCL) is part of the Shepherd Group of companies. Despite historically operating independently, the Shepherd Group, with its range of companies that supply products and services across the whole built environment life cycle, recognised it has a unique opportunity to organise itself to deliver integrated solutions. In addition to the benefits for clients, it is expected that organising in this way will ultimately allow the development of long-term revenue streams that can be delivered more efficiently than competitor organisations that will have to co-ordinate activities with third party organisations, adding management/interface costs.

The Shepherd Group set itself the vision of becoming an integrated solutions provider. Being a part of the group, this vision to transition to providing integrated solutions was cascaded to

SCL, i.e. SCL needed to organise itself to deliver integrated solutions, both when working with other group companies or alone. This required SCL to make the transition from a traditional contractor to integrated solutions provider.

Integrated solutions provision involves satisfying a customer's specific business needs through the delivery of a bespoke package of products and services that will together allow the customer to realise their business objectives, rather than just responding to a tender for a building. Historically tendering for and delivering projects in a traditional way, SCL needed to implement changes in their business that would enable them to meet their shareholder's aspiration of integrated solutions provision.

For SCL this transition was set in the context of an organisation that experiences variability in its performance, most notably on time completion of projects which in turn impacts profit and customer satisfaction. In addition, poor handover of the solution embodying the value proposition negotiated with the client by the work winning team to the project delivery team was impacting the delivery team's ability to understand and therefore deliver the solution in practice, again reducing customer satisfaction.

As a research engineer (RE) working within SCL the author has conducted the research project described in this thesis as a means of tackling these issues and enabling the business to make the products-to-service (P-S) transition.

1.2 THE INDUSTRIAL SPONSOR

The industrial sponsor is Shepherd Construction Ltd (SCL), a part of the Shepherd Group of companies. SCL is a main contractor providing design and construction services to clients in a variety of sectors including but not limited to residential, commercial, education and healthcare. The average project value is ~£40 million. Emerging sectors include power and infrastructure, and the business prides itself on its ability to deliver large scale, complex

projects. The construction project teams operate from three regional offices in the South (London), West (Manchester) and East (Leeds), all of which are supported by design, estimating and procurement functions which are based in York. Having no direct labour, the business sub-contracts work to third parties, co-ordinating the activities of consultants, designers and sub-contractors. As part of the Shepherd Group Built Environment (SGBE) division of The Shepherd Group, SCL are also supported by SGBE professional service departments responsible for marketing, finance, human resources, information systems and business systems. The divisional structure is designed to allow the operating companies within the division, of which SCL is one, to concentrate their efforts on winning work and doing work. SCL's turnover for 2010/2011 was £251 million, for 2011/2012 was £297 million and for 2012/2013 is forecast as £365 million. The company employs 365 people.

SCL, otherwise referred to throughout this thesis as the 'company,' is the unit of analysis for this research as will be explained further in Chapter 3.

Figure 1.1 following shows the Shepherd Group organisational structure, with SCL a part of the Shepherd Group Built Environment Division (SGBE.)

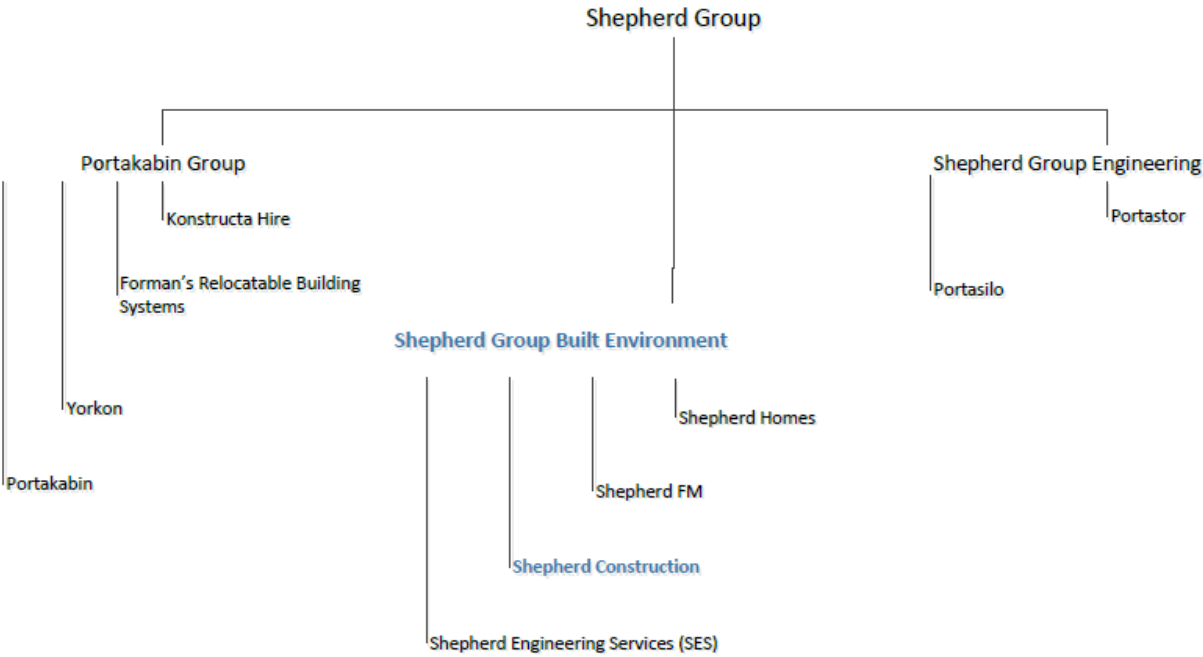


Figure 1.1 Shepherd Group organisation structure chart

The company was originally founded in 1890 by Frederick Shepherd and initially achieved success in speculative house building, later diversifying into general contracting. The company became a private business, F. Shepherd and Son (Frederick Welton Shepherd) in 1924, and by the time the Second World War broke out had a workforce of around 700 engaged primarily on projects in the North East of England. Post war, contracting operations expanded with the opening of new offices and acquisition of local companies in new areas. In addition to the contracting company, which officially became Shepherd Construction Ltd in 1968, other operating companies were founded, primarily in response to innovations arising from the construction activities.

Portasilo Ltd was formed in 1953, meeting a need to supply cement in bulk to sites. Today the business designs, manufactures and maintains a range of equipment for handling and storing bulk powdered materials in the process industry.

In 1961, with an awareness that building-site accommodation was inadequate, a new type of accommodation unit with extendable legs was developed that could be re-used by transporting it from one site to another – the Portakabin was born. Portakabin now manufacture then sell or hire a range of modular buildings that can be used for applications as varied as multi-storey offices, supermarkets and schools to name but a few.

The mechanical and electrical installation activities became a limited company, Shepherd Engineering Services (SES), in their own right in 1962, and in 2007 set up PRISM (**pre-fabricated integrated service modules**), a facility for the off-site pre-fabrication of mechanical and electrical assemblies.

Lastly, Shepherd Facilities Management (SFM) were created in 2007; with existing expertise in mechanical and electrical installation, SFM was set up to offer clients a building maintenance service which has more recently extended to providing a fully serviced office environment including cleaning, reception and interior fit out activities.

Despite being a part of the Shepherd Group each company was set up to operate independently. Each company, originally developed and led by one of Frederick Welton Shepherd's four sons, developed its own policies, procedures, systems and people capabilities, reporting their performance to a Group Board who assumed a governance and monitoring role on behalf of the Shepherd family. Today however, the Shepherd Group, which is still a private, family owned business with an annual turnover for 2012/2013 of £672 million, is looking to maximise the capabilities that exist across the range of companies, setting an overarching strategy to deliver integrated solutions.

1.3 THE GENERAL SUBJECT DOMAIN

At the core of this research project is the concept of integrated solutions provision in the construction industry, i.e. “the bringing together of products and services in order to address a

customer's particular business or operational requirements. Delivering integrated solutions to meet customer needs involves specifying, designing, constructing, financing, maintaining, supporting and operating a system/facility throughout its life cycle." (Brady et al., 2005a, p.572.)

The 'products-to-services' literature originated in the manufacturing and services industries where one of the primary drivers for the move to servitisation was the economic gains to be had by providing services centred on an installed base of products, i.e. service and maintenance contracts and support for products already sold (Oliva & Kallenberg, 2003.) Despite service-led construction projects not necessarily in themselves being more profitable (Lind & Borg, 2010), businesses see a move to solutions provision as a means for developing longer term relationships and contracts that over time can offer stability and reduce competition, thereby ultimately resulting in more certain and increased profits. Making the transition to solutions provider, or service manufacturer, opens up new revenue streams in the areas of business consultancy, operational service and financing.

The Institute for Manufacturing's High Value Manufacturing Framework (Livesey, 2006) classifies types of manufacturer along the product – service spectrum according to how they create value – refer to Figure 4.1. This assessment is based on whether revenue is generated by products or services and whether the majority of costs lie in production or non-production activities. Manufacturers that have the majority of their costs in production and generate the majority of their revenue from the sales of these products are deemed to be traditional product manufacturers. Those who have begun to generate revenues from services associated with the products they produce, yet whose majority of costs still lie in the production activity, are described as service-led producers. When the majority of costs lie in non-production activities the business is a systems integrator, undertaking the complex activity of organising

third party specialists to design and produce components that they must integrate into a functioning product, often a one-off, the sale of which generates the majority of revenue. Finally, service manufacturers have shifted their focus to providing services associated with their products, generating revenue from services and therefore having their costs associated with these non-production activities. Ultimately these companies may sell off their production capability entirely, wholly basing their business on providing support and services across a range of products.

Applying this framework to contracting organisations in the construction sector, a product manufacturer would be a company that generates their revenue through the construction of buildings, with the majority of their costs being associated with that production, i.e. labour and materials. In summary, a product manufacturer in construction is a building contractor who tenders for work and generates profit through that construction activity alone. As building businesses are “hollowed-out” (Leiringer & Brochner, 2010, p.1124) and work sub-contracted to third parties, they essentially become ‘systems integrators.’ Systems integration, deemed to be the core capability of solutions provision (Brady et al., 2005b), concerns the ability to integrate and manage all the parties involved, both internal and external, in the design, development and co-ordination of components and systems such that they come together as a functioning asset, i.e. the completed building that operates as planned. Organisations that have become systems integrators therefore still generate their revenue through production of the building, however the majority of their costs now lie in the non-production activities, for example consultancy costs, design development costs. These firms essentially “outsource detailed design and manufacture to external suppliers and contract manufacturers while maintaining in-house the systems integration capabilities necessary to co-ordinate a network of external component and sub-system suppliers” (Davies, 2004, p.731.) The transition to service manufacturer, or solutions provider, is complete when the

majority of the revenue generated by the business is from services, such as business consultancy, operational service and financing, rather than from the production of the building. These organisations are capable of providing a holistic service that supports the client's long-term business needs by managing and maintaining the asset throughout its lifecycle, ensuring it is performing to specification and enabling the client to achieve their business outcomes, rather than just constructing a building and walking away.

Research into the products-to-services transition has been dominated by examples from the manufacturing and capital goods sectors, with the majority of these proposing theoretical models or identifying the key characteristics of solutions provision as opposed to describing how this transition can be enacted in practice, or indeed the problems associated with trying to enact this transition (Foote et al., 2001; Galbraith, 2002; Oliva & Kallenberg, 2003; Brady et al., 2005a; Brady et al., 2005b; Gebauer & Friedli, 2005; Davies et al., 2006; Baines et al., 2007; Baines et al., 2009).

In more recent years the research into the products-to-service (P-S) transition has extended to include construction related examples (Johnstone et al., 2008; Leiringer et al., 2009), with the procurement agenda, either PFI or government procurement policies, prompting the address of solutions provision. These works begin to comment on the challenges construction organisations face with regard to the products-service transition, yet acknowledge that “in order to advance the debate there is a real need for more empirically informed and critical debates around the meaning, operationalization and implementation of current P-S strategies across industry sectors” (Johnstone et al., 2009, p.535). In addition, it is also suggested that current literature “over simplifies the reality of delivering P-S as a result of the normative nature of current P-S prescriptions” (Johnstone et al., 2008, p. 873), with theoretical models

and recommendations for making the transition being generalisations such as ‘develop capabilities’ and ‘restructure rewards.’

Due to the paucity of empirical literature and under theorisation of the products-to-services transition – i.e. specifically how to move from one state to the other - in the construction sector, and the business needs of the industrial sponsor, SCL, this work has used existing literature/models as a starting point against which the current state of the company has been assessed thereby allowing operational practices to close the gaps to be developed and implemented. Taking this approach has challenged current literature and has resulted in new practices and findings that support the transition to solutions provision to be proposed.

1.4 SUPPORTING SUBJECT DOMAIN

The aim of integrated solutions provision is the delivery of a service to the client that fulfils their business needs – in other words, providing a service that adds value: “Integrated solutions providers add value by providing combinations of products and services that create unique benefits for each customer” (Brady et al., 2005a, p.362.) Moreover, “value and value creation are at the heart of service” (Vargo et al., 2008, p.146).

The aim of the research project was to develop practices that would enable consistent delivery of integrated solutions, i.e. practices that would enable value to be delivered to the customer. The idea of adding value led to consideration of whether lean thinking could provide a foundation for these practices, and be a potential mechanism for the P-S transition - “the critical starting point for lean thinking is [therefore] value” (Womack & Jones, 2003, p.16).

Womack & Jones (2003) state that value is defined by the ultimate customer, and is only meaningful when described in terms of a specific product and/or service that meets the customer’s needs at that point in time at that price. This description of value is the first of five lean principles set out by Womack and Jones (2003) in their seminal book “Lean

Thinking.” The five lean principles of Lean Thinking as described by Womack and Jones (2003) can be summarised as follows:

1. Specify **value** from the customer’s perspective.
2. Identify the actions required across the whole **value stream** to deliver that value.
3. Make the value creating actions **flow**.
4. Produce what is **pulled** by the customer only.
5. Aim for **perfection** through continuous improvement and elimination of wastes.

Since value is central to lean thinking, the lean construction community has spent much time and effort in trying to define value. Drawing on the works of Womack & Jones (2003), Emmitt et al. (2005), Livesay (2006) and Vargo et al., (2008) for the purposes of this research value is considered to be as follows:

- Value is defined from the customer’s perspective.
- Value is derived from the product/service based on the customer’s perception of product/service usefulness at that point in time, at that price – this is the external, tangible, end goal that the integrated solutions provider is aiming to deliver.
- There is value derived from the way the product/service is delivered – the integrated solutions provider aims to provide the customer with a good experience which is made up of ‘soft values’ such as work ethics, communication and problem resolution, ‘hard values’ such as achieving timescales, cost limits and safety targets and additional value arising from the process itself, for example community engagement in the construction activities.
- Value is created collaboratively.

Integrated solutions providers look to work with their customer to understand all these aspects of value such that an agreed value proposition is defined and then delivered.

The second of Womack and Jones (2003) principles states that all the actions across the value stream, or the value chain (Porter, 1985), required to deliver that agreed value proposition need to be identified. In this case the value stream is the series of activities required to deliver integrated solutions. Davies & Hobday (2005) and Brady et al. (2005a) describe this integrated solutions lifecycle (refer to Figure 4.3), or value stream, as consisting of four phases – strategic engagement, value proposition, systems integration and operational service. This raised the question as to whether the actions needed to carry out these phases had to be defined and standardised in order to enact consistent integrated solutions provision, and following from that, would creating flow (the third lean principle (Womack & Jones, 2003)) through the phases of the integrated solutions lifecycle further enable the P-S transition. These research questions are discussed further in Chapter 2.5 and throughout Chapter 4.

1.5 CHAPTER SUMMARY

This chapter has introduced the general subject domain of integrated solutions provision and the industrial sponsor's aspiration to achieve that business model. A supporting subject domain of lean thinking has been proposed as a philosophy which can inform the way this transition is achieved. The backdrop for this change is an industry that is experiencing ever tightening profit margins and increasing customer demands, and an organisation, part of a group of companies, which is unable to consistently perform.

2 OVERARCHING AIM, OBJECTIVES AND RESEARCH QUESTIONS

This chapter sets out the aim and objectives of the research, explaining the background in which they were conceived and justifying them with regard to business and academic needs. Also discussed are the research questions that have been investigated.

2.1 BACKGROUND TO OVERARCHING AIM AND OBJECTIVES

To meet its parent group's aspiration, SCL needed to embed the characteristics of integrated solutions provision, making the transition from product manufacturer/systems integrator to service manufacturer.

However, SCL were experiencing a number of issues that would need to be overcome in order that they could deliver integrated solutions. As such, the strategy to enact the products-to-service transition within SCL would need to understand these issues and address them.

Firstly, SCL was experiencing variation in its ability to deliver projects on time and therefore within budget. Individual project teams were developing their own ways of working leading to inconsistent performance in the work winning (strategic engagement/value proposition) and project delivery (systems integration) phases of the integrated solutions lifecycle (Davies & Hobday, 2005; Brady et al., 2005a) – see Figure 4.3. This is at odds with a lean thinking approach which advocates identifying and standardising the actions required to deliver value across the value stream, i.e. the integrated solutions lifecycle.

Also proving problematic was the successful handover of the solution, embodying the value proposition negotiated with the client, by the work winning team to the project delivery team, who would then have to realise that solution in practice. This loss of understanding was directly impacting on the customer's experience as well as the team's ability to deliver the solution.

Similarly, the handover from the project delivery team to the facilities management (FM) team, who would manage operational service of the completed asset, was not only resulting in a reduction in customer satisfaction but also a lost opportunity for the company to utilise the expertise of the FM company (whether from within group or not) in the development of the solution.

Current approaches to both handovers tended to break the continuity of understanding of value throughout the project lifecycle, whereas flow of the value proposition throughout the integrated solutions lifecycle is a central tenet of lean thinking and arguably a prerequisite to integrated solutions provision.

2.2 OVERARCHING AIM

The overarching aim of this research project was to develop practices to enable SCL to consistently deliver high value integrated solutions, and in doing so provide a basis for the wider group vision of the operating companies working together to pool their expertise and deliver a service offering unique in the industry.

This aim recognises the long term vision of the group of companies. This research project is the first step of a cultural change journey that will involve the organisation learning how to think and work differently, continually challenging what it does such that it becomes a true learning organisation, thinking business and integrated solutions provider. The ultimate aim is true cultural change, not merely a change in outward appearance and rhetoric.

2.3 OBJECTIVES

The study sought to understand the problems associated with the consistent delivery of integrated solutions in SCL with a view to developing practical mechanisms based on lean thinking that could be applied within SCL, and the later across the wider group, ultimately enabling achievement of the research aim.

The overall aim was to be achieved by completion of the following objectives:

Objective 1: Identify the characteristics of integrated solutions provision.

Objective 2: Understand the current state of SCL, the case study organisation, with respect to the desired state of solutions provision.

Objective 3: Design, implement and assess changes to achieve the desired state.

Objective 4: Use the learning from Objective 3 to refine and further develop practices to achieve the desired state, iterating the design-implement-assess-learn cycle as necessary.

Objective 5: Assess the impact of the practices implemented and establish the contribution of the project to differentiating the company in the integrated solutions marketplace.

2.4 JUSTIFICATION OF THE OBJECTIVES

The objectives have been developed to achieve the research aim and ergo, the needs of the sponsor organisation. In addition, in conjunction with the research design, they also allow the academic requirements of the EngD to be fulfilled.

The first objective, to identify the characteristics of integrated solutions provision, ensures the researcher, and the company, have an in-depth understanding of integrated solutions provision with respect to current literature and research. Since SCL has a vision to become an integrated solutions provider it essential to understand what this means and define the future state it is aiming for. Understanding the desired future state, or the target condition, is important for effective process improvement and for ensuring people focus their efforts on doing the right things rather than on opinions and ideas (Rother, 2010.) By defining the desired future state the company will have a benchmark against which it can then assess itself and against which academic conclusions and findings can be drawn.

Completion of Objective 1 enables Objective 2 - understand the current state of the company with respect to the desired state of integrated solutions provision - to be carried out. It is essential to understand the current state, with respect to the desired state, in order to be able to identify the problems that need to be overcome and the changes that need to be made - “when the desired future state is articulated, you then attend to the present reality and ask, ‘What is it in the present which needs changing in order to move to the desired future state?’”(Coghlan & Brannick, 2010, p.67).

The outcomes of Objective 2, i.e. the differences between the current state and the desired state, then provides the focus for Objective 3, which is to design, implement and assess changes to achieve the desired state. The purpose of Objective 3 is tangible change in the company that will move it closer to its aspiration of delivering solutions; it is therefore critical to achieving the company’s needs as well as providing the empirical evidence for academic contribution since “the best way of learning about an organisation or social system is through attempting to change it” (Easterby-Smith et al., 2008, p.93). Assessing whether the changes implemented have had the desired effect will establish the contribution the changes made to delivery of integrated solutions and to the company’s performance. This assessment will also provide a picture of the now current state of the company against which the desired future state can again be assessed, thereby identifying the next cycle of change that needs to be implemented.

Objective 4 then uses the learning from Objective 3 to refine and further develop practices to achieve the desired future state, recognising that it is not always possible to achieve the future state in a single cycle of change. The outcome of this objective is again tangible change and a contribution to knowledge based on empirical evidence.

The final Objective, 5, then assesses the impact of the research project on the company, explaining how the practices implemented have influenced the ability of the company to deliver solutions. By doing so, the contribution of these practices to integrated solutions provision can be articulated, fulfilling the research goal of making a contribution to knowledge (ESRC, 2007) and informing areas for further development in the on-going realisation of the company and group strategies.

2.5 RESEARCH QUESTIONS

Alongside the research aim and objectives, which are associated with the company's needs, the following research questions have also been investigated as a means of making a contribution to academic knowledge and theory.

Question 1: Does lean thinking have a role to play in the enactment of the products-to-service transition?

At the start of the research it was proposed that lean thinking has a role to play in the enactment of products-to-service strategies, primarily since the concept of 'value' is central to both lean thinking and integrated solutions provision (as explained in Chapter 1.4). Justification of such a proposition would provide a unique theoretical contribution on how to enact P-S strategies in the construction sector.

Inconsistencies in the way in which SCL were carrying out the phases of the integrated solutions lifecycle (Davies and Hobday, 2005; Brady et al.,2005a) indicated that the actions required across the value stream to deliver value (Womack & Jones, 2003) had not been clearly identified prompting the following research question:

Question 2: Do standard approaches/ways of working based on lean thinking enable consistent performance of the phases of the integrated solutions lifecycle?

Following Womack and Jones' first two lean principles of 'value' and 'value stream' (which informed questions 1 and 2) their third lean principle of making the value creating actions flow led to the next research question.

Question 3: Does creating flow across the phases of the integrated solutions lifecycle enable the P-S transition?

As these questions were being investigated a further research question emerged:

Question 4: Is there a one size fits all approach to lean implementation?

Attendance at International Group for Lean Construction (IGLC) conferences and a review of lean construction literature highlighted debates concerning the application of lean (Green, 1999; Green & May, 2005) and the different models of implementation (Scarborough & Terry, 1998), leading to consideration of this research question.

As the research process progressed, other questions also arose.

Objective 1 was to identify the characteristics of integrated solutions provision and Objective 2 to understand the current state of the company with respect to the desired future state. As this work was being undertaken it prompted the question of benchmarking an organisation's maturity against a set of criteria which could readily be understood by people in the company and used to inform next steps and show progression. This resulted in research question 5:

Question 5: Is there a need for assessing/benchmarking the maturity of an organisation during its P-S transition?

Part of Objective 3 required an assessment of the changes implemented and in doing so prompted research question 6, which in turn led to questions 7 and 8.

Question 6: Do path dependencies impede the implementation of lean thinking (and therefore P-S transition where that is based on lean thinking)

As P-S transition strategies, based on lean thinking, did not play out in practice exactly as expected it raised the question as to whether there were organisational barriers impeding change. Since the P-S strategies implemented had focussed on implementing standard ways of working, and routines (ways of working) are path dependent (Teece et al., 1997) it prompted the consideration that path dependencies were impeding the P-S transition. This then led to questioning whether understanding these barriers would allow them to be overcome or capitalised upon:

Question 7: Will an understanding of path dependencies enable P-S strategies and lean implementation strategies to be tailored to overcome and/or capitalise upon the path dependencies?

And finally whether practices based on lean thinking would overcome these barriers:

Question 8: Can implementation of operational practices based on lean thinking enable path dependencies to be overcome, allowing the P-S transition to occur?

The objectives and research questions described in this chapter are shown mapped against the research process in Chapter 3, Figure 3.3, and linked to the academic papers produced which support this thesis in Chapter 3, Table 3.1. These questions and the surrounding literature are also discussed in more detail throughout Chapter 4, which explains the research undertaken.

2.6 CHAPTER SUMMARY

This chapter has explained the overarching research aim to develop practices that will enable consistent delivery of solutions to clients by SCL, the industrial sponsor organisation. It is anticipated that achievement of this aim will support the long term Shepherd Group vision of solutions provision. The objectives and research questions that have been investigated and fulfilled through the research have been listed and discussed, explaining how they satisfy the needs of the company and the academic contribution to knowledge required of the EngD.

3 ADOPTED METHODOLOGY

The following chapter explains the circumstances considered with respect to the relevant methodological principles, the methods that were used and how these achieved the research aims and objectives.

3.1 METHODOLOGICAL CONSIDERATIONS

Two prevalent approaches to social research are inductive and deductive approaches (Blaikie, 2007; Bryman, 2012). These approaches describe the relationship between theory and research and whether “data are collected to test or build theories” (Bryman, 2012, p.20). A deductive approach starts with the researcher, based on what is currently known in that domain, producing a hypothesis, or general statement, which they then seek to prove through the collection of data. The hypothesis is then confirmed or rejected depending on the findings and the current theory is revised accordingly to incorporate these new findings (Bryman, 2012). In contrast, an inductive approach starts off with a singular, specific statement that prompts investigation and collection of data with a view to a general theory being produced (Blaikie, 2007).

Deductive and inductive approaches are aligned with a positivist epistemology and objective, or realist, ontology. Epistemology is concerned with “what should pass as acceptable knowledge” (Bryman, 2012, p.711). A positivist epistemology approaches the social environment as it would the natural sciences, looking for evidence of facts that are treated objectively – hence being aligned with an objective ontology. Ontology is concerned with whether social entities and phenomena exist independently of the people involved with them or exist as a result of the perceptions and actions of the social actors involved. Objectivism is an ontological position that suggests “organisation and culture are pre-given” (Bryman, 2012, p.33) and as such social actors have no role in determining them. Conversely,

constructionism challenges this perspective and “asserts that social phenomena and their meanings are continually being accomplished by social actors” (Bryman, 2012, p.33). The ontology of constructionism is therefore aligned with an interpretive epistemology. Having taken the position that social entities are created by the people involved with them (an ontology of constructionism), an interpretive epistemology advocates that knowledge can be created based on understanding the actions of people involved in the social situation being studied, rather than having to rely on facts that are free from perceptions and interpretation.

Since the aim of this research was to develop practices that people could use in their daily lives, and which would promote change in how the organisation defined itself, i.e. change from product to service provider, it was felt essential to understand how people in the organisation worked and why, allowing their meanings and perceptions to inform the resulting practices. Given the ontological and epistemological position taken, neither deductive nor inductive research strategies were appropriate.

Deficiencies in deductive and inductive approaches led to the combining of these approaches and the resulting development of retroductive and abductive research strategies (Blaikie, 2007). Inductive and deductive approaches were criticised for including elements of each other, for example there is an element of induction in a deductive approach when the researcher makes suggestions on how their findings might impact on the original theories that informed their initial hypothesis (Bryman, 2012). An inductive approach is also criticised for describing things based on observations rather than explaining things, despite some arguing that observations cannot be made without making interpretations (Popper, 1961; Blaikie, 2007). Deduction is similarly criticised for testing theory based on observation since a deductive approach assumes an objective view of reality, i.e. it is based on facts, yet observations, which reflect reality according to those being observed, are not factual but open to interpretation. In contrast, an abductive approach “involves constructing theories that are

derived from social actors language, meanings and accounts in the context of their everyday lives” (Blaikie, 2007, p.89). It is therefore based on an ontology of constructionism and an interpretive epistemology.

Although current academic literature contains a number of theoretical models and descriptions of the characteristics of integrated solutions provision, they have largely been developed in the manufacturing and service sectors, and as such at the start of the research project their applicability to the case study company was unknown. An abductive research approach would allow these existing theories to be tested within the organisation, through observation and interview of those involved, and support development and elaboration of these theories (Blaikie, 2007).

While current academic literature includes theoretical models for how integrated solutions providers should organise themselves (Foote et al., 2001) and describes the characteristics integrated solutions providers should possess, the means of attaining these models and characteristics, i.e. how to transition from one state to another – the products-to-service transition, is not clearly defined. Some authors recognise that the transition is portrayed as unproblematic, with suggestions on what is required being vague (Johnstone et al., 2008, 2009). The lack of theory and empirical accounts of organisational P-S transition in the construction sector offered an opportunity to generate new knowledge. An abductive approach supports the generation of new knowledge through the accounts and experiences of those involved, developing these theories iteratively, rather than deductive and inductive approaches which are linear research designs. Rather than propose theories that would then be tested, or use data to create a general theory, the abductive approach chosen allowed new theories to emerge based on understanding the state of the organisation from the perspectives of the people working there. An action research methodology was used to encourage people

to reflect on what was happening in the organisation, and the results of changes implemented as a result of taking action that was determined by identifying the gap between the organisations current state and desired future state (which was informed by current academic models). As a result of these reflections, new knowledge and practices were developed which then allowed existing theories to be critiqued and developed.

Given that the aim of the research project was to develop and implement practices that people in the company would be using in their day-to-day lives to enable the consistent delivery of integrated solutions, thereby effecting the P-S transition, it was thought essential to engage people from across the business in the research process. The approach of engaging people in the research process was not only anticipated to encourage their buy-in to new ways of working, but would also draw upon the wide range of expertise from across the business. Employee engagement, and the resulting tacit learning, would also support the company's aspiration of integrated solutions provision being about a true, cultural change in attitude and approach to projects and not just marketing rhetoric. Also of consideration was the role of the research engineer, who would be embedded in the company, and attending management meetings and project meetings, and interacting with people affected by the changes made. An abductive approach actively supports both of these considerations, with Blaikie (2007) suggesting that the social scientist should immerse themselves in the environment being investigated, "withdraw from it for reflection and analysis, followed by further stages of immersion and withdrawal" (Blaikie, 2007, p.103).

The research methods used were primarily qualitative, as the use of words rather than quantitative data analysis "embodies the view of social reality as a constantly shifting emergent property of individuals' creation (Bryman, 2012, p.36). Nevertheless, quantitative data has also been used to evidence tangible benefits to the company's senior management

and to triangulate findings as a means of validating results and reducing risk of researcher bias.

3.2 METHODOLOGY DEVELOPMENT/REFINEMENT

Given the interpretive approach being taken to the generation of new knowledge and theory, the real-life context in which the research was being carried out, i.e. within a company that was aspiring to change, and the overarching aim and proposition of the research – ‘how’ to deliver consistent integrated solutions through the development of practices based on lean thinking – a case study research design was chosen as the framework for the collection and analysis of data.

A case study satisfies the three conditions described by Yin (2009) that should inform the chosen method – the form of research question, whether control of behavioural events is required and whether the research focuses on contemporary events. Since the form of the research question concerns ‘how’ the company will enact the P-S transition, and also shows the research being concerned with the present/future, a case study design is suitable as it allows an in-depth investigation of contemporary phenomena within its real life context (Yin, 2009) and will account for the fact that the researcher cannot control behavioural events.

A case study design also allows an in-depth analysis of the case involved (Yin, 2009) over a period of time, which was relevant to this research as it aimed to make organisational change during the duration of the four year research period. Although cross-sectional research design or survey research would have collected data from more than one case, which arguably could have improved external validity, they are concerned with collecting data at a single point in time in order to detect patterns (Bryman, 2012) and therefore would not have suited the purpose of this research which was to enable organisational transition from products to services within the sponsor organisation.

A number of tactics have been used as a means of meeting the criteria that judge the quality of a research design – construct validity, internal validity, external validity and reliability (Kidder & Judd, 1986; Yin, 2009). A single case study, with SCL as the unit of analysis, has been undertaken as the company had engaged the researcher to implement the research process as a means of enabling their vision. Given that the company, at the start of the research, was arguably typical of many main-contractors in the construction industry, the experiences, lessons and theories generated by this case could be assumed to be informative to other similar businesses (Yin, 2009) and therefore externally valid. Multiple sources of evidence have been obtained through the various methods described in Chapter 3.3 and throughout Chapter 4 in order to ensure construct validity, along with senior managers in the company reviewing and sense-checking the data gathered. Internal validity has been addressed through cross-checking of data and matching patterns that occurred in interview responses and evidence from company records. To address the issue of reliability the researcher has kept records of all the data gathered, such as interview transcripts, copies of company records and performance data, such that another individual could review and use the same information to arrive at the same findings.

Yin states that case study inquiries benefit “from the prior development of theoretical propositions to guide data collection and analysis” (2009, p.18). The theoretical proposition under consideration was that lean thinking could inform the development of the practices that would be implemented within the company to enable the P-S transition. In order to develop these practices, an action research framework was implemented within the case study company as a means of creating change.

“Action research aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science” (Rappoport, 1970, p.499). This

methodology embraces involvement of the researcher and the people affected by and responsible for implementing the changes in the research process (Easterby-Smith et al., 2008) and uses the knowledge of the people involved to effect change, the learning from which creates new knowledge about the changes made, their impact and the change process itself (Fellows & Lui, 2008).

The action research cycle as described by Coghlan & Brannick (2010, p.8) consists of the following stages which are also shown in Figure 3.1:

- Stage 1: Define context and purpose.
- Stage 2: Constructing.
- Stage 3: Planning action.
- Stage 4: Taking action.
- Stage 5: Evaluating action.

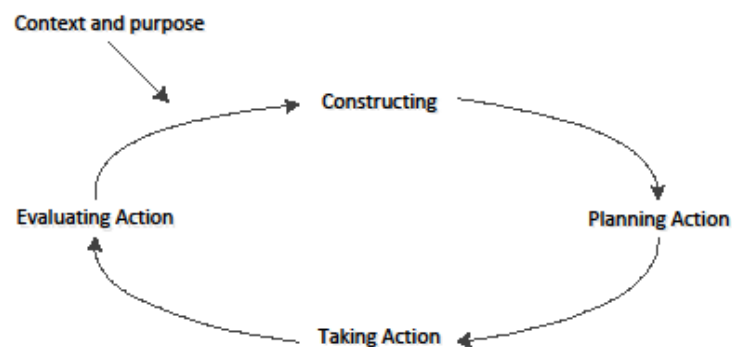


Figure 3.1 The action research cycle (Coghlan & Brannick, 2010, p.8)

In this case, the company had a vision of the future – integrated solutions provision – that the action research was aiming to achieve. Beckhard’s framework for planned change (Beckhard & Harris, 1987; Beckhard & Pritchard, 1992; Coghlan & Brannick, 2010) has four phases,

which include defining the future state and then assessing the current state such that the actions required to move towards the future state can be identified:

Phase 1: Determining the need for change.

Phase 2: Defining the future state.

Phase 3: Assessing the present in terms of the future to determine the work to be done.

Phase 4: Managing the transition from the present to the future.

Both the action research cycle (Figure 3.1) and Beckhard's framework are assumed to lead to numerous cycles of change as shown in Figure 3.2 (Beckhard, 1997; Coghlan & Brannick, 2010).

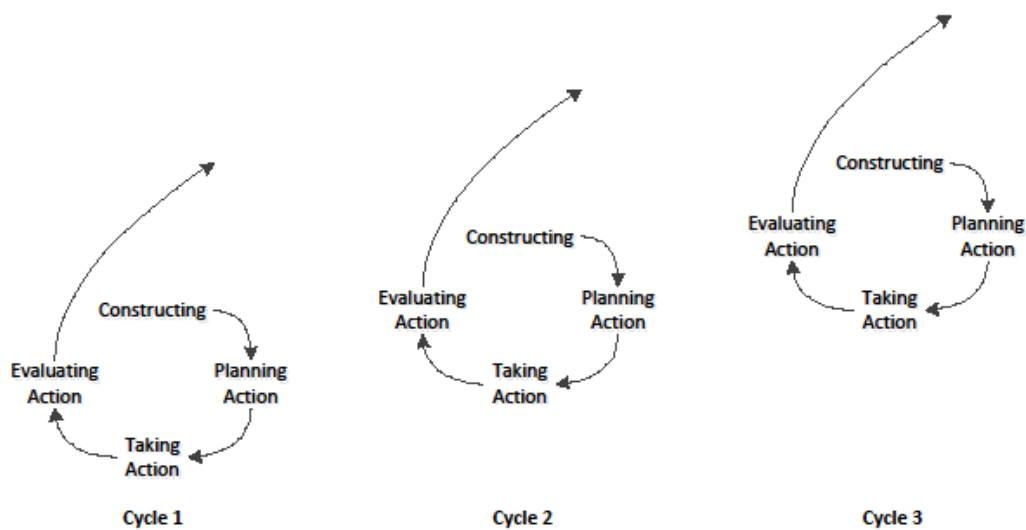


Figure 3.2 Spiral of action research cycles (Coghlan & Brannick, 2010, p.10)

The evaluation/assessment of action from the preceding cycle identifies further changes required to achieve the desired state and therefore informs the subsequent actions to be taken. The spiral of action research cycles also allows the changing nature of the organisation and unforeseen events to be accounted for as the research progresses.

The action research cycle was combined with Beckhard's framework for planned change resulting in the following research process:

- Step 1: Determine the need for change.
- Step 2: Define the desired future state.
- Step 3: Assess the present in terms of the future to define the work to be done.
- Step 4: Agree the plan of action.
- Step 5: Implement the agreed plan of action.
- Step 6: Evaluate action.
- Step 7: Determine next issues.
- Step 8: Agree the plan of further action.
- Step 9: Implement further actions.
- Step 10: Evaluate actions implemented.

The steps outlined above include two action research cycles. Steps 1 to 6 represent the first action research cycle. Steps 7 to 10 represent the next action research cycle, using the evaluation from step 6 to determine the subsequent course of action. Steps 7 to 10 could be repeated numerous times until the desired future state is achieved.

At the start of this research there were no preconceptions about how many action research cycles would be undertaken as the current state of the organisation with regard to the desired future state was unknown, and therefore the actions required to close the gap, and whether they could be achieved in one cycle, were undefined. This approach is aligned with the research philosophy of understanding the reality of the company through the eyes of those

involved, as well as ensuring the research would respond to the actual issues uncovered in the company, rather than rigidly taking place for its own sake.

Eventually two action research cycles were undertaken over the course of the four year timescale. This allowed practices to be developed, implemented and evaluated within the company and enabled the research questions to be investigated. While results show the research has contributed to moving the business towards the desired future state, Chapter 5 acknowledges that there is further work that could be done through subsequent action research cycles.

The research process, how it fulfils the objectives and answers the research questions (refer to Chapter 2), the research methods used and the outputs are shown in Figure 3.3.

The top line of Figure 3.3 shows the research objectives that were designed to achieve the overall aim. Sitting underneath these objectives are the steps of the two action research cycles carried out, with the steps sitting underneath the particular objectives they were meant to fulfil. The research questions addressed by each step are shown underneath the appropriate steps. Note that the research questions are shown according to where they were investigated by the research process and not necessarily in the chronological order in which the questions arose. The methods used to carry out the steps of the research process are shown in the fourth row, aligned with the research steps they were used to collect data for. The academic outcomes, i.e. conference and journal papers (refer to Table 3.1 for detail) are then shown, again aligned with the research steps that investigated the research questions and produced the resulting practices/conclusions that are discussed in the paper. The last row shows the practices developed by the steps of the research process that were implemented in the company, and therefore described as company outcomes.

Appendix A shows the timing and durations of the activities carried out for each step of the research process (which are described in detail throughout Chapter 4).

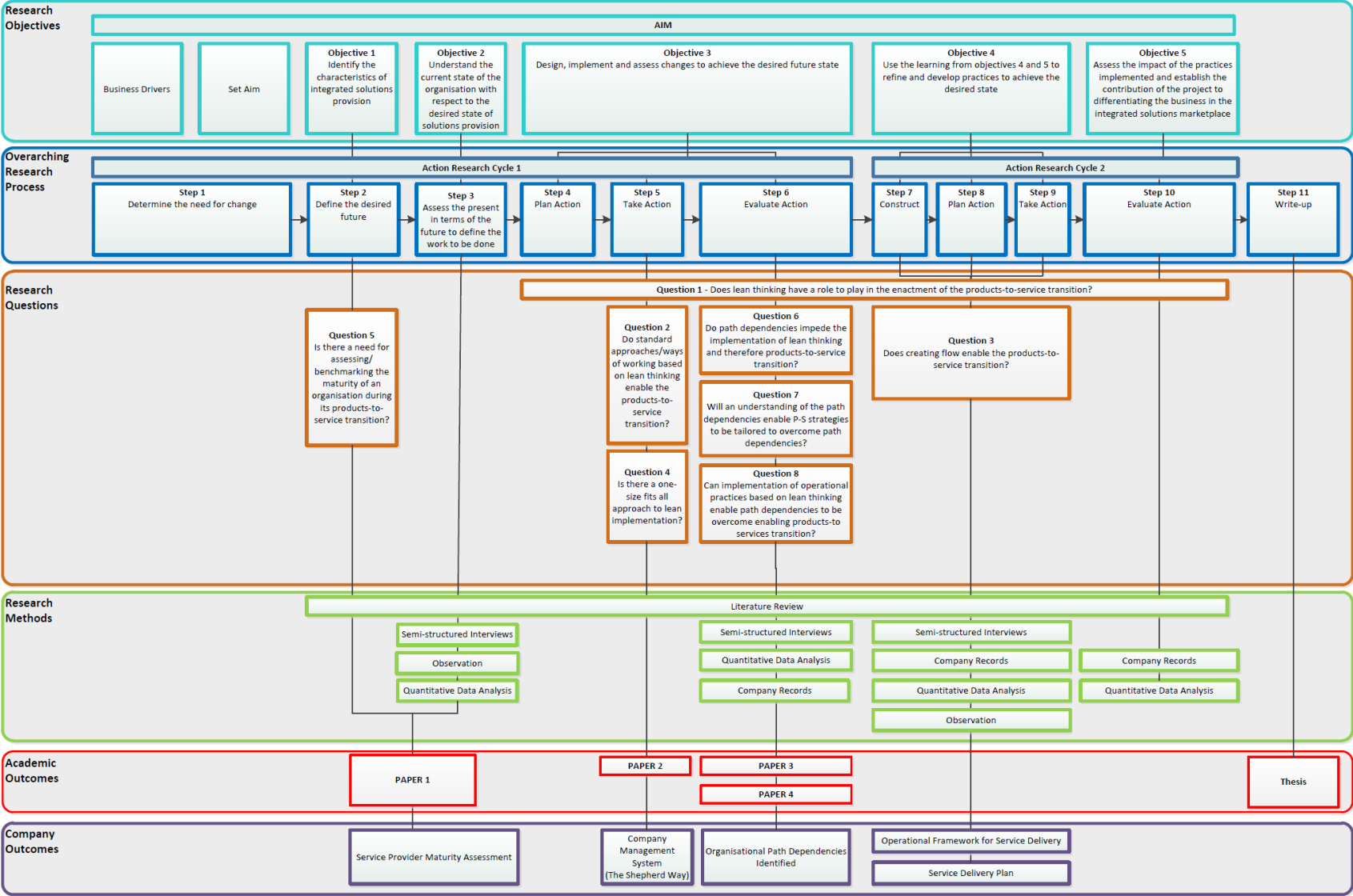


Figure 3.3 The Research Process

Table 3.1 Published papers showing relevance to objectives and research questions

Paper # & location in thesis	Title	Journal/Conference and status	Paper description	Relevance of the paper to the objectives & research questions
Paper 1, Appendix K	Problematisation of the shift from products-to-services	Proceedings of the 29 th Annual ARCOM Conference, Reading, UK, 2-4 th September, 2013. Published.	Using the characteristics of integrated solutions provision described in current academic literature as the aspirational future state, the problems associated with embedding these characteristics in practice in the case study company are uncovered and discussed.	Defines the characteristics of integrated solutions provision, i.e. the desired future state partially fulfilling objective 1 and describes the problems experienced when trying to embed these characteristics, thereby describing the current state of the organisation with regard to solutions provision, supporting objective 2.
Paper 2, Appendix L	Developing a strategy to enact lean	Journal of Engineering, Project and Production Management Published.	Explains how lean thinking was used to develop a set of standard processes and tools that resulted in more consistent project performance in the phases of the integrated solutions lifecycle.	The development of the processes and tools, based on lean thinking, were designed and implemented as a means of ensuring consistent performance in the phases of the integrated solutions lifecycle – in doing so moving the company closer to the desired future state of solutions provision and partially satisfying objective 3. The paper investigates the role lean thinking, specifically the development of standard ways of working incorporating lean thinking, has to play in enabling consistent performance in the phases of the integrated solutions lifecycle (research questions 1 and 2), and indicates that there is not a one size fits all approach to lean implementation (research question 4.)
Paper 3, Appendix M	The impact of path dependencies on lean implementation within a construction company	Lean Construction Journal Published.	Based on how changes implemented in the company have played out in practice it is proposed that path dependencies inhibit P-S transition based on lean implementation and that gaining an understanding of path dependencies is an important part of enabling change strategies. Possible causes of path dependency in the company are discussed.	The identification of the company path dependencies is part of the assessment of the changes implemented and partially fulfils objective 3. The learning from the study also contributes to objective 4 by means of informing future practices required to enable the P-S transition. These papers directly investigate the research questions concerning whether path dependencies inhibit P-S transition based on lean thinking, whether gaining an understanding of these path dependencies will allow future change strategies to be tailored to overcome or capitalise upon them and whether application of lean thinking enables path dependencies to be overcome (research questions 6, 7 and 8).
Paper 4, Appendix N	Path dependency to path creation: enabling strategic lean implementation	Proceedings of the 20 th Annual Conference of the International Group for Lean Construction, San Diego, USA, July, 2012. Published.	Describes the path dependencies uncovered in the company and shows that an understanding of them enables change strategies associated with P-S transition, based on lean thinking, to be tailored to overcome these barriers to change.	

3.3 METHODS/TOOLS USED

The Oxford Dictionary of English (2010) defines ‘method’ as “a particular procedure for accomplishing something.” The following methods have been used to accomplish the research aim.

3.3.1 LITERATURE REVIEW

There are a number of purposes to reviewing the existing literature – finding out what is already known in the problem area, understanding current theories and concepts, appreciating the types of research strategy that have been carried out, identifying inconsistencies or controversies, and understanding whether there are unanswered research questions and therefore opportunities for new work, making sure it is not repeating what has already been done before (Bryman, 2012; Easterby-Smith et al., 2008).

Whilst this research project has products-to-service transition as the general subject domain, the supporting subject domain of lean thinking and an overarching action research framework that is based on solving organisational problems has led to literature review being a constant activity throughout the research process. Initially, in each subject area, the literature review allowed a general understanding of the topic, an appreciation of current theories and approaches, and identification of related topics that might be applicable.

Concerning the general subject domain of products-to-service business models, a review of the literature provided a starting point for understanding the desired future state that the company was looking to achieve. Then reviewing the literature from the perspective of ‘how’ companies achieve the desired state has allowed unanswered questions to be uncovered and opportunities for a new contribution through this project to be identified.

As the research progressed, the nature and purpose of the literature review changed. Rather than setting out to review a certain topic, a new topic to investigate emerged. For example,

evaluating action at step 6 of the research process necessitated understanding the barriers to change in the organisation; this led to identification of path dependency literature which in turn informed new research questions (questions 6, 7 and 8).

3.3.2 SEMI-STRUCTURED INTERVIEW

One-to-one semi-structured interviews have been used a number of times throughout the research process in order to gather data/information from the people in the case study organisation. While the use of questionnaires was considered as they would have allowed more people to be consulted, they can often yield poor response rates and answers to open questions are at risk of interpretation by the researcher (Fellows & Lui, 2008). Instead, semi-structured interviews support an interpretive case study approach as “most case studies are about human affairs or behavioural events” (Yin, 2009, p.108) and allow deeper insights into events than questionnaires (Fellows & Lui, 2008).

The data gathered through semi-structured interviews has included historical information about what has happened in the past and why, what is currently happening in the company and why with respect to a certain topic, and how changes implemented in the company through the research process have been received and why. The experiences and views of the people involved in the research, gained through these interviews, was used both to inform the action taken at certain stages of the research process as well as to develop the practices that would satisfy the research aim.

In each case a standard set of interview questions was developed in order to reduce interviewer variability (Bryman, 2012), however interviews were semi-structured, rather than structured, in order that the sequence of the questions could be varied and additional questions could be asked depending on the response and other relevant sources of evidence identified (Yin, 2009). Interviews were carried out face-to-face, one-to-one and transcribed long hand

to reduce the risk of distorting answers and introducing errors or the opinions of the researcher which are potential weaknesses of the method (Yin, 2009; Bryman, 2012). Responses were then analysed and repeated words, phrases and opinions or ideas were identified and matched in an effort to ensure internal validity (Yin, 2009).

3.3.3 OBSERVATION

Since qualitative research is concerned with the generation of concepts through immersion of the researcher in the collection of data in order to discover any patterns (Fellows & Lui, 2008), observations have been undertaken as a means for the researcher to immerse herself in the organisation, understand how people behave and why, and in doing so generate new ways of working (Yin, 2009; Bryman, 2012).

Since the researcher was acting as a change agent for the company, setting out to facilitate changes to working practices, participant observation was undertaken. Blaikie (2007) suggests that participant observation, as well as interviews, are useful methods which support an abductive approach by giving the researcher an opportunity to immerse themselves in the environment being investigated and perceive reality from the perspectives of those involved, therefore allowing them to understand what needs to change. Also, having identified what changes are required, participant observation gives the researcher an opportunity to manipulate events in order to make change (Yin, 2009). In this case, as well as attending management meetings and project related meetings such as post project review sessions, the researcher facilitated workshops to develop and implement new practices.

Since participant observation can lead to the researcher becoming so involved in activities that they do not have time to carry out the observer role, i.e. make notes about what is happening, and lead them to become entrenched in the same thinking as the group they are studying (Yin, 2009), non-participant observation was also carried out.

Non-participant observation, or direct observation, where the researcher has simply observed a situation and not taken part directly (Fellows & Lui, 2008), has also been carried out through attendance at project meetings and site visits. This allowed the researcher to focus solely on observing the situation and the artefacts being used, for example documents, forms and information systems.

Both these forms of observation have been used throughout the research process to understand from the perspectives of the people involved, when in their day to day settings, the current state of the company, positive and negative practices and behaviours with respect to the desired future state of solutions provision, and to assess the impact of changes made as a result of the practices developed.

3.3.4 QUANTITATIVE DATA ANALYSIS

A quantitative approach implies the use of measurement in the collection of data (Fellows & Lui, 2008). In this case, quantitative data has been used at certain steps in the research process primarily as a means of assessing company performance; it has been used to quantify the current state, identify areas for improvement and assess the impact of practices developed.

In some instances quantitative data has also been used for triangulation purposes. Triangulation allows the cross-checking of findings through the use of different types of method or sources of data, thereby improving the credibility of the research (Bryman, 2012; Fellows & Lui, 2008). Not only has quantitative data served to verify findings emerging from the qualitative work, but it has also been used to aid the decision making process. For example, where qualitative findings revealed numerous issues, the researcher and senior management team used quantitative data, primarily concerning company performance, to help decide priorities.

The quantitative data used has included financial performance data (profit and turnover), project performance data (cost and time) and compliance audit scores (quality).

3.4 CHAPTER SUMMARY

This chapter has discussed the considerations with regard to research methodology in general and explained the research methodology undertaken along with the research methods used.

Following an abductive approach, a case study of action research aimed at enabling the consistent delivery of high-value integrated solutions, thereby effecting the P-S transition, has been carried out. In contrast to a deductive approach, which would have started with an initial hypothesis and set out to prove or disprove it, in this case operational practices and propositions have been developed, implemented and evaluated based on the data collected by the research methods described.

4 THE RESEARCH UNDERTAKEN

This chapter describes the research undertaken for each of the steps in the research process, explaining how these achieved the research objectives and answered the research questions. The outcomes of each step and their impact on the company are also discussed.

4.1 STEP 1: DETERMINE THE NEED FOR CHANGE

The need for change was determined by Shepherd Group's leadership team who have set a vision to deliver solutions. This group vision has been cascaded to SCL who captured the aspiration to deliver integrated solutions in their company strategy document. The strategy document described the intention to utilise the company's technical expertise to develop and deliver solutions to clients that the company has a strategic business relationship with.

SCL's company strategy document outlined that the ability to deliver solutions in this way was expected to be underpinned by a 'No Compromise Delivery' approach (which means consistent project execution in terms of time, quality, cost and safety, health and environment (SHE)), an investment fund that would be provided by the group to support financing opportunities where a business case could be made, and a growing FM capability that could be provided by the sister company, Shepherd Facilities Management (SFM).

The drivers for this change in strategy towards solutions provision have been considered from key stakeholder perspectives. Shareholders (the Shepherd family) have invested heavily in the business and need a return on their investment that has not been forthcoming in recent years. In the current economic climate some competitors are failing, few are changing and some are living off reserves; with their strategies designed to cope with the declining market and improving cost base efficiencies. More organisations are competing for the same work – there is a need to offer something different. Employees deserve to be part of a successful business and the community needs to benefit positively from what the company does. Supply

chain partners are critical to the company's success but need to be engaged in the right way. And lastly, but crucially, customers have needs that the group believes, with its range of companies – providing products and services – it can meet and exceed, offering something different to its competitors and in doing so satisfying all its stakeholders.

4.2 STEP 2: DEFINE THE DESIRED FUTURE STATE

In order to achieve the aim of the research project (which was to develop practices to enable SCL to consistently deliver high value integrated solutions, and in doing so provide a basis for the wider group vision of the operating companies working together to deliver a service offering unique in the industry) it was deemed essential to fully understand the desired future state of 'integrated solutions provision' since all future activities would be aimed at making changes that would move the business towards that position.

Definition of the desired future state was considered from two perspectives. Firstly the available literature on the topic of integrated solutions provision and how product-to-service business models are enacted (i.e. how the transition from products-to-services is made) and secondly the measurable outcomes that the business is expecting from this approach.

The need to define the desired future state, as informed by the action research cycle explained in Chapter 3, also prompted the research question as to whether there is a need for benchmarking/assessing a company's maturity with regard to integrated solutions provision over the course of its transition from current state to desired future state. As a result of this, a maturity assessment that can be used to evaluate the state of the business with respect to the characteristics of solutions provision was developed, trialled and implemented.

4.2.1 LITERATURE REVIEW

A review of the literature associated with integrated solutions provision and the products-to-service transition was undertaken in order to gain an understanding of the subject and how it

is characterised in practice, thereby allowing the desired future state to be defined. It was also expected that a review of the subject would uncover any current practices and theories that had been developed to enable the transition, as well as identifying related topics and opportunities for academic contribution. Although the company had set out its own definition in its strategy document, undertaking a review of the literature would allow this view to be checked, reinforced, challenged and brought up to date with the latest thinking.

The products-to-services literature originated in the manufacturing and service industries where the primary driver for the move towards servitisation was the economic gains to be had through providing services centred on an installed asset base of products, i.e. service and maintenance contracts for products already sold by the company (Oliva & Kallenberg, 2003). Especially where products have a long life cycle there is scope for a steady stream of revenue, with services often yielding higher margins than the initial product sale and not requiring significant capital investment in comparison to new product development (Lojo, 1997; Heskett et al., 1997). Customer organisations needing to downsize and reduce their overhead has also prompted the move to servitisation as they seek to outsource maintenance contracts and servicing of products. Finally, as service provision is more labour intensive and less visible as a tangible entity, processes and capabilities required for service provision are harder to imitate and therefore a potential source of competitive advantage (Heskett et al., 1997).

The High Value Manufacturing Framework developed by the Institute for Manufacturing at the University of Cambridge (Livesey, 2006) classifies types of manufacturers in a matrix according to where the majority of revenue comes from and where the majority of costs lie – see Figure 4.1 following.

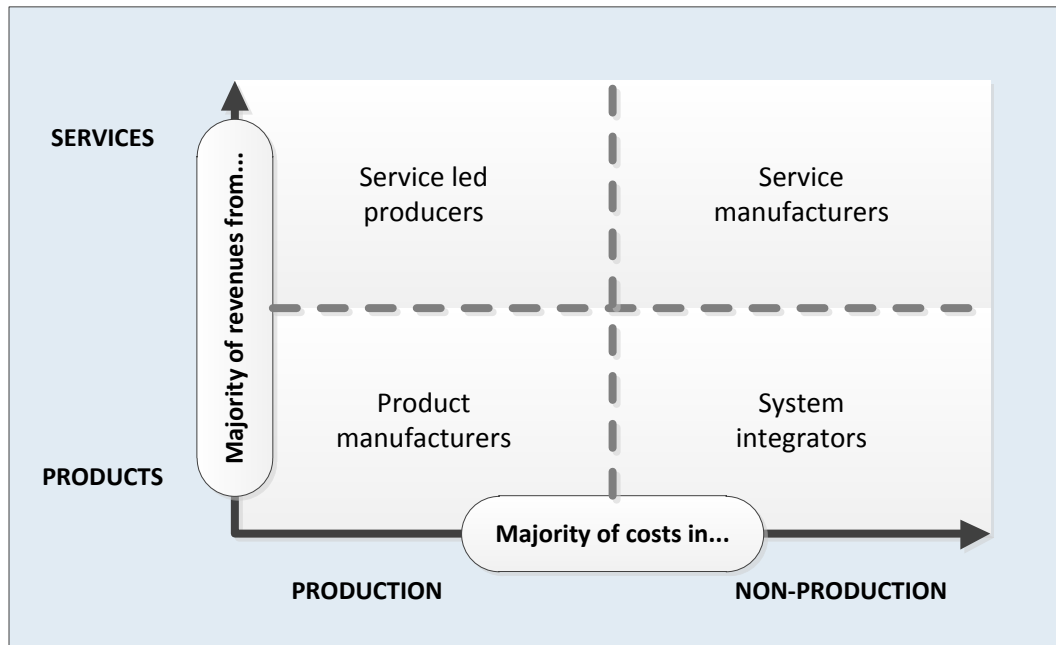


Figure 4.1 High value manufacturing framework (Livesey, 2006)

Manufacturers that have the majority of their costs in production and generate the majority of their revenue from the sales of these products are deemed to be traditional product manufacturers. Those who have begun to generate revenue from services associated with the products they produce, yet whose majority of costs still lie in the production activity, are described as service-led producers. When the majority of costs lie in non-production activities the business is a systems integrator, undertaking the complex activity of organising third party specialists to design and produce components that they must integrate into a functioning product, often a one-off, the sale of which generates the majority of revenue. Finally, service manufacturers have shifted their focus to providing services associated with their products, generating revenue from services and therefore having their costs associated with these non-production activities. Ultimately these companies may sell off their production capability entirely, wholly basing their business on providing support and services across a range of products.

Research in the manufacturing and service sectors includes case studies of organisations such as IBM and Nokia and offers theoretical models and attributes that characterise solutions provision (Foote et al., 2001; Galbraith, 2002; Oliva & Kallenberg, 2003). Among these, Foote et al. (2001) propose a ‘Model for Strong Solutions’ that identifies 19 points/characteristics of an organisation that is set up to deliver integrated solutions.

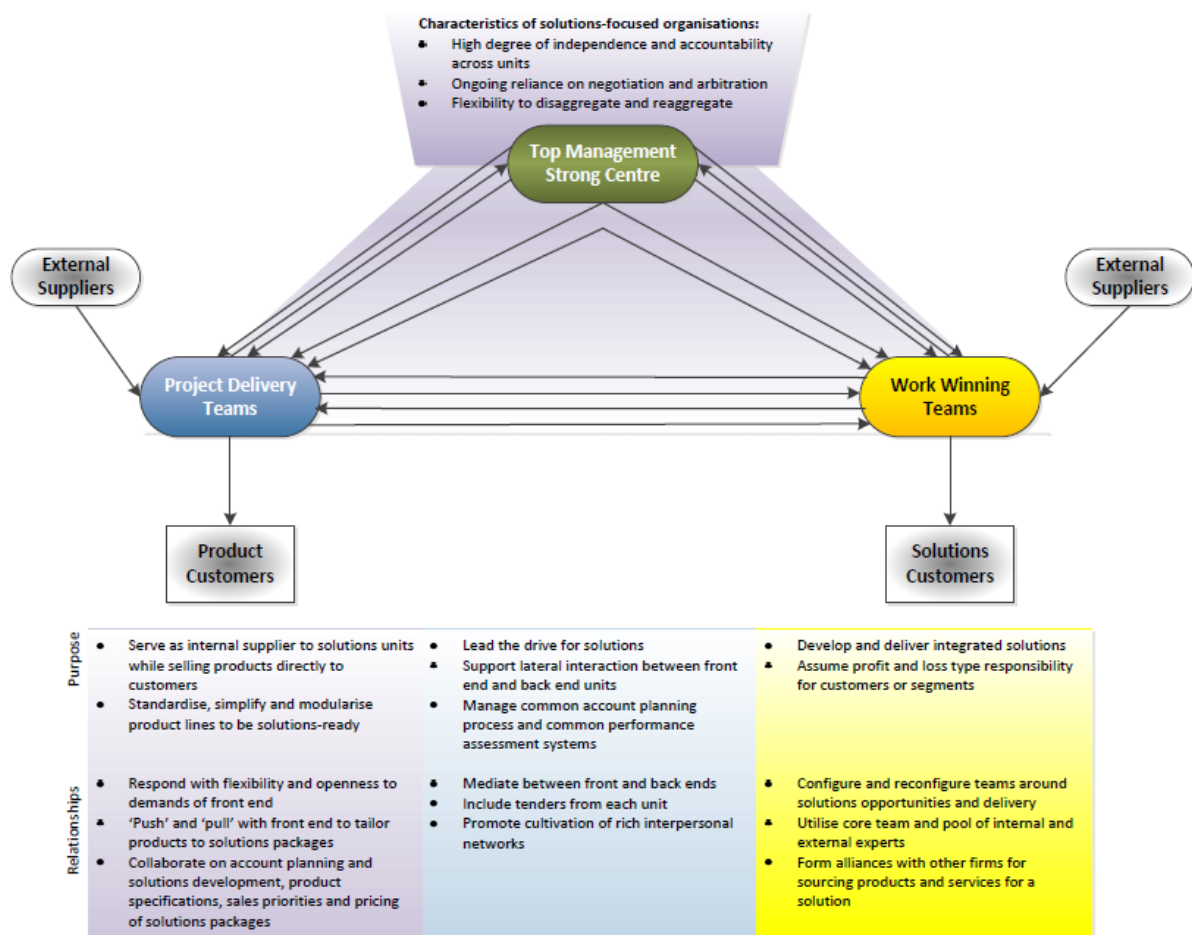


Figure 4.2 Model for strong solutions (Foote et al, 2001)

As illustrated by Figure 4.2, in the Model for Strong Solutions (Foote et al., 2001) customer facing front end teams work with clients to develop solutions, drawing on internal and external expertise and forming alliances with other organisations where they can source the products and services required to deliver the solution. The front end teams have profit and loss responsibility and manage the client relationship over the whole lifecycle. The back end

teams then produce the product/service and need to have the flexibility to respond to the demands of the front end. The back end is the internal supplier to the front end teams, but might also sell directly to customers. Back end teams would also develop new product lines that the front end can sell. A strong management centre is required to mediate between the front and back end teams, providing leadership and direction when there are conflicting demands. Aligned with Galbraith's Star Model (2002), the Model for Strong Solutions touches on the organisational considerations that must be led by the strong centre to ensure this approach can work in practice: the reward systems, processes, structure, performance management system and overarching strategy.

Despite these theoretical models, Baines et al. (2007), in their literature search into product-service systems (PSS), find that "a range of tools and methodologies exist for designing PSS, however these tend to lack a critical in-depth evaluation of their performance in practice" (p.1550). Later Baines et al. (2009) suggest that future research should include the development of guidance, tools and techniques that practitioners could use to effect the transition to services.

This view is mirrored in the construction related literature on the products-to-service (P-S) transition. Johnstone et al., (2008), who explored how the P-S transition has played out in the aerospace, construction and engineering sectors, conclude that recommendations in the literature about enacting the transition tend to be vague. Issues such as rewards, structure and people issues need to be addressed, yet little real guidance is provided. This therefore leaves the theoretical models, and the descriptions of these, as the primary basis for defining the future state.

Focusing on the construction sector, Davies et al. (2001), Davies (2004), Brady et al. (2005a) and Brady et al. (2005b) propose and define the characteristics of integrated solutions

business models and, therefore, the capabilities that organisations wishing to deliver solutions need to develop. They identify four main characteristics as follows:

Systems integration: Deemed to be the core capability (Brady et al., 2005b), this concerns the ability of the business to integrate and manage all parties involved, both internal and external, in the design, development, co-ordination and testing of components and systems such that they come together as a functioning asset, i.e. the completed building. This also requires managing and delivering customer satisfaction (Brady et al., 2005a.).

Operational service: The ability to maintain, update and operate an asset through its lifecycle, providing the opportunity for the collection and feedback of asset performance information that can be used to improve the design and develop of future solutions.

Business consultancy: Understanding the customer's business needs and offering advice and solutions that will meet their business needs.

Financing: Providing assistance to clients in the purchase and management of their new asset.

These definitions are aligned with the 'Integrated Solutions Lifecycle' developed by Davies and Hobday (2005) and which is included in Brady et al. (2005b) - see Figure 4.3.

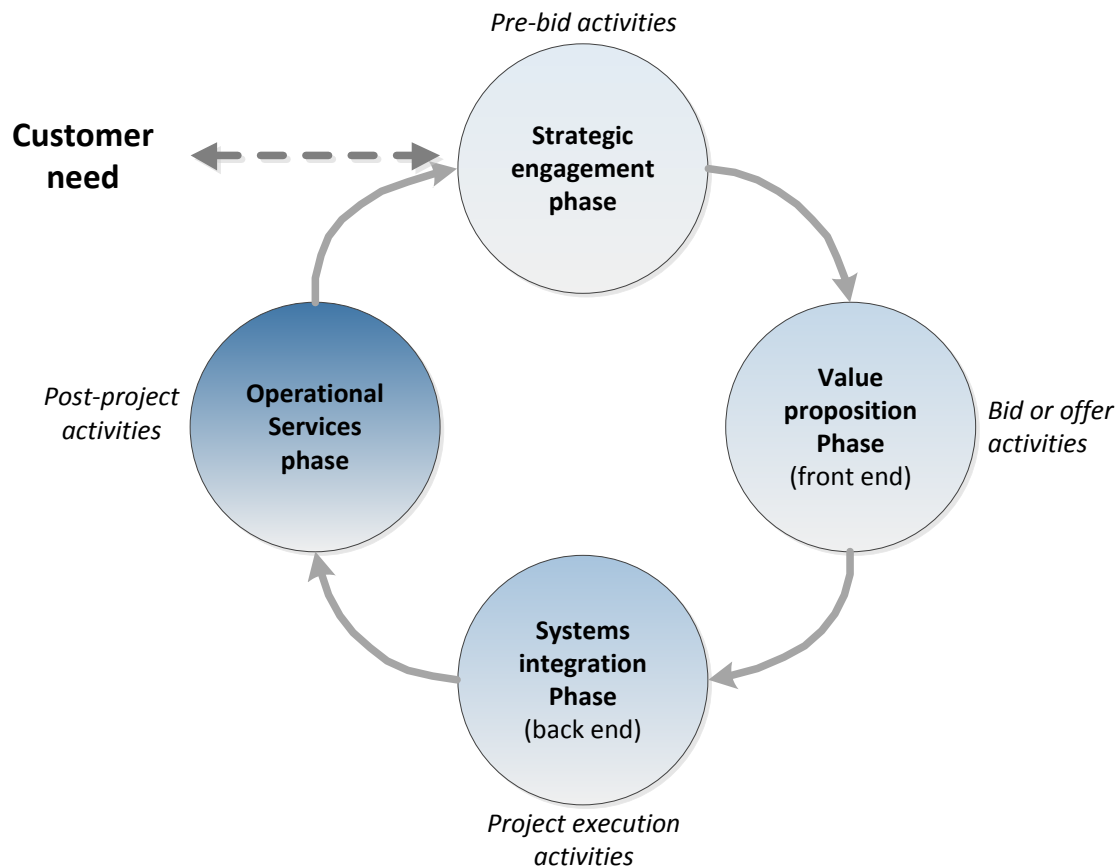


Figure 4.3 The integrated solutions lifecycle (Davies & Hobday, 2005; Brady et al., 2005a)

Note that the financing and business consultancy activities and capabilities are considered to be incorporated within the strategic engagement and value proposition phases.

Note also that design activities are considered to take place during the value proposition phase, which is concerned with the development of the solution that will be offered to the client, and extend into the systems integration phase (design management).

In relation to the lean thinking principles (Womack & Jones, 2003) described in Chapter 1.4, this lifecycle depicts a top-level view of the integrated solutions value stream as it shows the key activities through which value, as defined by the customer, needs to flow in order that the solution can be delivered.

Figure 4.4 maps SCL’s current solution delivery lifecycle against the ‘Model for Strong Solutions’ (Foote et al., 2001) and ‘Integrated Solutions Lifecycle’ (Davies & Hobday, 2005)

terminology to show how the terms used in the different models align with the company's terminology.

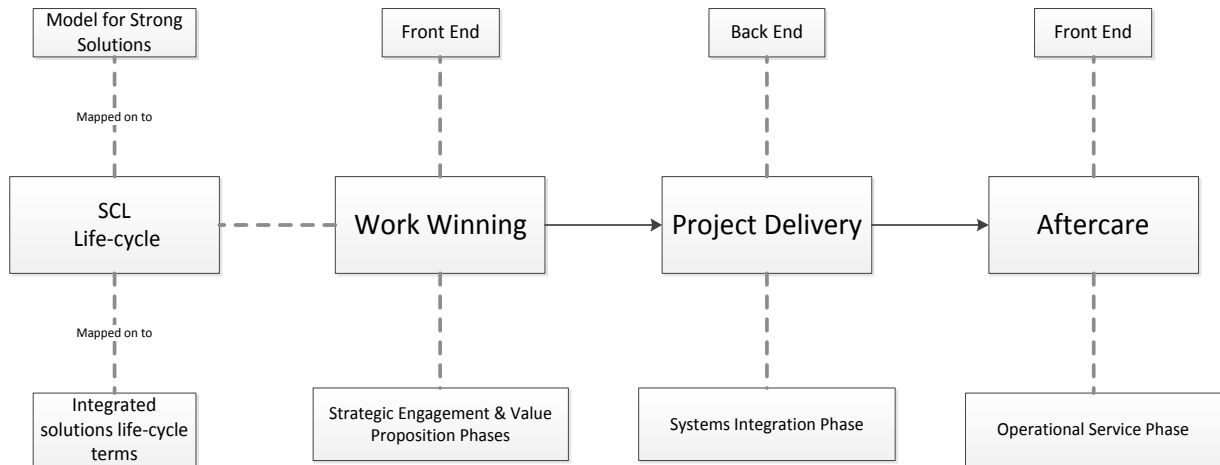


Figure 4.4 Current state project lifecycle in SCL

In mapping the models together, in order to understand how they fitted the current company context, it became apparent that no one model incorporated all the characteristics of solutions provision that are discussed in the literature, thus highlighting a major theoretical limitation.

Therefore, for the purposes of defining an aspirational future state, and as the basis for assessing the changes that would be implemented in practice, the 'Integrated Solutions Lifecycle' (Davies & Hobday, 2005) and 'Model for Strong Solutions' were combined into a hybrid model that defines aspirational future state.

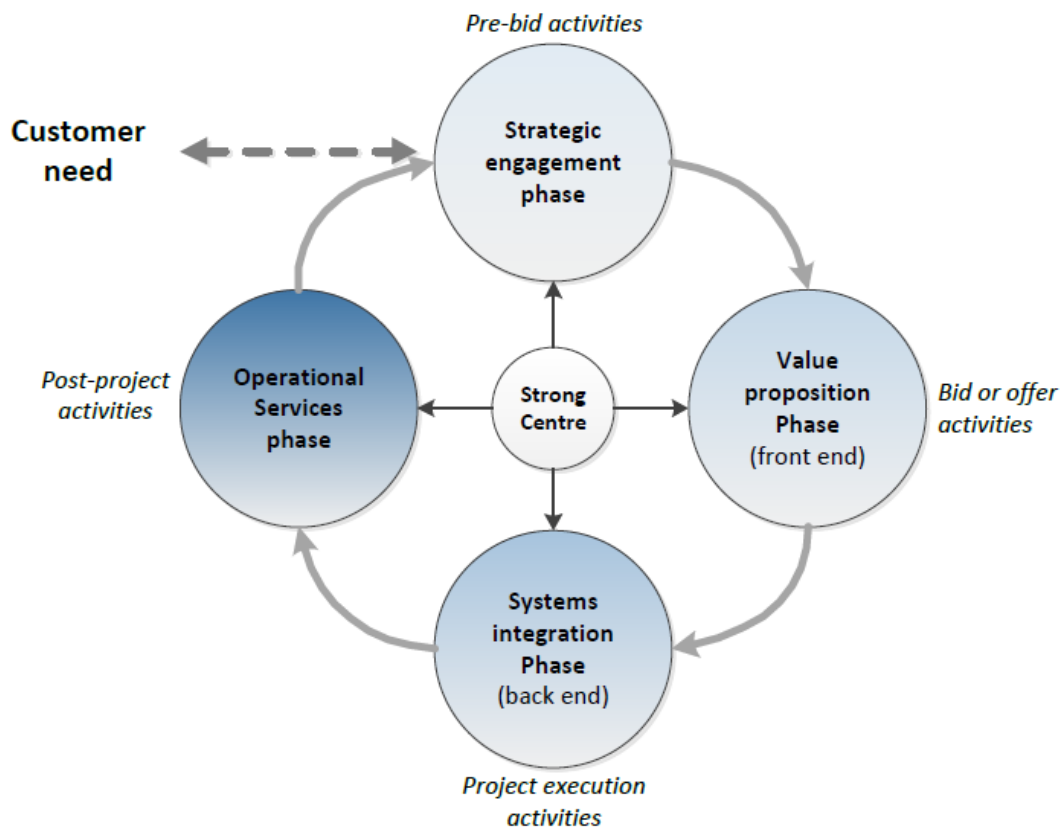


Figure 4.5 Combined integrated solutions lifecycle

This proposed model (Figure 4.5) shows the phases of the integrated solutions lifecycle held together by a strong centre. The strong centre represents the organisational aspects of solutions provision, for example co-ordination of resources, accounting systems, rewards systems, which must be implemented and managed by senior management, and embodied in procedures as well as organisational culture, in order to support the project lifecycle.

The researcher also applied the High Value Manufacturing Framework (Livesey, 2006) to the construction sector allowing the differences of the types of businesses in each quadrant (recall Figure 4.1) to be articulated. A product manufacturer would be a company whose revenue is generated mainly through the construction and sale of the product, i.e. the building, with the majority of costs being associated with the production activity, i.e. labour, materials. In other words, a product manufacturer in the construction industry is a building business that tenders for and builds construction projects, utilising own labour, with margin being generated by the

building alone. Should that type of business then begin to generate the majority of revenue through services associated with that product, for example maintenance of the asset, with majority of costs still being associated with the production activity, it would have become a service-led producer. Many construction companies have become systems integrators, sub-contracting the physical work and concentrating on the management and co-ordination functions (Leiringer & Brochner, 2010). Systems integrators, although still generating the majority of revenue through the production and sale of the building, have the majority of their costs associated with non-production activities, for example consultancy costs, design development costs: “These firms outsource detail design and manufacture to external suppliers and contract manufacturers while maintaining, in-house, the systems integration capabilities necessary to co-ordinate a network of external component and sub-system suppliers” (Davies, 2004, p.731). A systems integrator is therefore a business that tenders for work and then uses their expertise to integrate consultants and supply chain to develop the best product for that customer given the brief, and then manages that team to deliver the product. Although margin is generated through design and procurement of sub-contract packages in addition to the building, the majority of revenue still comes from the production of the building. As with systems integrators, the majority of costs for a service manufacturer are also associated with the non-production activities, although these activities have now expanded into business consultancy, financing opportunities and engagement of third party experts. The key difference for the service manufacturer is therefore that revenue is generated not only from the construction activity, but also from the financing opportunities and aftercare services such as facilities management and operation. Service manufacturers, or solutions providers, are therefore businesses that service a client’s business needs, not just their building needs, through the provision and maintenance of an asset that has been tailored to enable them to deliver their business objectives. Within the sponsor organisation, this

concept of service manufacture or solutions provision, as described by Alderman et al. (2005), is articulated as a desire to provide education facilities, rather than just building schools, which are designed and operated such that pupils achieve the desired exam results; or to provide healthcare facilities that enable the Trust to achieve target waiting times and patient care costs, rather than just building a hospital and handing over the keys.

4.2.2 BUSINESS MEASURES OF SUCCESS

In addition to the literature, the company had set out in its strategy document its strategic imperatives and how it expects the move to solutions provision to impact on its stakeholders. The following sentences, paraphrased from the strategy document which was written by the company's Chief Executive Officer and approved by the Shepherd Group Board, capture the company's definition of integrated solutions provision and what the future state is expected to look like.

For shareholders (the Shepherd family), the focus is on improved profit and a resulting increase in relevance of SCL within the group of companies. Employee focus is on achievement of 'No Compromise Delivery' (consistent project execution in terms of time, quality, cost and SHE) with the intention to develop strategic partnerships with supply chain partners in order to support that. Customer focus will mean understanding their business case and delivering against it, developing strategic business to business relationships with repeat business or referral the objective. Finally, the intention is to engage with the community, i.e. all those the business touches, in a thoughtful, ethical and safe way. These will be supported by an investment fund, provided by the Shepherd Group, which can enable this new way of customer engagement and by growing the FM business, which can offer asset management services.

These aspirations, which define how the company understand solutions provision as well as the expected outcomes, are reflected in quantitative measures that are used within SCL to monitor performance and prompt action (Table 4.1). Since this research is aimed at realising these aspirations of solutions provision, these measures have also been used to triangulate the findings from qualitative analysis, and to evidence the business benefits of changes implemented.

The first column of the table shows each measure in relation to the relevant phase of the Integrated Solutions Lifecycle (Davies & Hobday, 2005) and the Model for Strong Solutions (Foote et al., 2001) that have been used as the benchmark for the desired future state.

Table 4.1 Quantitative business measures

Relevant phase of the integrated solutions lifecycle/model for strong solutions	Measure	Description and data source
All	Customer satisfaction	Scored out of 10 by the customer using SCL's customer feedback form – average score across sample projects.
All	Company Profit margin	The difference between the amount earned and the amount spent in delivery of the project as captured in the Mosaic finance system.
Strategic engagement (front end)	Repeat business	Count of the number of current customers for whom the business has already worked for/is already working for
Strategic engagement (front end)	Referrals	Count of the number of contracts won based on recommendations
Systems integration (back end)	Supply chain partnerships	Scores allocated to supply chain partners by SCL project teams using the Mosaic sub-contractor appraisals system
Strategic engagement (front end)	Community engagement	A score against set criteria assessed through the Considerate Constructors scheme (CCS) – shown as average rating across sample projects.
Value proposition (front end)	Work win rate	Number of tenders won compared to number of tenders submitted, compiled by the estimating department – shown as ratio of won:tendered
Systems integration (back end)	No compromise delivery – projects completed on time	Actual completion date versus planned completion date as agreed with the customer and recorded in Mosaic. Actual completion = planned completion is on time delivery. Measure shown as ratio of projects on time to total number of projects.
Systems integration (back end)	No compromise delivery – projects achieving profit margin	Actual margin achieved versus planned margin agreed at final price meeting and inputted into the Mosaic accounting system. Measure shown as number of profitable projects out of the total number of projects.
Systems integration (back end)	No compromise delivery - quality	Internal audit compliance scores – average % compliance across sample projects using the audit checklist.

Note: Mosaic is the Company's in house database/enterprise requirements management (ERP) system.

There were no quantitative measures available within SCL for facilities management (FM) as provision for this was most often arranged independently by the client, or outsourced to a third party, in some cases Shepherd FM, one of SCL's sister companies. Also there were current measures for provision of financing or having a strong centre.

No quantitative measures of success for solutions provision could be found during the literature review.

4.2.3 MATURITY ASSESSMENT

In order to understand the desired future state of integrated solutions provision, current academic literature on the subject had been read (refer to Chapter 4.2.1). An outcome of reviewing the literature, coupled with the company's definition of its vision to provide solutions as understood through internal corporate literature, was the development of a maturity assessment which can be used to assess a contracting organisation's level of maturity with regard to ability to deliver solutions.

The maturity assessment began as a list of characteristics of integrated solutions provision, the barriers to implementation and potential means of developing the characteristics as suggested by the literature. As the literature was read, this information was noted down, in the form of a table, in order to organise what was being learned. Appendix B shows the initial table of information and the authors of the literature from which the resulting maturity assessment was founded.

During this time, within the business the strategic vision of solutions provision was being communicated to the senior team. It became apparent through participation in management meetings that it was difficult to articulate to people what this vision would look like in practice – how would it differ from what was currently done? The idea therefore arose that it would be useful to define, in tangible terms, the differences between a traditional contractor and integrated solutions provider in order that the required change could be better communicated to people in the business.

Using the High Value Manufacturing Framework types/stages as levels of organisational maturity, and the Integrated Solutions Lifecycle (Davies & Hobday, 2005) and Model for

Strong Solutions (Foote et al. 2001) to prompt the consideration of all aspects of the customer proposition that the company needs to deliver, the characteristics that would be evidenced in the company at each of these stages for each area was described (Figure 4.6).

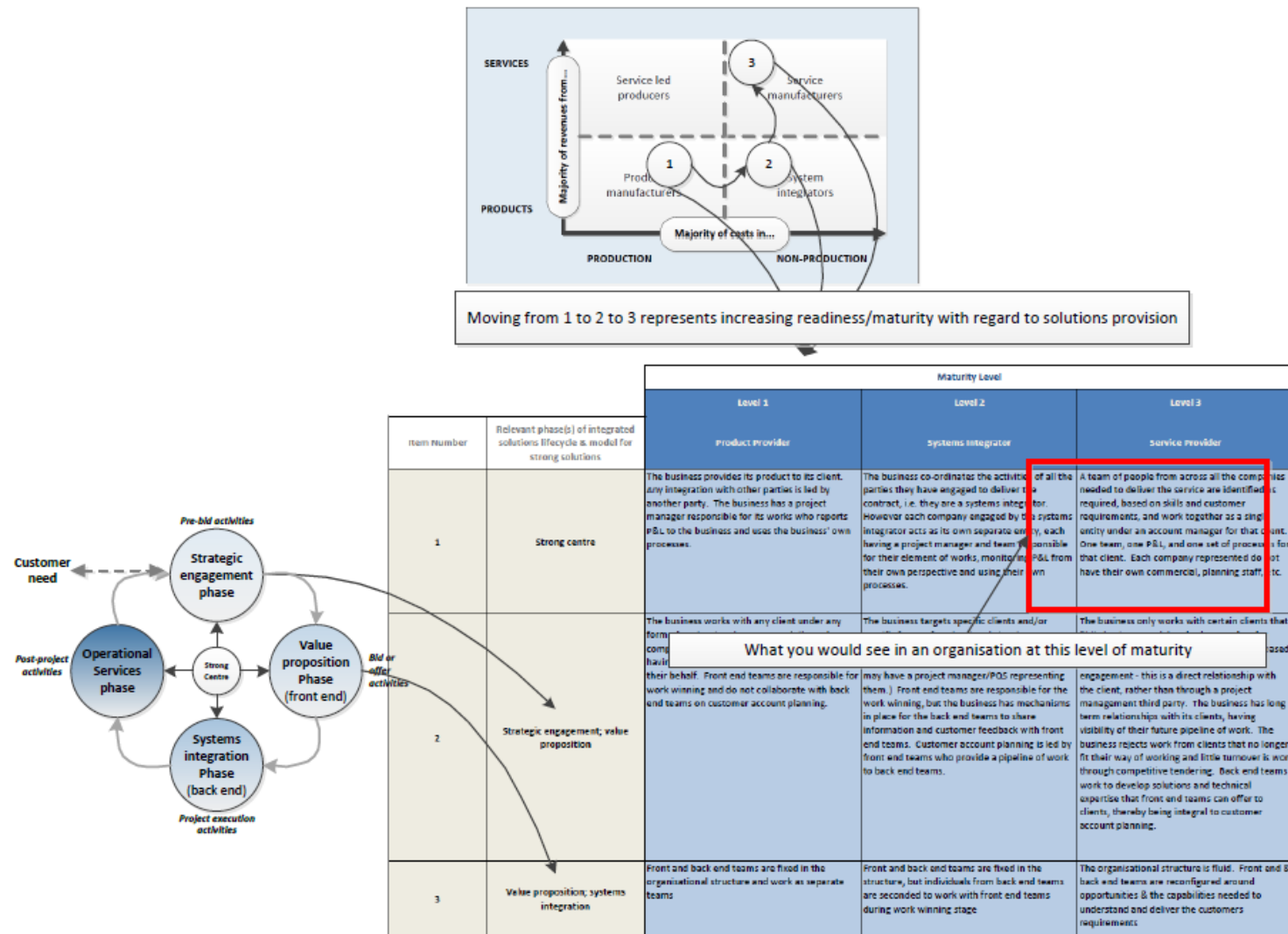


Figure 4.6 Development of the Maturity Assessment

The resulting maturity assessment, which is a synthesis of the literature, therefore articulates the difference between the desired future state (Level 3 maturity on the ‘service provider maturity assessment’) and the current state and in doing so identifies areas for change.

Undertaking the exercise, as a means of understanding the literature and articulating how integrated solutions provision differs from the current state, prompted the research question as to whether there is a need to benchmark/assess the maturity of an organisation during its product-to-service transition.

The full version of the maturity assessment is shown in Table 4.2 following.

The maturity assessment has fifteen items/sets of descriptors that are related to aspects of the Integrated Solutions Lifecycle and/Model for Strong Solutions (as indicated by the second column from the left.) For each item, descriptions for each level of maturity are defined. An organisation would rate itself against each item as either Level 1 – product provider, Level 2 – systems integration or Level 3 – service provider and insert its current level in the fourth column from the right titled ‘Current Level’. The three right hand columns then prompt the current state situation to be noted, areas for improvement to be identified and any barriers to improvement to be recorded. This promotes the use of the maturity assessment as an improvement tool as well as diagnostic tool.

Table 4.2 Service provider maturity assessment

Service Provider Maturity Assessment								
For each item number read the maturity level descriptions and decide the current level of maturity in your organisation (insert into the "Current Level" column.)								
Terminology								
Product provider - A building business that tenders for and builds construction projects. The product is the completed building. Value and margin are generated by the building alone.								
Systems integrator - A contracting business that tenders for work, using their expertise to integrate consultants and supply chain to develop the best product for that customer given the brief, and then managing that team to deliver the product (the completed building.) Value and margin are generated through design and the procurement of sub-contract packages in addition to the building itself.								
Service provider - A business that services a client's business needs through the provision and maintenance of an asset from which that client can realise their business objectives. Value and margin are realised through a range of services which are based around the production of a building, for example financing, design solutions and expertise that will enable realisation of client business targets, building maintenance and operation.								
Front end team - work winning team								
Back end team - operational delivery team (construction team)								
Item Number	Relevant phase(s) of integrated solutions lifecycle & model for strong solutions	Maturity Level			Current Level	Current State Comments	Areas for Improvement	Barriers to Improvement
		Level 1 Product Provider	Level 2 Systems Integrator	Level 3 Service Provider				
1	Strong centre	The business provides its product to its client. Any integration with other parties is led by another party. The business has a project manager responsible for its works who reports P&L to the business and uses the business' own processes.	The business co-ordinates the activities of all the parties they have engaged to deliver the contract, i.e. they are a systems integrator. However each company engaged by the systems integrator acts as its own separate entity, each having a project manager and team responsible for their element of works, monitoring P&L from their own perspective and using their own processes.	A team of people from across all the companies needed to deliver the service are identified as required, based on skills and customer requirements, and work together as a single entity under an account manager for that client. One team, one P&L, and one set of processes for that client. Each company represented do not have their own commercial, planning staff, etc.				
2	Strategic engagement; value proposition	The business works with any client under any form of contract and secures work through competitive tendering, with the client most likely having a project manager/project QS acting on their behalf. Front end teams are responsible for work winning and do not collaborate with back end teams on customer account planning.	The business targets specific clients and/or specific forms of contract and aims to secure repeat business and frameworks in addition to some competitive tendering (although the client may have a project manager/PQS representing them.) Front end teams are responsible for the work winning, but the business has mechanisms in place for the back end teams to share information and customer feedback with front end teams. Customer account planning is led by front end teams who provide a pipeline of work to back end teams.	The business only works with certain clients that fit its business model and values, and under preferred forms of contract, winning work based on relationships, sector expertise and early engagement - this is a direct relationship with the client, rather than through a project management third party. The business has long term relationships with its clients, having visibility of their future pipeline of work. The business rejects work from clients that no longer fit their way of working and little turnover is won through competitive tendering. Back end teams work to develop solutions and technical expertise that front end teams can offer to clients, thereby being integral to customer account planning.				
3	Value proposition; systems integration	Front and back end teams are fixed in the organisational structure and work as separate teams	Front and back end teams are fixed in the structure, but individuals from back end teams are seconded to work with front end teams during work winning stage	The organisational structure is fluid. Front end & back end teams are reconfigured around opportunities & the capabilities needed to understand and deliver the customers requirements				

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		Level 1	Level 2	Level 3	Current Level	Current State Comments	Areas for Improvement	Barriers to Improvement
Item Number	Relevant phase(s) of integrated solutions lifecycle & model for strong solutions	Product Provider	Systems Integrator	Service Provider				
4	Strategic engagement; value proposition; systems integration	The front end teams engage with the client and develop an offer based on the client's specification and tendering process. Front end teams, perhaps supported by individuals from back end teams who are drafted in for that tender, do enough work to win a contract, after which the contract is handed to the back end team to deliver.	Front end teams, supported by back end teams and external third parties, engage with the client to understand the purpose of the product (the building) and the client's aspirations so they can offer alternative designs and solutions. Front end teams have the capability to carry out design development and planning activities, however this is often re-worked by the back end team after the contract is handed over to them.	Front end teams have the consultancy skills, sector knowledge and specialist construction discipline knowledge (design, planning, logistics) needed to understand the client's business such that they can offer a solution and service that will enable delivery of the client's business objectives. Consultancy skills would include writing business plans, arranging financing solutions, development of systems/protocols, asset management expertise, sector expertise, etc. The front end teams can draw on the technical expertise from across the business and external third parties to develop the best solution. Front end teams create a fully developed solution and methodology that the back end team can then deliver without re-working. The front end team carry out a detailed handover to the back end team and have a checking role throughout the delivery phase to capture out turn data and lessons learned.				
5	Value proposition; systems integration	Front end teams 'handover' to back end teams once a contract is won, ending front end team contact with the client at handover	Front end teams retain some contact with the client post handover, for example carrying out client feedback	Key account managers, allocated at the start of the relationship, provide a consistent point of contact for that client for the duration of the working relationship				
6	Strong centre	Profit & loss responsibility lies with back end teams and ends on completion of the product (i.e. at PC)	Back end and front ends teams have accountability for profit and loss performance that ends on completion of the product defects period. Any remaining contract for aftercare/maintenance is a new contract with a different provider or part of the business	Key account managers for each client have profit and loss responsibility for all the activities with that client which is monitored through to the attainment of the specific targets set out for that contract and on-going targets where the contract includes the servicing of the product (customer facing profit centres)				

		Level 1	Level 2	Level 3	Current Level	Current State Comments	Areas for Improvement	Barriers to Improvement
Item Number	Relevant phase(s) of integrated solutions lifecycle & model for strong solutions	Product Provider	Systems Integrator	Service Provider				
7	Strong centre	The back end team structure is fixed and has little flexibility in how it plans resources and operates. Resources are planned and costed to certain teams/departments to meet budgets and workload.	Back end teams are flexible and can be made up of people from across the business, though the resources are allocated to certain teams/departments who charge for that resource when shared with other parts of the business. Resource planning is focussed on maximising utilisation, meeting individual team/department budgets and is negotiated through senior management agreement at local level.	The back end units of the business, or across a Group of businesses, are flexible; they can cope with demands for resources from the front end (any front end from across the Group) and can tailor their approach to deliver their element of the product/service in line with the overall service required, working for the account manager, irrespective of which company anyone actually works for, i.e. the group of companies can create temporary project organisations comprising their staff plus their sub-contractors, suppliers, etc. Resource planning is strategic and client focussed.				
8	Strong centre	Pain/ gain (profit/loss) is managed and reported within each individual business involved in the production of the product and are based around production targets	Mechanisms to share pain/gain are in place across the whole team, i.e. the systems integrator and their sub-contractors and consultants, and are based on production targets. Each individual business retains their own P&L management and reporting.	Mechanisms to share pain/gain are in place for those involved with all parts of the contract (production & service elements) and are based on targets agreed with the client				
9	Strong centre	Front end & back end teams are rewarded differently. The reward is triggered by completion of production (construction, i.e. PC achieved) and based on margin achievement.	Front end & back end teams have the same reward structure. The reward is triggered by completion of production (construction, i.e. PC achieved) and based on margin achievement.	Front & back end teams are rewarded based on client satisfaction measures developed with the client and assessed post occupancy (i.e. when the complete service has been delivered and operated)				
10	Strategic engagement; value proposition; systems integration	The options for sourcing materials, products and sub-contracts are open and selection is based primarily on price.	The business has a supply chain of preferred suppliers and sub-contractors, influenced by and signed off by back end teams, who can work with the business on solution development. Selection of third parties is based on previous performance, capabilities and solution development, in addition to price.	Front end teams engage with third party experts and develop strategic business relationships that include sharing financial and design information, and giving feedback/challenge for continuous improvement.				

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		Level 1	Level 2	Level 3	Current Level	Current State Comments	Areas for Improvement	Barriers to Improvement
Item Number	Relevant phase(s) of integrated solutions lifecycle & model for strong solutions	Product Provider	Systems Integrator	Service Provider				
11	Operational service	Asset management and operating concerns extend to the production of O&M manuals that are handed over to the client at PC.	Asset management and operating concerns are considered at the design stage and O&M manuals are handed over at PC. There may also be a handover to a facilities management company.	Asset management and operating/whole life concerns are considered and delivered as part of the solution development and service offering.				
12	Strategic engagement/value proposition	The business is not involved with providing financing for its clients	Typically the business is not involved in providing finance, however may consider doing so for PFI contracts or as part of a consortia	The business actively looks to provide financing options, where provision includes having the skills and/or access to capital to make an investment				
13	Strong centre	Each project is stand alone and learning from previous projects is not consciously fed into future projects	The business has learning/feedback loops in place as part of its processes and mechanisms are in place to share knowledge across the business, however there is no post occupancy information and information is not specifically used to inform future designs/solutions	Everyone in the business has the capabilities for knowledge sharing and implementing feedback loops. Knowledge and information from previous projects, including post occupancy data, is used to develop and improve future solutions				
14	Strong centre; strategic engagement	Risks are managed and resolved contractually	The business uses standard industry contracts to allocate and manage risk, but prefers collaborative contracts and resorts to contract enforcement as a last resort	The business offers guarantees and support for the services it has delivered (assuming risks that are normally borne by the customer)				
15	Strong centre	The business' management team run the business as a product provider, aligning people, processes, organisational structure and rewards mechanisms to achieve that business strategy. Management decisions are viewed from the business' immediate perspective.	The management team develop long term strategies with supply chain, consultants and clients, as well as aligning people, processes, organisational structure and rewards to systems integration. Decisions take consideration of retaining long term relationships, rather than short term gains.	The business has a strong central management team who provides vision and direction and create an environment, organisational structure and working practices that enable provision of services. The central management team mediate between front and back end teams, and also across departments/businesses, making decisions in the interests of the client.				

4.2.4 SUMMARY

The Integrated Solutions Lifecycle (Davies & Hobday, 2005; Brady et al., 2005a) and Model for Strong Solutions (Foote et al., 2001) – existing theories - have been developed into a combined model (Figure 4.5) which has been used to define the desired future state of integrated solutions provision. This combined model represents the top-level view of the value stream (Womack & Jones, 2003) – the series of actions – through which value must flow in order for integrated solutions to be delivered.

The combined model, along with the High Value Manufacturing Framework (Livesay, 2006) and other literature (Galbraith, 2002; Baines et al., 2007) that has been embedded into the maturity assessment, define the desired future state against which required changes have been identified, implemented and monitored.

Completion of this step of the research process fulfilled Objective 1, ‘define the desired future state’, and resulted in the production of the ‘service provider maturity assessment’.

4.3 STEP 3: ASSESS THE PRESENT IN TERMS OF THE FUTURE TO DETERMINE THE WORK TO BE DONE

Having determined the desired future state, the next step involved assessing the current state of the business with respect to future state in order to understand the gap between the two and therefore allow actions to move towards the future state to be identified.

The current state was assessed against the elements of the combined integrated solutions lifecycle and model for strong solutions (Figure 4.5) using a number of methods as shown in Table 4.3.

Table 4.3 Current state analysis methods

	Analysis Method		
	Quantitative	Qualitative	Service Provider Maturity Assessment
Strong centre			√
Strategic engagement (including business consultancy & financing)	√		√
Value proposition (front end)	√	√	√
Systems integration (back end)	√	√	√
Operational service			√

4.3.1 QUANTITATIVE ANALYSIS

Table 4.4 shows the then current state performance using the measures and sources described in Table 4.1. The data used to calculate these measures was collated in this format by the researcher specifically for this analysis; however the data was obtained from company systems (the Mosaic ERP system) and reports that are created by employees as part of the regular reporting process.

Table 4.4 Current state performance

Relevant phase of the integrated solutions provision lifecycle/model for strong solutions	Measure	Current state performance
All	Customer satisfaction	39/50
All	Company Profit margin	-£2.1M
Strategic engagement (front end)	Repeat business	No data available
Strategic engagement (front end)	Referrals	No data available
Systems integration (back end)	Supply chain partnerships	70%
Strategic engagement (front end)	Community engagement	No data available
Value proposition (front end)	Work win rate	1 in 8
Systems integration (back end)	No compromise delivery – projects completed on time	1 in 5
Systems integration (back end)	No compromise delivery – projects achieving profit margin	15/19
Systems integration (back end)	No compromise delivery - quality	No data available

The measures show that only 1 in 5 projects were completing on time, doubtless impacting on the profitability of the projects and the overall company profit. The work win rate indicates that for every 8 tenders only 1 was won; the time wasted on the 7 lost tenders could have been invested in more thoroughly choosing and pursuing opportunities that more closely fitted with the company's strategic vision. The lack of data in other areas was due to poor data collection and retention processes in the company, evidencing that the company was not focused on these areas – what gets measured gets done. In the case of the quality measure, the lack of data was also due to there being no accepted set of processes that were regularly audited for compliance.

4.3.2 QUALITATIVE ANALYSIS – POST PROJECT REVIEWS

Post project reviews are carried out at the end of each project to capture best practices, understand what went well, what could be done better and identify areas for improvement. The reviews are meetings, chaired by a senior manager, and attended by project team members from all disciplines from both the front end and back end teams, i.e. back end team - design, planning, project management, commercial and front end team – estimating, bid team. The meeting systematically covers all elements of the project lifecycle from pre-bid and tendering activities through to all on-site activities, with participants giving feedback on each element. The result is an in-depth source of information based on the experiences and perspectives of the participants involved with the project.

Meeting minutes from ten post project reviews (of the most recently completed projects) were analysed with a view to understanding how strategic engagement/value proposition (work winning) and systems integration (project delivery) activities were being carried out. Recurring themes and phrases were identified along with root causes where these had been discussed.

The common issues were as follows:

- Resources not being allocated to the team (both front end and back end) in a timely manner.
- Unclear strategy at work winning stage.
- The project delivery team re-working decisions (for example regarding sub-contractor choice and content of packages) that had already been taken at work winning stage because they weren't made aware of what work had been done, what decisions had been made and why.
- Sudden increase in forecast cost once work had commenced on site.

- Items being missed out of sub-contract packages resulting in an increase in cost of the package which was identified late in the project delivery phase.
- Programme slippage resulting in late completion due to build staff relying on planners to manage the programme and a lack of engagement of sub-contractors.
- Build staff having to manage sub-contract workers directly due to poor sub-contractor managers/supervisors.
- Large number of defects to be closed out post practical completion (PC) resulting in reduced profit margin/loss.
- Consideration of BREEAM requirements being left to the end of the project resulting in the opportunity to gain some credits being missed and money having to be spent in other areas to achieve the client's desired rating.
- Issues, regarding quality, cost and programme, only being uncovered late on into the project leaving less time for intervention and mitigation, i.e. management not uncovering problems and the team not openly reporting problems until they could no longer be hidden.
- Uncertainty over payments from the client resulting in delayed starts and/or starts on site that then have to be stopped.
- Panic at the end of the project when the team are trying to complete internal finishes and interface with the customer/stakeholders as they want to prepare for occupation of the building.

The majority of the issues expressed were with regard to the project delivery phase of the lifecycle, however it was recognised by the teams that most of these can be influenced by

activities carried out at the work winning stage of the project, i.e. getting them right at value proposition phase will result in more successful systems integration phase.

4.3.3 QUALITATIVE ANALYSIS – PARTICIPANT OBSERVATION

At the time of the current state assessment the business was running two training programmes made up of a number of modules for first line managers (deputy build managers and supervisors) and advanced managers (commercial managers, contracts managers, project managers, senior estimators, design department managers). The purpose of the training was to teach people the company standard ways of working with regard to all aspects of the project lifecycle in order to ensure everyone would be working to the same standard and therefore meet project and business targets, as described by the measures in Table 4.1. A total of ninety people underwent the training which was delivered in groups made up of people from each region of the business in order to promote sharing of ideas and allow people to meet counterparts from other teams. The training had been initiated prior to the new strategy to deliver integrated solutions by the senior management team in recognition of inconsistent business performance. Because the researcher became involved in the development and delivery of the content of these training programmes they became another opportunity to understand the current state of the organisation with regard to the desired future state of solutions provision.

In developing the content of the training modules it became apparent that there was no current, documented, standard defined by the company as to how activities should be carried out. Eventually the training modules were written by the researcher and senior managers working in those disciplines and were based on current best practices being carried out in their area of the business. In the end, the work winning module in the advanced manager training

programme included a process mapping session where the delegates would all map out what they believed to be the best way of working based on what they currently did.

Reflection on the delivery of the modules served to reinforce the lack of consistency in working practices across the company. As the groups discussed the topics raised in the training sessions prior to being presented with the proposed new standard, it became apparent that even different teams in the same region were working in different ways, with people creating ways of working, for example templates and forms, on each new project they commenced.

4.3.4 SERVICE PROVIDER MATURITY ASSESSMENT

The ‘service provider maturity assessment’ described in Chapter 4.2.3, Table 4.2 was scored by three senior managers in the company as another means of assessing the current state with regard to the desired characteristics of integrated solutions provision that are described in the literature and which are described as Level 3 maturity on the ‘Service Provider Maturity Assessment’. These senior managers were chosen to make the assessment since they had been exposed to the strategy of integrated solutions provision and were working in different regions, providing a wide view of the company. Of the 15 categories in the assessment, 7 were scored at maturity Level 1 - product provider, and 6 scored at Level 2 – systems integrator, with the remaining 2 categories averaging a score of 1.5, i.e. sitting between these two positions. The organisation was assessed at Level 1 maturity (product provider) with regard to having a strong centre and operational service, at Level 2 (systems integrator) regarding strategic engagement/value proposition and between Levels 1 and 2 for the systems integration phase of the integrated solutions lifecycle.

Categories on the maturity assessment (item numbers 1, 2, 3, 4, 5 and 9) concerning the relationship between front (work winning) and back end (project delivery) teams identified a

silos mentality between regions and departments that was perceived to be accentuated by the rewards scheme that only applies to the back end team and not the whole team. Comments in quotation marks that follow are the comments made by the senior managers when they completed the maturity assessment. Collaboration between front end and back end staff acknowledged that “support [from the back end team] is often requested [by the front end team] and sometimes given”. This in turn is seen to lead to “work winning team involvement often ending at handover,” although in some cases “project managers and surveyors are increasingly integrated into bid teams to provide continuity”. It was thought that the company is getting better at developing solutions and adding value at design stage, however categories asking about types of client and project targets (item numbers 1, 2, 5, 6) included “customer satisfaction on occupation is not on the team’s agenda,” with the majority of suggested areas for improvement concerning the customer experience: need to “spend more time on external stakeholders”; need to “keep a common face in front of the customer”; need to “focus on customer relationships and allowing key individual’s to follow clients.” Provision of operational services (item number 11), FM, was scored at 1-2, with acknowledgement that “limited” projects hand over to SFM, a sister company to SCL within the Shepherd Group. Providing financing for clients (item number 12) was seen to be a developing area where expertise was improving, with better definition of opportunities required such that they will gain approval from the Shepherd Group Board. Categories concerning use of third party experts (item numbers 1 and 10), including their selection and forms of contracts, resulted in the opinion that the company does not have a true supply chain, in the sense of long term, collaborative relationships, merely a number of sub-contractors that are frequently used. Lastly, it was considered that there are “no real feedback loops” and that the availability of previous information on which to develop or derive best practices is scant (reference item number 13).

The managers who completed the assessment also commented, without prompting, on its usefulness in describing the desired future state of integrated solutions provision, and specifically how it enabled the differences between the future state and current state to be understood such that actions to move from one state to the other could be identified.

4.3.5 SUMMARY

This section has reported the findings of a variety of methods used to assess the current state of the organisation with regard to the desired future state of integrated solutions provision.

Observation of the company training programmes highlighted a lack of consistency in the way teams were approaching the strategic engagement/value proposition and systems integration phases of the integrated solutions lifecycle. The lack of consistency and process, further evidenced through the post project review findings, were judged by senior management to be a major contributory factor to the poor performance with regard to on time completion and work win rate – the quantitative business measures for these phases of the lifecycle. Feedback from the maturity assessment also pointed to supply chain and organisational silos as being barriers to achieving the desired state of solutions provision.

That the ‘service provider maturity assessment’ (Table 4.2) was used and positively commented upon supports the research proposition that a form of benchmarking/assessment of company’s maturity to deliver integrated solutions is useful as the company undertakes the P-S transition. The assessment provided a means for those in the company to judge the current state, and understand what the future should look like, thereby allowing activities to close the gap to be understood.

Completion of this step has satisfied Objective 2, ‘assess the present in terms of the future in order to define the work to be done’, and along with step 2 resulted in the production of Paper 1 which is included in Appendix K.

4.4 STEP 4: PLAN ACTION

The current state evaluation had revealed inconsistent working practices in the systems integration and value proposition phases of the integrated solutions lifecycle – in other words, the actions on the value stream that would enable integrated solutions provision had not been clearly defined. The senior management team deemed this variation to be the major cause of late project completion and low work win hit rate. These in turn were impacting on company profit and therefore the confidence of the Shepherd Group Board in the company and its relevance to the group.

The senior leadership team therefore decided that a detailed review of practices in the following areas was required with the outcome being a set standard for how these activities should be carried out that would then be spread across the company to achieve consistent performance to the required standard:

- Design management.
- Package management.
- Planning.
- Quality management.
- Project management.
- Supply chain management.
- Work winning.

It was felt that the strategy of integrated solutions provision could not effectively be implemented without stability in performance arising from consistent ways of working.

The leadership team decided that action should be taken in two stages in order that the immediate risks to the company (for example of loss making projects arising from late project completion) would be addressed as soon as possible. The first stage would be the development and implementation across the company of a number of ‘tools’ that would define how high risk activities should be carried out so that they would be done to the correct standard. The purpose of this first stage was to provide stability and tackle the most critical aspects of project execution/systems integration and work winning/value proposition (recall Figure 4.5). Stage two would then be the wholesale review of practices in each of the areas listed previously, developing the end to end process for that discipline and any associated tools. The literature review and action research described in the following section applies to both of these two stages and resulted in the development of the Company Management System, internally known as ‘The Shepherd Way’.

4.5 STEP 5: TAKE ACTION

Following a review of academic literature (see Chapters 1.4, 4.5.1 and 4.9.1), action research was undertaken to develop and implement processes and tools across the company that would enable consistent performance in the value proposition/work winning and systems integration/project execution phases of the integrated solutions lifecycle. These processes and tools would define the actions that would be carried out across the integrated solutions value stream enabling it to be consistently realised. This action research, based on the application of lean thinking, would directly investigate the research questions as to whether lean thinking, and specifically standard ways of working, have a role to play in the P-S transition (refer to research questions 1 and 2 described in Chapters 2.5 and Figure 3.1 in Chapter 3).

4.5.1 LITERATURE REVIEW

The ability of a firm to change, its dynamic capability, is partly dependent on its ability to change its processes, which encompass its competencies and capabilities (Teece et al., 1997). In order to develop improved capabilities in the areas of work winning and project delivery-phases of the integrated solutions lifecycle – the company had identified the need for new, standard ways of working that would be implemented across the organisation.

The concept of standardisation is one of the core lean techniques, and principle 6 of the 14 Management Principles of The Toyota Way (Liker, 2004) is that standardised tasks are the foundation for continuous improvement and employee empowerment. “The creation of standardised processes is based on defining, clarifying (making visual), and consistently utilising the methods that will ensure the best possible results” (Liker & Meier, 2006, p. 112).

In addition to the concept of developing the processes and tools being founded on the lean principle of standardised work, the aim was also that the processes and tools would themselves be designed to enable lean ways of working – in other words, the processes and tools would be designed to eliminate waste from the way activities were carried out, thereby allowing value to flow through the value stream, i.e. the integrated solutions lifecycle (Figure 4.5).

Value is specified by the customer (Womack & Jones, 2003), with value adding activities being those that move the completed product closer to the customer’s specification. Activities that do not add value are considered to be non-value adding or waste. Non-value adding activities are those that must be carried out in order to facilitate the value adding activities, but which in themselves don’t add value directly (SMMT Industry Forum, 1991). Wastes disrupt the flow of value through the value stream and prevent it from being delivered as planned, for

example on time, to the required quality, to the customer's requirements. Waste can be defined using 8 categories:

- Overproduction – making more than the customer demands or too early.
- Inventory – stores of work in progress or finished goods that can result in poor working conditions and hide problems and inefficiencies.
- Transportation – unnecessary moving or handling of parts; handling equipment moving empty or part loaded.
- Process – using inappropriate processes for the task; waste in the work itself.
- Idle time – people or the workforce stood waiting.
- Worker motion – unnecessary people movement that does not add value, including non-ergonomic working conditions.
- Bad quality – tasks not completed right first time; defective work.

(Bicheno, 1991; SMMT Industry Forum, 1991).

- Making do – starting a task that cannot then be completed because not all of the necessary inputs to the task are available (Koskela, 2004), or not finishing work on the premise that what has been done is good enough (Emmitt et al., 2012).

Toyota also state “unused employee creativity” as being a waste (Liker, 2004, p.89).

Elimination of these wastes from activities enables the value adding activities to flow, resulting in the customer receiving what they require on time, to the correct standard and within budget.

Elimination of waste is at the heart of the Toyota Production System and the 14 Management Principles described in *The Toyota Way* (Liker, 2004) explain how lean thinking is applied to

management philosophy, process, people and partners, and problem solving in order to eliminate waste from all aspects of the organisation. The 14 principles are as follows:

1. Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals.
2. Create continuous process flow to bring problems to the surface.
3. Use “pull” systems to avoid overproduction.
4. Level out workload.
5. Build a culture of stopping to fix problems, to get quality right first time.
6. Standardised tasks are the foundation for continuous improvement and employee empowerment.
7. Use visual control so no problems are hidden.
8. Use only reliable, thoroughly tested technology that serves your people and processes.
9. Grow leaders who thoroughly understand the work, live the philosophy and teach it to others.
10. Develop exceptional people and teams who follow your company’s philosophy.
11. Respect your extended network of partners and suppliers by challenging them and helping them to improve.
12. Go and see for yourself to thoroughly understand the situation.
13. Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly.
14. Become a learning organisation through relentless reflection and continuous improvement.

In addition to these, the lean construction technique ‘Last Planner™ System’ (Ballard, 1994) has also been incorporated into the tools developed. Last Planner™ is a method of production control in construction (Ballard & Howell, 1998a, 1998b; Ballard, 2000a, 2000b) that involves the use of look ahead planning, commitment planning and learning to enable the seven flows - of information, materials, previous work, external conditions, people, equipment and space (Koskela, 2000) - to be realised through the value stream so that the production plan is achieved. The embedding of these principles and techniques into the completed processes and tools is explained in Chapter 4.5.2.3.

The lean construction literature review and attendance at International Group for Lean Construction (IGLC) conferences revealed a variety of approaches to and definitions of lean implementation. In some instances, lean implementation within a case study organisation is the application of Last Planner™ (Viana et al., 2010; Hamzeh, 2011). Meanwhile other work describes the development of production systems that are based on lean techniques such as 5C workplace organisation (Carneiro et al., 2009). Green and May (2005) identify as missing from the literature empirical research into the way ‘leanness’ is diffused and enacted in practice, proposing that cases of lean implementation generally assume a unitary view of the firm (Fox, 1974; Burrell & Morgan, 1979), where all parties are striving to achieve a common goal for the organisation, ignoring the pluralist perspective, in which people have their own agendas and interests. Meanwhile, Scarborough and Terry (1998) describe three different models for implementing change – lean production being used as an innovation for competitive advantage (the diffusion model), lean production as an additional ‘bolt-on’ solution, and lastly using lean to trigger widespread, institutional change (the adaptation model). Critically, Green (1999) suggests that lean is a “complex cocktail of ideas” (p. 23) that includes a wealth of ideas such as continuous improvement, teamwork, supply chain management. This raised the question (research question 4) as to whether there is a one size

fits all approach to lean implementation which could be investigated through this action research. In this research, the author has used seminal works such as Lean Thinking (Womack & Jones, 2003) and The Toyota Way (Liker, 2004) as the primary guides for implementing lean since they address lean implementation from an organisational perspective, not just a project perspective, considering its implications on people, processes, culture and leadership. Since this research was aiming to enact true, cultural change within SCL, from product-to-service provider, these works were deemed fitting sources of reference.

4.5.2 ACTION RESEARCH

Since the way routines (ways of working/processes) are developed, captured and disseminated influences how an organisation is able to learn (Zollo & Winter, 2002), it was essential to develop a process for creating the tools and processes that would promote learning and promote development of the dynamic capabilities needed to change the company. Bearing this in mind, along with Toyota principle number 10 of developing exceptional people and teams who follow the Company's philosophy (Liker, 2004), it was appropriate that lean thinking should also be applied to the way the processes and tools were developed in addition to the content/purpose of the processes and tools themselves. To that end, the tools and processes were developed by groups of people from across the company, facilitated by the researcher or a member of the researcher's team, following a standard process.

4.5.2.1 Development of the standard processes and tools

A process to create the standard tools and processes was therefore developed which would:

- Produce and implement the right processes and tools, i.e. those that would:
 - Enable the correct outcomes(s) to be achieved every time. This would be specific to the purpose of each individual tool, i.e. quality, cost, time, and

depend on which phase of the integrated solutions lifecycle it was being used to enable.

- Create flow by eliminating/minimising waste.
- Engender employee involvement and empowerment.
- Promote learning and sharing across the business.

The process draws on the value stream mapping approach described by Rother & Shook (1999) that advocates mapping of the current state in order to identify wastes and areas for improvement before creating the desired future state.

Figure 4.7 shows the process that was employed to develop the standard tools and processes.

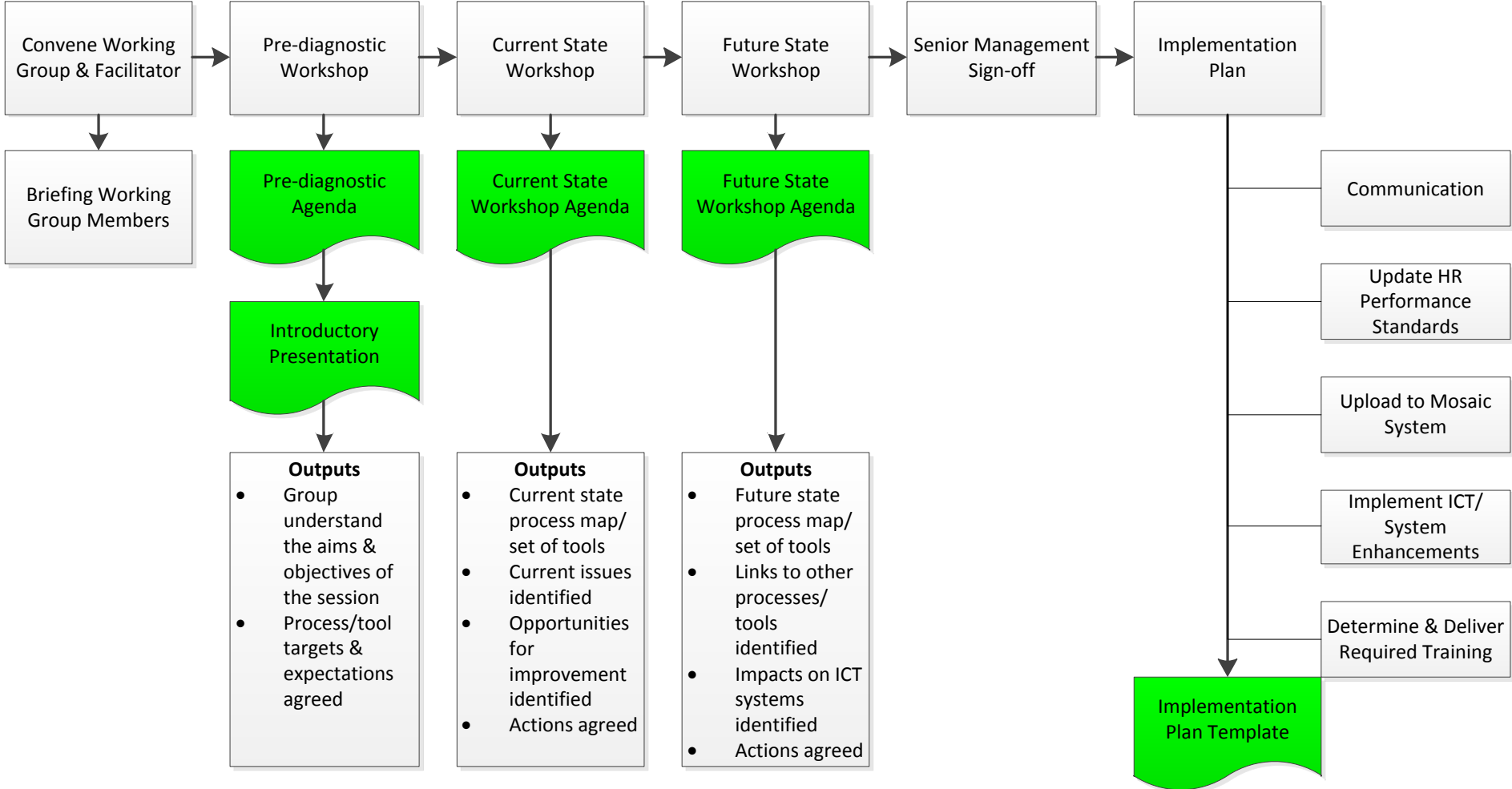


Figure 4.7 Process for the development of standard tools & processes

Standard tools (refer to the green boxes in Figure 4.7) were developed and used to facilitate each step of the process, for example, a standard implementation plan format was created along with workshop agendas so that all teams were taken through the same approach irrespective of which member of the researcher's team was facilitating. In addition, roles and responsibilities for working group members were defined. Sponsoring directors and working group leaders were also appointed with the intention being that these senior people would promote the work done in their area across the company and would also encourage people to participate and complete actions.

Fifty people from across the company were convened into nine working groups that were allocated a specific aspect of the work winning/value proposition or project delivery/systems integration phase of the integrated solutions lifecycle to address, i.e. package management, design management, planning, and then taken through the process shown in Figure 4.7. A pre-diagnostic workshop explained the purpose of the activity with regard to the company need, the lean thinking behind it and their roles as working group members. Following this, the current state workshop(s) involved understanding the current ways of working that were in use across the company and gaining feedback on how effective they were, what worked well, and what did not work well. Having understood the current state, the teams drafted a step-by-step process and amended current templates/developed new tools that would become the future state way of working. These new tools and processes were specifically designed to ensure the eight wastes would be eliminated, and therefore flow enabled, and that The Toyota Way principles were considered, with the researcher and her team prompting and challenging the working groups to make sure these aspects were incorporated. The teams then proposed these tools to their sponsoring directors and then the senior leadership team for sign off. Following sign off, the processes and tools were implemented across the company; the way this was done is explained in Appendix C.

4.5.2.2 The completed standard processes and tools

The approaches described above were firstly used to develop and implement the stabilisation tools. The list of tools developed is shown in Table 4.5, along with which stage of the integrated solutions lifecycle the tool is relevant to, and the influence of ‘lean thinking’ on that tool in terms of its foundation and purpose.

Table 4.5 Stabilisation tools and link to ISP lifecycle

Link to relevant phase of ISP lifecycle	Tool name	Description of the tool	Purpose and Link to Lean Thinking
Strategic engagement/value proposition	Tender Launch Meeting Agenda & Checklist	A standard agenda to ensure all the tender team review all the project information and agree the tender strategy	Promote flow of information across the team involved with the bid (Principle 2) to ensure successful bid and achievement of win rate.
Strategic engagement/value proposition	Verification of Client Funding Check	Checks to be made by finance team to ensure that the client has the funding for the project	Promote flow of cash between parties involved in the project, satisfying stakeholders (Principle 2).
Strategic engagement/value proposition	Final Price Meeting Agenda	A standard agenda to ensure all tender information is presented appropriately for approval before submittal to client	Ensure decisions about predicted margins and costs are made for the long term (Principle 1) and that correct bid costs are submitted resulting in successful bid and achievement of win rate.
Handover from value proposition to systems integration	Tender Handover Agenda and Checklist	A standard agenda to ensure all information and assumptions made by the tender team is communicated to the project delivery team	Ensure flow of information (Principle 2) from the work winning team to the project delivery team ensuring the delivery team realise what has been promised to the client allowing them to satisfy all project targets.
Systems integration	Project Launch Meeting Agenda	Agenda to ensure the project team review all project information, agree objectives and team set up at the start of the project	Ensure flow of information (Principle 2) across the whole project delivery team so all people are clear on their roles (aligned with Principle 10) and all project targets can be satisfied.
Systems integration	Construction Director Mid-Month Review	Check list for construction directors which details all the activities and tools they should be checking their project teams are carrying out	Management checklists the purposes of which are to prompt managers to go and see for themselves (Principle 12) and check their teams are carrying out the correct activities to the correct standard. This checking also helps to grow leaders who thoroughly understand the work, live the philosophy and teach it to others (Principle 9) and ensure development of exceptional people and teams (Principle 10). The outcome of the checks should be successful achievement of all project targets.
Systems integration	Project Team Checklist	Checklist for the project manager which details the critical tasks and tools he should be checking his team is implementing and maintaining	
Systems integration	Project Commercial Review and KPIs	Checklist for commercial managers to use to assess whether the project team are undertaking the required commercial tasks	
Systems integration	Risk Health Check	Executive Board checks to ensure that the project team are properly resourced and managing risk appropriately	

Link to relevant phase of ISP lifecycle	Tool name	Description of the tool	Purpose and Link to Lean Thinking
Systems integration	Collaborative Planning	A 4 stage on site planning process that enables supply chain engagement and management of the plan to a daily level following removal of constraints	An adaptation of Last Planner this involves development of a collaborative programme, in which supply chain are involved (Principle 11) and then promotes the 7 flows of information, materials, previous works, external conditions, people, equipment & space (Principle 2) activities so they can be allocated to a detailed weekly plan and managed on a daily basis resulting in on-time completion. The collaborative programme provides a visual view of the activities (Principle 7).
Systems integration	Package Management	Set of 7 tools which allows creation and purchase of a sub-contractor package such that it meets the clients requirements	Ensure the correct information flows to the supply chain regarding their scope of works, therefore ensuring cost, quality and time targets are met and supply chain are properly engaged (Principles 2 & 11)
Systems integration	Sub-contractor Appraisals	Method for assessing and communicating sub-contractor performance	Promote engagement with and continuous improvement of the supply chain in line with Principle 11, resulting in supply chain contributing to achievement of project targets.
Systems integration	Forward load for sub-contractors	Method for giving sub-contractor companies a forward view of workload so they can resource plan	Promote engagement with the supply chain, reference Principle 11, allowing them to bid for appropriate work.
Systems integration	Quality Essentials Plan	Means to identify key quality control risks and actions to mitigate them	Aims to eliminate bad quality waste, as advocated by Principle 5, by forward planning the management of quality – includes planning how QA checklists, stop day checks & handover sheets will be used.
Systems integration	QA Checklist	List of quality control instructions, relating to a particular type of work e.g. bricklaying, to adhered to	Aims to eliminate bad quality waste through checking critical items prior and during installation, ensuring a culture of stopping to fix problems as they arise (Principle 5).
Systems integration	Stop day check sheet	List of items to be checked and signed off before the next stage of works can commence.	Aims to eliminate bad quality waste through checking of critical items post installation before it's too late to see that they have been installed incorrectly, in line with Principle 5.
Systems integration	Handover Sheet	Sheet to be signed off by preceding trade on site signifying the next trade can commence work	Provides visual management of progress and helps manage the flow of works on site to the next customer (Principles 2 & 7).
Systems integration	BREEAM Issues Summary Sheet	Sheet listing all actions required to achieve the BREEAM rating	Ensures management and flow of information required to achieve the Client's BREEAM rating (Principle 2).
Systems integration	Countdown to Completion	Set of 6 tools that ensure consideration of the client's needs at handover, and which manage the completion of all activities and information required by the client at handover	Promotes client engagement and consideration of next customer needs in the closing stages of the project. Includes collaborative planning to ensure flow of activities (Principle 2) ensuring completion on time and customer satisfaction.

The same approach was then used to develop the end to end processes and tools which are shown in Tables 4.6 and 4.7 as a series of tasks and tools associated with that task. Again, the relevant phase of integrated solutions lifecycle that the task and tool is aimed at enabling is shown along with how lean thinking informed that step of the process and any standard tool developed. The standard process for 'Project Management' and some of the associated tools, which are used in the systems integration phase of the integrated solutions lifecycle, are included in Appendix D.

Appendix A shows the timeline and durations of the development and implementation of firstly the stabilisation tools, then the work winning process and tools and then the project delivery process and tools.

Table 4.6 Work winning high level process and link to relevant ISP lifecycle phase

WORK WINNING - HIGH LEVEL PROCESS AND TOOLS REGISTER					Shepherd
Link to ISP Lifecycle Phase	Function	Task Ref	Tasks ⁽⁵⁹⁾	Tools ⁽¹⁷⁾	Purpose and Link to Lean Thinking
Strategic Engagement/Value Proposition	Pipeline	1	High Level Process Map	High Level Process Map Detailed Process Map	
		1.1	Identify Opportunity & Raise Project Lead Number in Mosaic	Mosaic - Work Winning Screens Opportunity Rating Form	Log initial details about the potential project - commence information & intelligence gathering in order to make best decisions (Principle 1, 2 & 13).
		1.2	Compile Decision to Pursue	Mosaic - Decision to Pursue	Collation of information that will allow management decisions that take a strategic long term view on the bids to be pursued, with a view to developing relationships with the right clients rather than short term profit margins and ensure there is appropriate resource in the business to deliver (Principles 1, 2, 4 & 13).
		1.3	Commence Project Package Strategy		Consider and suggest which supply chain partners should be involved with the tender as early as possible, ensuring they have resource and to commence work on identifying best solutions (Principles 1, 2 and 11).
		1.4	Implement and Maintain Monthly Work Winning in Progress Meeting	WWIP Agenda	Management meeting to monitor progress of bid and ensure resource planning and decision making (Principle 1 & 4).
		1.5	Submit DTP to MD for Sign Off		Management sign-off to ensure opportunities are pursued with right clients and based on the long term (Principle 1).
		1.6	MDs Sign-off Decision to Pursue via Workflow from Pipeline		Workflow sign-off that creates flow in the process (Principles 2, 8, 12 & 13).
	Pre-Qualification	2.1	Complete PQQ Submission	PQQ Manager (Localnet)	Prepare pre-qualification document in line with client format to communicate relevant information about our bid to the client.
		2.2	Prepare for Interview		Ensure the team are ready to be interviewed by the client.
		2.3	Attend Interview		Client determined interview to assess the SCL offering.
		2.4	Confirmed on Tender List YES	PQQ Feedback Questionnaire	Determined by the client.
		2.5	Confirmed on Tender List NO		
		2.6	Send Customer Survey/Feedback to Information Co-ordinator		Obtain feedback from the client in order to learn about what could be improved in order to promote learning and continuous improvement (Principle 14).
		2.7	Review DTP and Send out DTT and Funding Verification Workflows	Funding Verification Flowchart Tender Appraisal	Ensure flow of funding and promote flow of cash between parties involved in the project, satisfying stakeholders (Principle 2).
		2.8	Commence Risk and Opportunities Register		Method for highlighting risks that would turn into wastes and opportunities for developing solutions to meet the client's needs.
		2.9	Compile Tender Budget	Tender Budget Template	Estimate and plan the costs of completing the tender - part of ensuring the correct opportunities are pursued (Principle 1).
		2.10	Submit Project Package Strategy for Sign Off		Obtain sign-off which supply chain partners will be working with the team on the bid, basing decisions on long term view and supply chain fit for the project (Principles 1 & 11).
		2.11	MDs Sign-Off Decision to Tender	Mosaic - Decision to Tender	Management sign-off approval to progress to tender stage, thereby confirming this opportunity fits the business strategy (Principle 1) and that there is resource available (Principle 4).

WORK WINNING - HIGH LEVEL PROCESS AND TOOLS REGISTER					Shepherd
Link to ISP Lifecycle Phase	Function	Task Ref	Tasks ⁽⁵⁹⁾	Tools ⁽¹⁷⁾	Purpose and Link to Lean Thinking
Strategic Engagement/Value Proposition	Tender	3.1	Tender Documents Received		Determined by the client.
		3.2	Acknowledge Receipt of Tender Documents		Communicate to the client that tender documents have been received.
		3.3	Set Up Filing System and Document Control		Ensure there is an agreed filing system for project documentation that everyone understands and can use. Will mean correct information is used, reducing mistakes and time spent searching for information (worker motion) (Principles 2 & 5).
		3.4	Create Tender in Mosaic		Log the project in the Company's Work Winning System, allowing the whole team to access information about the tender and progress the required tasks (Principle 2).
		3.5	Submit Tender Notification to DCE	Mosaic - Authorisations (Print STAR)	Notification to Chief Executive to ensure communication and support for the bid.
		3.6	Arrange Tender Launch		Meeting with the tender team to communicate all the information obtained to date (Principles 2 & 12) and develop a clear bid strategy (Principles 2, 11 & 12).
		3.7	Develop and Monitor Tender Programme	Tender Programme	Define and plan the activities needed to deliver the tender on time thereby ensuring team are clear of notes and timescales (Principles 2, 8 & 10).
		3.8	Compile and Issue Tender Deliverables	Tender Deliverables Template	Create a clear list of actions and deliverables for the tender process, ensuring communication across the team of roles and responsibilities (Principles 2 & 10).
		3.9	Sign-off Tender Budget		Gain management approval for tender costs ensuring we grow leaders who understand our processes and know what is happening in the business (Principles 9 & 12).
		3.10	Tender Launch Meeting	Tender Launch Meeting Agenda	Promote flow of information across the team involved with the bid (Principle 2) to ensure successful bid and achievement of win rate.
	Tender/Estimating	4.1	Update and Maintain Decision to Pursue		Keep the decision to pursue up to date with the latest intelligence ensuring correct information is being used (Principle 2).
		4.2	Update and Maintain Risk and Opportunities Register		Keep risks and opportunities register up to date so latest risks (wastes) and opportunities are identified and actioned.
		4.3	Finalise Project Package Strategy		Agree the final supply chain strategy following receipt of the tender documents (i.e. latest information) ensuring correct supply chain are engaged (Principle 11).
		4.4	Finalise Scope of Service for all Consultants		Define the scope of works for consultants thereby ensuring they are clear on their responsibilities (Principles 2 & 11).
		4.5	Develop Project Trade Up Plan (Commercial Strategy)		Develop strategy for improving the commercial position, identifying areas for opportunity and alternative solutions.
		4.6	Compile Estimating Packages	Enquiry for Subcontractor Quotations	Apportion the employer's requirements/client's needs into packages of work for the supply chain to provide prices for.
		4.7	Compile Advice of Tender; Design and Construction Programme and IRS	Advice of Tender	Compilation of information relating to the on-site activities that is used to provide logistics plans and forms basis of preliminary prices early. Consideration and planning can reduce on-site wastes - materials and transport.
		4.8	Undertake Design Audit	Design Audit	An early check of the design solution to ensure it meets client's requirements, is functionally correct and identify opportunities for improvement thereby ensuring quality right first time (Principle 5).
		4.9	Implement Design Management Strategy	Design Management Strategy	Agree means of managing the design with the supply chain, ensuring design functionality and achievement of client requirements (Principles 2, 5 & 11).
		4.10	Commence and Maintain Project Delivery Activities		Early consideration of project delivery activities.
		4.11	Commence Environmental Planning		Early consideration of environmental issues, ensuring client and company environmental standards are met.
		4.12	Liaise with Shepherd Hire Centre		Consideration and planning of site cabin set up ensuring it is located correctly (reducing the site wastes) and fit for the size of the team.
		4.13	Commence ICT Support Plan		Make sure ICT systems are planned and aligned to the requirements of the specific project (Principle 8).

WORK WINNING - HIGH LEVEL PROCESS AND TOOLS REGISTER					Shepherd
Link to ISP Lifecycle Phase	Function	Task Ref	Tasks ⁽⁵⁹⁾	Tools ⁽¹⁷⁾	Purpose and Link to Lean Thinking
Strategic Engagement/Value Proposition	Tender/Estimating	4.14	Complete Commercial Report	Commercial Report	A review of the client's contractual requirements with a view to identifying and mitigating risks (Potential wastes).
		4.15	Issue Parent Company Guarantee as necessary	PCG Request Form	PCG is a client requested guarantee, PCG request is made to the Group as required in a standard format that provides them with necessary information to make a decision (principles 1, 2 & 13).
		4.16	Risk and Opportunities Workshop	Risk and Opportunities Workshop Agenda	Workshop to review the risk and opportunities register, agreeing actions as to who will mitigate/follow up. Risks are potential wastes that need to be managed in order to enable flow and right first time (Principles 2, 5 & 13).
		4.17	Mid Tender Review	Mid Tender Review Agenda	Tender team checks progress against the plan ensuring action due dates are being met and latest information has been communicated across the team (Principle 2).
		4.18	Complete Tender and Undertake Quotes Technical Review		Review all quotes from supply chain to check they are technically correct and compile into the tender document (Principles 1 & 13).
		4.19	Estimating Compile TASS (Estimating System for information only)		Input prices, from rates and supply chain, into the Estimating System in order to produce final price information.
		4.20	Final Tender Review Meeting Meeting	Final Tender Review Meeting Agenda	Ensure decisions about predicted margins and costs are made for the long term (Principle 1) and that correct bid costs are submitted resulting in successful bid and achievement of win rate.
		4.21	Executive Settlement Meeting	Mosaic - Settlement	Meeting with senior management to ensure decisions about predicted margin and costs being made with a long term view and obtain final sign-off before tender submission (Principle 1 & 13).
		4.22	Submit Tender		Submission of the tender documentation to the client.
		4.23	Prepare for Tender Interview		Client determined part of the selection process.
		4.24	Tender LOST - Update Mosaic Status	Mosaic Screens	Become a learning organisation through relentless reflection and continuous improvement (Principle14).
		4.25	Tender WON - Attend Post Tender Interview and Compile Customer Feedback	Post Tender Feedback Questionnaire	Become a learning organisation through relentless reflection and continuous improvement (Principle14).
		Post Tender	5.1	Post Tender Review Meeting	Post Tender Review Findings (similar to PPR Findings?)
	5.2		Complete Subcontractor Tender Appraisal		Provides feedback to supply chain partners in line with Principle 11 - challenge supply chain and help them to grow.
	5.3		Log Tender Best Practice	Best Practice Datasbase (Localnet)	Become a learning organisation through relentless reflection and continuous improvement (Principle14).
	5.4		Tender Handover Meeting - one tool that covers the transition from Work Winning to Project Delivery	Tender Handover Meeting Agenda	Purpose is to enable flow of information from the front end team to the back end team (Principle 2).
	5.5		Sign Contract/Request Letter of Intent		Legal requirement to enter into contract.
	5.6		Transfer to Cost Control		Transfer project from work winning to Project Delivery system in Mosaic.

Table 4.7 Project delivery high level process and link to relevant ISP lifecycle phase

PROJECT DELIVERY - HIGH LEVEL PROCESS AND TOOLS REGISTER					Shepherd
Link to ISP Lifecycle Phase	Function	Task Ref	Tasks (79)	Tools (85)	Purpose and Link to Lean Thinking
Systems Integration	Count up to Commencement	PD1.1	Project Launch Meeting	Process Map Project Launch Meeting Agenda Allocation of Tasks	Ensure information on all aspects of the project flows across the whole team so everyone is clear on their responsibilities and all project targets will be met (Principles 1 & 10)
		PD1.2	Count up to Commencement Workshop	Count up to Commencement Agenda	Collaborative planning [Last Planner] of activities to involve everyone in achievement of the start on site date (Principles 2 & 11).
		PD1.3	Carry out Subcontractor Pre-Start Meetings	Subcontractor Pre-Start Meeting Agenda	Initial individual meetings with supply chain partners to ensure they understand project targets and how the project will be run (Principles 2 & 11).
	Project Management	PD2.1	Implement & Maintain Risk Register	Process Map Risk Register	Risk Register to identify and mitigate issues that could become potential sources of waste.
		PD2.2	Implement & Maintain Subcontractor Review Meetings	Subcontractor Progress Review Meeting Agenda	Maintain regular communication and flow of information with supply chain (Principles 2 & 11)
		PD2.3	Implement & Maintain 8 Week Look Ahead Meetings	8 Week Look ahead Meeting Agenda Action List	An adaptation of Last Planner this involves development of a collaborative programme, in which supply chain are involved (Principle 11) and then promotes the 7 flows of information, materials, previous works, external conditions, people, equipment and space (Principle 2) by removing constraints from planned activities so they can be allocated to a detailed weekly plan and managed on a daily basis resulting in on-time completion.
		PD2.4	Implement & Maintain Weekly Co-ordination Meetings	Weekly Co-ordination Meeting Agenda Weekly Planning Template	
		PD2.5	Implement & Maintain Daily Huddles	Daily Huddle Overview	
		PD2.6	Implement and Maintain Daily Site Diary	Site Diary	Collect information regarding key daily events to be used for communication and reporting purposes with all stakeholders (Principles 2 & 11)
	Project Checks	PD3.1	Implement & Maintain Project Team Checklist	Project Team Checklist	Management checklists the purposes of which are to prompt managers to go and see for themselves (Principle 12) and check their teams are carrying out the correct activities to the correct standard. This checking also helps to grow leaders who thoroughly understand the work, live the philosophy and teach it to others (Principle 9) and ensuring development of exceptional people and teams (Principle 10). The outcome of the checks should be successful achievement of all project targets.
		PD3.2	Implement & Maintain CD Mid Month Review	CD Mid Month Review	
		PD3.3	Implement & Maintain WIP Meetings	WIP Pack Template WIP Agenda	
		PD3.4	Implement & Maintain Project Commercial Reviews	Project Commercial Review Commercial Manager KPI's	Promote flow of cash between parties involved in the project, satisfying stakeholders (Principle 2).
		PD3.5	Check Verification of Client Funding	Funding Verification Flowchart Funding Verification Template	
		PD3.6	Produce Monthly Client Report	Client Report	
	Planning	PD4.1	Implement & Maintain Strategy for Planning	Process Map ASTA Programme Template	Management and monitoring of the construction programme and reporting of progress to client thereby maintaining communication and flow of information (Principle 2). The collaborative programme provides a visual view of the activities (Principle 7).
		PD4.2	Implement & Maintain Document Management System		
		PD4.3	Implement & Maintain Progress Reporting	Short Term Programme (subcontractors example) Planner's Monthly Progress Report	

PROJECT DELIVERY - HIGH LEVEL PROCESS AND TOOLS REGISTER					Shepherd	
Link to ISP Lifecycle Phase	Function	Task Ref	Tasks (79)	Tools (85)	Purpose and Link to Lean Thinking	
Systems Integration	Temporary Works	PD8.1	Temporary Works Process	Process Map Temporary Works Process	Ensure SCL team and supply chain partners manage the flow of information regarding temporary works resulting in safe working practices and achievement of programme.	
		PD8.2	Implement and Maintain Temporary Works Competent Person Register	Temporary Works Competent Person Register		
		PD8.3	Appoint SCL Temporary Works Co-ordinator	Appoint Temporary Works Co-ordinator		
		PD8.4	Implement & Maintain Temporary Works Register	Temporary Works Register		
		PD8.5	Check Subcontractor Permit to Load/Dismantle	SCL TW Permit to Load/Dismantle Checklist		
	BREEAM	PD10.1	Estimating handover BREEAM knowledge to Site Team	BREEAM Action Tracker BREEAM Pre-Assessment Comments	Ensures management and flow of information required to achieve the Client's BREEAM rating (Principle 2).	
		PD10.2	Project Team Review BREEAM Information			
		PD10.3	Organise and Attend BREEAM Workshop	BREEAM Workshop Agenda BREEAM Project Delivery Checklist BREEAM Material Change Control Tracker		
		PD10.4	Set Up and Maintain BREEAM Evidence Records in 4Projects	Building User Guide Responsible Material Sourcing Insulation Lifecycle Impacts Hard Landscaping Considerate Constructors Scoring Matrix Recycled Materials Schedule Biodiversity Requirements Targeted Waste Levels		
		PD10.5	Implement and Maintain Continuous Review of BREEAM Credits			
		PD10.6	Complete 6 Monthly Health Check	BREEAM Health Check Review		
		PD10.7	Submit Design Credit Evidence	Design Interim Certificate (example)		
		PD10.8	Organise Pre-PC Assessor Visit (as required)			
		PD10.9	Organise Post Construction Review Assessor Visit	Final Certificate (example)		

PROJECT DELIVERY - HIGH LEVEL PROCESS AND TOOLS REGISTER					Shepherd
Link to ISP Lifecycle Phase	Function	Task Ref	Tasks (79)	Tools (85)	Purpose and Link to Lean Thinking
Systems Integration	Countdown to Completion	PD12.1	Countdown Meeting Agenda	Process Map Countdown Meeting Agenda Non-Construction Close Out Programme (ASTA)	Promotes client engagement and consideration of next customer needs in the closing stages of the project. Includes collaborative planning to ensure flow of activities (Principle 2) ensuring completion on time and customer satisfaction.
		PD12.2	Collaborative Construction Close Out Workshop	Collaborative Construction Close Out Workshop Agenda	
		PD12.3	Implement Countdown Strategy Review Meetings	Countdown Strategy Review Meeting Agenda	
		PD12.4	Client / Subcontractor Pre-Handover Meeting	Client Pre-Handover Meeting Agenda Subcontractor Pre-Handover Meeting Agenda	
		PD12.5	Practical Completion Meeting	Practical Completion Meeting Agenda Project Directory - Client/Consultant Project Directory - Subcontractors	
	Customer Satisfaction	PD13.1	Initial Survey	Process Map Customer Survey	Obtain customer feedback with a view to becoming a learning organisation that continuously improves its processes and offering to its clients (Principle 14).
		PD13.2	Mid Survey		
		PD13.3	Post Survey		
		PD13.4	Undertake Post Project Review	Post Project Review Meeting Agenda Post Project Review Findings Post Project Review Notification Memo	
		PD13.5	Check and Update Best Practice Database	Contract De-briefing Agenda	

4.5.3 SUMMARY

In response to the inconsistency in work winning/value proposition and project delivery/system integration phases of the integrated solutions lifecycle (Brady et al., 2005a), a set of standard processes and tools, based on lean thinking, were developed by groups of people across the company. Being founded on lean thinking, these processes and tools enable the phases of the integrated solutions lifecycle to be carried out in a consistent, waste-free way, with a focus on adding value and thereby achievement of the customer's desired outcomes.

These processes and tools, collectively called 'The Shepherd Way' and which define the actions along the integrated solutions lifecycle value stream, have been embedded into the company's integrated management system which satisfies the requirements of ISO9001 (Quality Management System), ISO18001 (Occupational Health and Safety Management System) and ISO14001 (Environmental Management System). As part of the company management system these processes and tools are now subject to the ISO9001 standard (BSI, 2008) and as such are subject to document control protocols. Despite the development of the initial processes and tools being linear, they will now be continually reviewed and improved, with future post project reviews and feedback informing what improvements might need to be made.

4.6 STEP 6: EVALUATE ACTION

Having implemented the processes and tools developed as part of the previous step, the next step in the research process was to evaluate whether they had improved consistency of performance and therefore contributed to improving the value proposition and systems integration phases of the integrated solutions lifecycle. Evaluation commenced 12 months

after the project delivery stabilisation tools had been launched and 4 months after the work winning process had been launched (refer to Appendix A).

Action was evaluated in the following ways:

- Quantitative analysis using the same set of measures as described previously in Table 4.1 and used to assess the current state (refer to Table 4.4), thereby allowing differences between pre- and post-development and implementation of the processes and tools to be assessed.
- Qualitative analysis based on the observations of the researcher during involvement in the improvement process.

The findings of these analyses led to three further research questions being posed (questions 6, 7 and 8 – refer to Chapter 2.5). Since the changes implemented were found not to have played out in practice as planned, suggesting there were organisational barriers to change, it was proposed that path dependencies were impeding the implementation of lean thinking and therefore the P-S transition (research question 6). A path dependency analysis was therefore carried out as a third means of evaluating the changes made in order to identify the organisational barriers to change that were indicated by the quantitative and qualitative analyses.

4.6.1 QUANTITATIVE ANALYSIS

Table 4.8 shows the measures used to assess progress against the company's vision pre and post the development and implementation of the standard processes and tools. The explanation of and source for each measure was described previously in Table 4.1. The 'Current state performance' column shows the performance prior to the implementation of the processes and tools (refer back to Table 4.4) and the 'Future state performance' column shows

the measures post implementation of the processes and tools which have been designed to aid the transition to the desired future state of integrated solutions provision.

Table 4.8 Future state performance

Relevant phase of the integrated solutions lifecycle/model for strong solutions provision	Measure	Current state performance	Future state performance
All	Customer satisfaction	39/50	38/50
All	Company Profit margin	-£2.1M	£4M
Strategic engagement (front end)	Repeat business	No data available	No data available
Strategic engagement (front end)	Referrals	No data available	No data available
Systems integration (back end)	Supply chain partnerships	70%	No data available
Strategic engagement (front end)	Community engagement	No data available	35/40
Value proposition (front end)	Work win rate	1 in 8	1 in 3
Systems integration (back end)	No compromise delivery – projects completed on time	1 in 5	2 in 3
Systems integration (back end)	No compromise delivery – projects achieving profit margin	15/19	10/11
Systems integration (back end)	No compromise delivery - quality	No data available	82%

The table shows improvements in the work winning rate, number of projects completing on time and the number of profitable projects. Data regarding audit compliance (where audits check whether the processes and tools are being used on each project), a measure of quality, was available now that there was a standard company management system – The Shepherd Way – which could be audited. The average score shows a good level of compliance, although the desired target is 100%. Disappointingly, data regarding supply chain performance was unavailable on the projects sampled, indicating a lack of importance in engaging the supply chain in improvements. The community engagement metric, measured through the Considerate Constructors Scheme, gives an indication that there is a high level of

interaction with the community and stakeholders, one element of the customer value proposition. Robust data regarding repeat business and referrals was still unavailable, again evidencing a lack of importance being given to this aspect of the strategy.

4.6.2 QUALITATIVE ANALYSIS

The researcher was directly involved in facilitating the development of the processes and tools and with their implementation across the company. The issues experienced in the development and implementation were therefore directly observed and could be assessed with regard to the plan and process since the researcher had created that plan and the understood intent behind it. The issues experienced were as follows:

- Over half of the participants did not engage with the development of the processes and tools as planned. The development of the stabilisation tools took 8 weeks and ran 3 weeks over programme as workshop sessions, where the groups would come together to develop their allocated processes and tools, were often cancelled or attended by fewer people than planned as their ‘day-job’ took precedence. This shows that the transition pathway to service provision is not smooth and easy as some of the current literature suggests, and that organisational barriers towards change might be present.
- Despite aiming to engage working group members by setting out clear roles and by linking the improvement activities to the company strategy, the time people gave to the strategy was limited. Difficulty in organising sessions and lack of completing actions outside sessions highlighted that either the company and/or the individual’s did not see this as a core part of their role. This arguably led to a lack of ownership of the finished processes and tools, which is opposed to the original intent of involving people in the improvement process.

- Many individuals expressed a concern that developing standard processes would inhibit the creativity of people. This is at odds with the intent of the approach, which was to involve people to give them ownership whilst ensuring that changes to processes are made in a controlled way so that improvements can be implemented across the whole of the company, and not just in a particular region or team.
- Checkpoints built into the improvement process to monitor progress and report issues to SCL's senior management team were not adhered to. This brings into question the level of senior management buy-in and understanding of the approach. Without this understanding it is unlikely that they can provide a 'strong centre' (Foote et al., 2001).
- Working group members questioned their involvement and contribution given that senior management were ultimately going to give sign off, and in their eyes, therefore potentially "over rule" what they had done. The challenge seems to be finding the balance between employee empowerment and involvement and a need to take decisions to steer the company in the right direction.

This qualitative review suggested that there were barriers to change within the organisation that were preventing people, at all levels, from becoming involved with and embracing change. Given that the organisation was actively aspiring to change its culture and purpose, i.e. transition from being a product to service provider, the issues described warranted further investigation to understand their root cause, since they would likely re-occur in the implementation of any future activities and similarly limit the level of change.

4.6.3 UNCOVERING THE ORGANISATIONAL PATH DEPENDENCIES

Through the qualitative observations, along with results from the quantitative analysis, it was apparent that there were barriers to change that were in existence in the organisation. Audit results showed the new operating routines were not being fully complied with across the

business and the planned process for developing and implementing the new processes and tools had not played out in practice as planned (as discussed in Chapter 4.6.2).

Since future changes would be necessary to progress towards the vision of delivering integrated solutions it was felt essential to understand these barriers on the premise that understanding them would enable them to be overcome, or allow future change strategies to account for them.

Literature on dynamic capabilities suggests that a firm's routines, i.e. its processes/ways of working, are specific to that firm and are therefore its history, as these routines have been learned and reinforced over time (Teece et al., 1997; Coombs & Hull, 1998). This prompted the idea that past events and decisions, path dependencies, were impeding the P-S transition (research question 6) which to date had been based on the implementation of standard processes and tools (routines) based on lean thinking. Further, it was anticipated that understanding the path dependencies would allow future change strategies to be tailored to overcome/exploit them such that the company could fully embrace the changes it would need to make to continue its transition to solutions provision (research question 7). Should an understanding of path dependencies allow them to be overcome/capitalised upon, the question as to whether path dependencies could be overcome by the implementation of practices based on lean thinking then followed (research question 8). The final stage of evaluating the changes made to date was therefore to identify the organisational path dependencies, i.e. barriers to change.

4.6.3.1 Literature review

Path dependency refers to the idea that events and decisions that have taken place in the past continue to influence current decisions and ways of working such that people become locked in paths that they cannot break free of (David 2001.) Examples such as the prevalence of the

Qwerty keyboard (David 1985) and the VHS video recorder (Liebowitz & Margolis 1995) are used to evidence that a single decision/event can lead to the lock-in of a product, even if that product, years later, becomes the less efficient or economical choice. Causes of path dependency include the durability of capital equipment and technical interrelatedness of technology (David 1985, Liebowitz & Margolis 1995); having made a capital investment, other technologies must align with this investment, and economies of scale need to be achieved to make the investment pay off. Whilst this makes economic sense it can lead to lock-in to a solution that over time prohibits change and becomes a waste, due to inefficient processing for example. Following from the economics literature, path dependency is considered in the context of dynamic capabilities, in other words the ability of a business to respond to internally or externally driven change. The competitive advantage of a firm is seen as being a combination of its managerial and organisational processes (routines), its asset position (its technology, customer base, relationships) and the future paths that are available to it, which in turn are dependent on the paths already taken (Teece, et al. 1997.) If a firm's routines are its history, to understand them fully, it follows that you need to understand the history, the path dependencies, too (e.g. Teece et al. 1997.) The link is also made between a firm's routines and learning (e.g. Garvin 1988.) Therefore, with respect to the changes implemented as part of this research, where new ways of working need to be developed, embedded and learned, it follows that path dependencies can influence the ability of a firm to make such changes. In other words, past decisions can lock the firm into pathways that constrain future choices and ability to respond to change.

4.6.3.2 Path dependency analysis

The proposal was that path dependencies, i.e. historical decisions and events, were continuing to influence the company in the present day and were proving to be barriers to change. The design of the path dependency analysis, undertaken as part of Step 6 in the overall research

process (refer to Figure 3.1), was to use the feedback from the cases of organisational change implemented through the action research described in Chapter 4.5, i.e. the development of the processes and tools, to identify the events in the company's history that have led to path dependency.

A history of the company was produced by conducting semi-structured interviews and interrogating company records. Seven people, representing departments from across the company, were interviewed on a one-to-one basis in order to gain an understanding of the key events that had occurred in the company's history. Semi-structured interviews allowed the researcher to ask questions around potential areas of path dependency that had been highlighted in the literature review whilst also allowing the interviewees to expand on their answers so that their experiences could be shared and the researcher could respond and probe further depending on the answers.

Company records were searched to obtain information about previous employees, past organisational structures, marketing initiatives and company performance data. The academic literature review had helped to inform what company records to review. These historical records complemented the interviews as they provided detailed, factual information about the company that did not rely on personal accounts or recollections and was not open to interpretation.

The company history was documented in a series of timelines, produced in MS Visio, in order to provide a visual representation that could be analysed more easily than a narrative. These timelines are included in Appendix E.

Semi-structured interviews were carried out to obtain feedback on the changes implemented, i.e. the development and implementation of the processes and tools described in Chapter 4.5. Ten people, representing both the value proposition and systems integration phases of the

project lifecycle were interviewed; some had been directly involved with the development of the processes and others had not. Tables 4.9 to 4.14 give examples of the questions and feedback given.

Table 4.9 Explain/describe Shepherd Construction Ltd and what it does

“Construction services”
“General building contractor”
“National building contractor”
“Principal contractor”
“Good regional builder, with core builder values”
“Family firm with family values”

Table 4.10 Feedback on business need to improve

“Tools provide a platform for implementation of Company procedures that prior to the development of the tools were both outdated and inadequate in scope”
“Alignment of the tools/process across the business was necessary.”
“Help us to monitor/manage governance issues, compliance, performance and improvement
“More defined in content and more prescriptive in their use. As an operations manager this gives me consistency.”
“Compared to the lack of process before the “current system is far more suited to business need”
“Business required standardised procedures to function effectively and provide baseline data”
“Format is more user friendly than before” (previous business used to communicate processes using flowcharts
“People used to work in isolation and in the way they had always done it”
“Believe they are a very important part of our business now ” (highlighting that they weren’t before)

Table 4.11 Feedback on the way processes and tools were developed

“The collaborative framework for development was a beneficial exercise to allow the assimilation of experience and operational requirements”
“Right to draw upon the skill base across the business”
“Some of the people were unsure of what they were doing” (in the working groups, as it wasn’t their day job, is a different type of work and some individuals were dominant)
“Consultation process was good and inclusive and was essential to get buy in at all levels”
“Working groups...gave things credibility in the field”
“Did not get senior management ownership and drive”
“Originally too much too quickly”

Table 4.12 Feedback on the way processes and tools were implemented

“Generally good”
“Could have been more workshops for site level staff”
“Everyone has taken on board the tools which aid their particular job where they can see an improvement in accuracy or production. Where there is no tangible improvement to be made they tend to ignore the tool or pay it lip service”
“Initial scepticism has been replaced by a recognition that some of the tools are a help rather than a hindrance. People will embrace good tools and ignore bad tools”
“Lot of teams use the tools, but the momentum has slowed”
“Low as 10% implementation; sites use the tools they feel are useful; people pick relevant tools”
“Too much too quickly, without coaching, buy in, or ownership.” (regarding the stabilisation stage)
“You need to keep checking and insist on a consistent approach otherwise the tool will be adapted unilaterally by individuals/teams
“I am conscious that I am communicating to others whilst still learning myself. It is good it is lead from the top”

Table 4.13 Feedback on what could have been done better/differently

“Some of the tools are unnecessarily cumbersome...generates an unnecessary level of check during implementation....overlap between tools”
“We still have too many (tools and process) and they have an administrative burden.”
“Mosaic is not user friendly.”
“Paper is a wonderful thing and the lack of a project pack for procedures is a clear business failure”
“Mosaic system is not intuitive.....paper!”
“More market research on the competition and what is out there”

Table 4.14 Barriers to change

“Lack of understanding of why change is required based upon ignorance of the market and general enhancement of requirements from Client bodies”
People become “happy with the status quo. Need to see a material, tangible benefit.”
“IT is a barrier”
“Communication is a barrier to change”
“Resistance to change due to no consultation”
“Historically conservative nature of the business and insularity through lack of new ideas and cross fertilisation of industry practices”
“Not outward looking enough” and “narrow minded”
“Parochial, risk averse and inbred”
“Reluctant to buy in expertise; we can do it ourselves”
“We fire fight and don’t share”
“East division want to change least; people can’t get their head around not having own direct labour force”
“Trying to retain family values in a harder world”
“We haven’t changed our mindset as the industry has changed”

Recurring statements and responses from the case study interviews were highlighted and categorised. The timelines were then interrogated in order to find events in history that might have led to these responses. In addition, some of the case study feedback prompted the researcher to investigate further certain areas of the company's history, at which point an event or decision that had not previously been on the timeline was uncovered and the timeline updated. From this exercise potential path dependencies were interpreted.

Having proposed the path dependent events, they were then triangulated with the quantitative data to ensure that the interview feedback was consistent with the other data and had not been misinterpreted by the researcher, nor solely the perception of that individual.

4.6.3.3 The path dependencies uncovered

The following path dependencies were found to have impeded the P-S transition which had been enacted through the development and implementation of the standard processes and tools.

Family owned business

Starting out as a family company has set the business on its original path, and 112 years on it is still a factor in how people see the company and approach their work. Throughout the years, family members have been directly involved in running various companies within the group, ensuring the company remained on this path. This initial beginning has therefore created a path dependency that is evidenced today in feedback that refers to "family values" and being "insular" and "parochial". The family origin should in some senses be a strength to capitalised upon. However, the downsides of the family heritage would appear to be a lack of challenge, reluctance to engage with parties external to the organisation and lack of accountability. This is concerning for a company looking to transition to deliver integrated solutions, since engagement with third party experts and competitors, and networking with

clients, are seen as means of making the transition to integrated solutions provision (Foote et al., 2001).

We are a ‘builder’

The family company heritage is closely linked to a second path dependency identified, that of the company still considering itself to be a “builder” rather than an integrated solutions provider. Nearly all of the interviewees, when asked what the company does, included the word “builder” in their response, despite the company having no direct labour and engaging a supply chain to carry out its works. This path dependency of being a builder, whilst having positive connotations with respect to reliability and quality, can be considered to be restrictive, and indeed outdated and at odds, with respect to the strategic intent to become an integrated solutions provider.

Removal of functional heads/process owners

The “builder” path dependency has undoubtedly been reinforced by disconnect between what people actually do and the company’s strategic intent; with no standard ways of working aligned to strategic intent, people had developed their own methods. In the late 1980s, functional heads, who were middle management, defined ways of working that were implemented across the business; interviewees recall being given a manual which clearly defined their role and the management reporting they needed to adhere to. The loss of these functional leads in 1988 meant company standards were no longer documented and implemented across the business, and that operating regions began to define their own ways of working. The removal of these functional heads, the process owners and experts, has led the business to become accustomed to lack of standardisation, and people becoming unaccustomed to being involved in defining processes for their functional area. This historical lack of process has impacted the level to which strategy has been enacted in

practice. This is evidenced by the short-lived nature of company initiatives which only endured for short periods of time.

The changes implemented, as described in Chapter 4.5, were designed to create the new standard approach to carrying out the phases of the integrated solutions lifecycle, and as such the company processes are now aligned to its strategic intent of integrated solutions provision. Feedback shows that people are beginning to see the benefits of standardisation, with someone commenting that the “tools provide a platform for implementation of company procedures that prior to the development of the tools was outdated and inadequate.” The comment that “people used to work in isolation and in the way they have always have done it” was in the context of acknowledging the benefits of the improved ways of working, as well as accepting that previously there was a lack of definition.

The creation of regional businesses/operating regions

The company developed its regional structure of having West, East and South areas of the company in the 1970s when various businesses were acquired across the UK. These acquisitions have created a path dependency as these regional businesses have become silos that other parts of the company, for example head office departments such as estimating and design, feel excluded from/in competition with. The creation of the regions need not have led to the dependencies that are starting to be overcome today, however the organisational structure and approach to processes that went alongside the creation of the regions meant that variation became prevalent and each part of the company created their own ways of working. One way or another, all of the work winning case study interviewees mentioned the operating regions in the sense of them having divided the company. This discord between departments has made implementation of change more difficult. An example of this is the work winning

process, where estimators are reluctant to stop doing activities that are now allocated to work winning managers since they feel it diminishes their role and importance within the business.

The issue of silos was also identified through the use of the maturity assessment (as described in Chapter 4.3.4), with the opinion being that the company rewards scheme, which only applies to the on-site project delivery teams and not head office departments and work winning teams, serves to continually reinforce the path dependency. Given that integrated solutions provision requires front end (work winning and estimating teams) and back end teams (the regional project delivery teams) to work together closely to deliver the client's value proposition, the silo mentality, borne out of the path dependency, is a barrier to P-S transition.

The development of Mosaic

The final path dependency identified by this research concerns the company's ICT systems, specifically the creation of the in-house developed Mosaic system which was launched in 2003. Durability of capital equipment, including human resources, is identified in the literature as being one of the causes of path dependency (David, 1985.) This is due to the fact that once an initial investment has been made, it is often more costly to change direction rather than continue with the current approach, even if that approach is less efficient, and therefore introducing waste, than another option.

All of the people giving feedback referred to the way the developed processes and tools are accessed through the system, with comments ranging from referring to lack of user friendliness, to people simply asking for "paper!" copies of the documents. Whilst in some respects an in-house developed system gives the business flexibility, and means it is not reliant on external third parties providing bespoke products, the fact that people are reluctant to use the system, and will therefore not be accessing the standard processes and tools that

have been designed to enable the P-S transition, has locked the company into a path that is constraining change.

4.6.4 SUMMARY

This section has evaluated the development and implementation of the processes and tools – called ‘The Shepherd Way’ - that were designed to improve consistency in performance of the work winning (strategic engagement & value proposition) and project delivery (systems integration) phases of the integrated solutions lifecycle (Figure 4.5).

Feedback from those using those standard processes and tools shows that they have provided a basis for governance and consistent performance that was previously lacking in the organisation. The quantitative measures for these phases of the integrated solutions lifecycle support this, with improvements seen in the tender win rate and number of projects completing on time.

Given that these improvements in the phases of the integrated solutions lifecycle were realised through the implementation of the processes and tools that were founded on lean thinking, it follows that the application of lean thinking is a means of enacting the products-to-service transition, providing a new theoretical framework that was absent from the literature and supporting the propositions posed by research questions 1 and 2. Since standardised processes and tools have been shown to enable integrated solutions provision, the consideration of whether a business has standard processes/procedures was added as a 16th category on the maturity assessment. The final version of the maturity assessment is included in Appendix G. The strategy for P-S enactment, based on lean thinking and the concepts of value, waste and flow, has also served to show that there is not a one-size fits all approach to lean implementation. Rather, lean implementation can be adapted to suit the specific

company context in which it is being applied, responding to research question 4 (also refer to Paper 2, Appendix L).

This section also described the path dependency analysis carried out as a means of identifying the organisational barriers to change that have been shown to have influenced the P-S transition, supporting the proposition (research question 6) that path dependencies impede the implementation of lean, and therefore P-S transition when that is enacted through applying lean thinking. It has also been shown that understanding path dependencies allows them to be overcome (research question 7), and that application of lean thinking is a means of overcoming them (research question 8) – refer to Papers 3 and 4 included in Appendices M and N respectively. Appendix F provides a summary table of the path dependencies uncovered, how an appreciation of them was used to inform the research, the ways in which the research carried out mitigated these path dependencies and future actions recommended to address the path dependencies.

Completion of previous research process steps 4, 5 and this step 6 (recall Figure 3.1) served to complete Objective 3 of the project, ‘design, implement and assess changes to achieve the desired future state’.

The outcomes of step 6, ‘evaluate action,’ as described in this section, were then used to inform the next action research cycle and subsequent research steps.

4.7 STEP 7: CONSTRUCT

Despite the improvements in performance as a result of the development and implementation of the standard processes and tools, and the positive feedback received on how these had provided a foundation for consistency that was recognised as being needed by the employees, the evaluation of the changes made had also highlighted a number of organisational barriers to change as well as showing that further improvements could be made. The quantitative

measures showed that customer satisfaction, the purpose of providing integrated solutions, had not improved, whilst data concerning supply chain performance was no longer being collected. This substantiates a comment from the use of the maturity assessment stating “we do not have a supply chain as far as I can tell.” In addition, other areas for improvement highlighted by the maturity assessment (refer to Chapter 4.3.4) had not yet been addressed. Therefore, with the standard processes and tools as the foundation it was recognised by the researcher and leadership team that further improvements needed to be made.

The path dependency study and maturity assessment had revealed organisational silos between regions and head office departments, such as estimating and work winning, as being a barrier to change arising from the historical creation of the regional businesses in the 1970s. At the time a number of projects being undertaken were experiencing problems with the ‘handover’ from the work winning team (including the head office estimating department) to the regional project delivery team, backing up the comment in the maturity assessment that “quality of project handover” is an area for improvement with regard to achieving the project targets, especially those of the customer. The resulting customer experience was akin to working with two totally different companies as they were introduced to the ‘new’ project delivery team and the work winning team that they had built a relationship with disappeared – again reflecting the assertion given by a senior manager through use of the maturity assessment that we need to “keep a common face in front of the customer” and the lack of improvement in customer satisfaction results. The resulting loss in customer relationship and customer satisfaction meant that project delivery teams were starting from the back foot, having to start working with the customer as though from scratch. The same could also be said for the transition from the project delivery team to the team that would then operate the asset - “customer satisfaction on occupation is not on the team’s agenda” as stated by a senior

manager filling in the maturity assessment. This fluctuating customer relationship is shown in Figure 4.8.

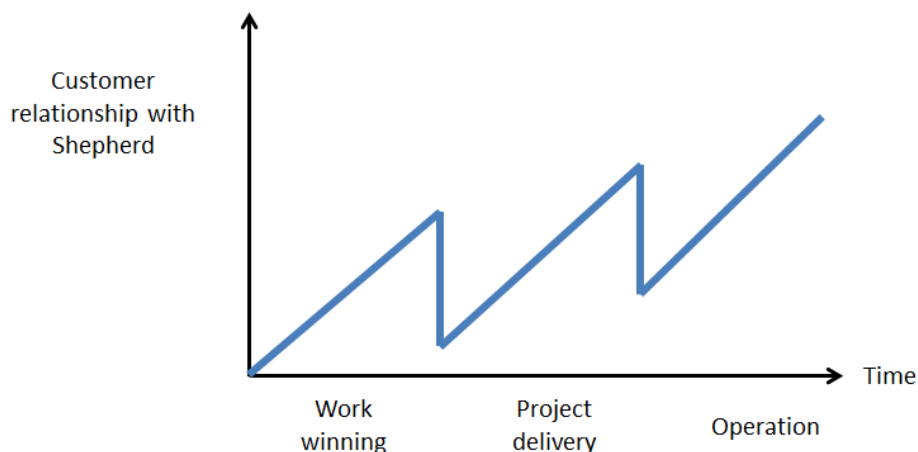


Figure 4.8 Customer relationship across lifecycle phase transitions

The reduction in the customer relationship represents a loss in understanding of the value proposition by the SCL team – perpetuated by the organisational silo path dependency as the project is passed from one team to another.

Although a number of processes and tools had been developed - 17 in the work winning phase and 85 in the project delivery phase – to manage how these phases of the integrated solutions lifecycle were carried out, only 1 tool, the Tender Handover, addressed the ‘handover’, or transition, from the work winning team to the project delivery team, with this being a ‘push’ of information from the work winning team to the project delivery team. In other words, the value stream was being broken at the point of handover, disrupting the flow of value. Similarly, tools concerning customer satisfaction were retrospective, aimed at collecting feedback post activity, rather than proactively looking to engage with the client to understand and consider their needs throughout the project. This insularity of the business, another path dependency arising from the family history which was leading to the potential loss/destruction of the value proposition, needed to be addressed to enable the business to become less inward looking and more customer focused – key characteristics of integrated solutions provision.

4.8 STEP 8: PLAN ACTION

It was therefore agreed with the leadership team to focus the next stage of the research process on creating flow through and between the phases of the integrated solutions lifecycle.

While the first set of changes explained in Chapter 4.5 had focused on defining the activities within the phases of the integrated solutions lifecycle – i.e. standardising the tasks along the value stream required to add value and reduce waste – this next stage of change would focus on creating flow through and between these phases so that all elements of the customer's value proposition would be understood and realised. In addition, it was anticipated that creating this flow, across everyone involved in the lifecycle, would help breakdown the organisational silos identified as a path dependency. This is shown in Figure 4.9.

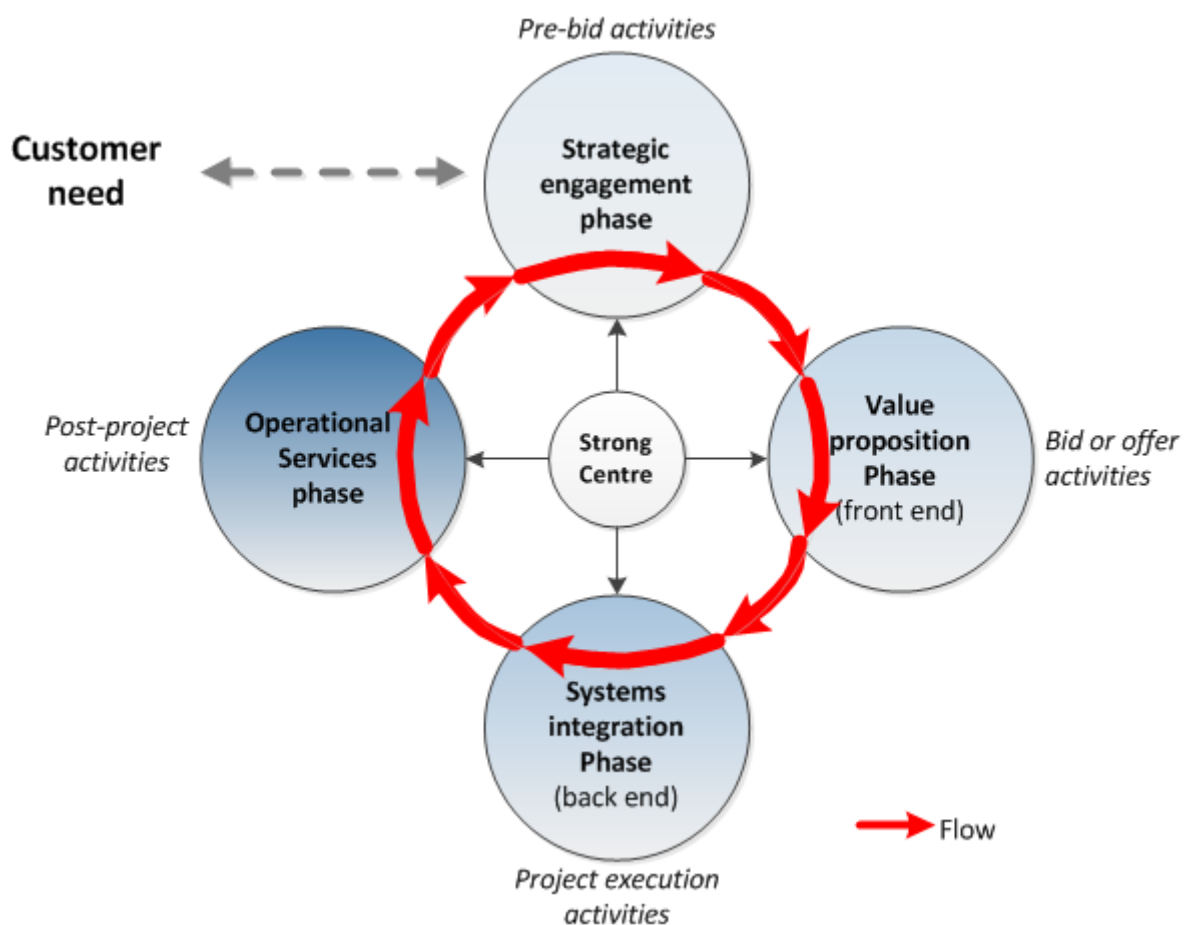


Figure 4.9 Research focus on flow between and through lifecycle phases

The plan was to use feedback from current projects experiencing difficulties in the transition phases, along with best practices identified on other projects, to inform the development of new practices that would enable successful flow of the value proposition through all phases of the integrated solutions lifecycle.

4.9 STEP 9: TAKE ACTION

Following a review of academic literature, semi-structured interviews and site visits were carried out in order to understand the current issues and best practices associated with customer engagement and the transition from work winning to project delivery and project delivery to operation of the asset. The result was the development of an ‘operational framework for service delivery’ and ‘service delivery plan’, founded on lean thinking, that enables the identification and flow of information associated with all aspects of the customer’s value proposition across the whole team for the duration of the integrated solutions lifecycle.

4.9.1 LITERATURE REVIEW

The aim of integrated solutions providers is to provide a combination of products and services that create unique benefits for each customer, with these products and services commencing earlier on in the pre-bid/strategic engagement phase and extending later into the life of the asset (Brady et al., 2005a) compared to the traditional, product manufacturing organisation. This increased range of focus therefore has an impact on when and how the organisation interfaces with the client and what can be classed as ‘value adding’ activities (Brady et al., 2005a). Vargo et al. (2008) state that “value is uniquely and phenomenologically determined by the beneficiary”.

The lean construction community has spent much time discussing the definition of value, primarily since lean thinking is concerned with value generation and minimisation of waste:

“Value generation is defined as meeting client requirements while minimising waste” (Forgues et al., 2008, p.435; Salvatierra-Garrido & Pasquire, 2011). It is generally acknowledged that an agreed definition of value is not yet found (Thyssen et al., 2010), however research exploring the concept of value through nineteen years of proceedings of the International Group for Lean Construction (IGLC) (Salvatierra-Garrido et al., 2012) finds that efforts have mainly concerned delivering value at project level, i.e. throughout the systems integration phase of the integrated solutions lifecycle.

However, it is acknowledged that understanding value needs to commence at the design stage of the project (the strategic engagement and value proposition stages) (Pasquire & Salvatierra-Garrido, 2011), and that this will include conversations and workshops with the client (Miron & Formoso, 2003; Bertelsen & Emmitt, 2005; Ballard, 2008; Ferrari Caixeta et al., 2013), as well as requiring the people who are involved in the design process needing to understand what value is, both in general terms and for that specific project (Drevland & Svalestuen, 2013).

Emmitt et al. (2005) explain that there are many aspects of value: value concerned with the product itself, and process value concerning the experience given to the customer that is made up of soft values (such as ethics, communication, conflict solving), hard values (such as timescales, costs and product quality), and value that comes from the process itself, for example community engagement activities that teach about the construction process. Figure 4.10, drawn up by the researcher, draws on these descriptions of value, showing the aspects of value that the customer and stakeholders might desire, categorising them as either tangible or intangible, and considering that the ultimate goal of solutions provision is the achievement of the customer’s business targets not just those associated with the building.

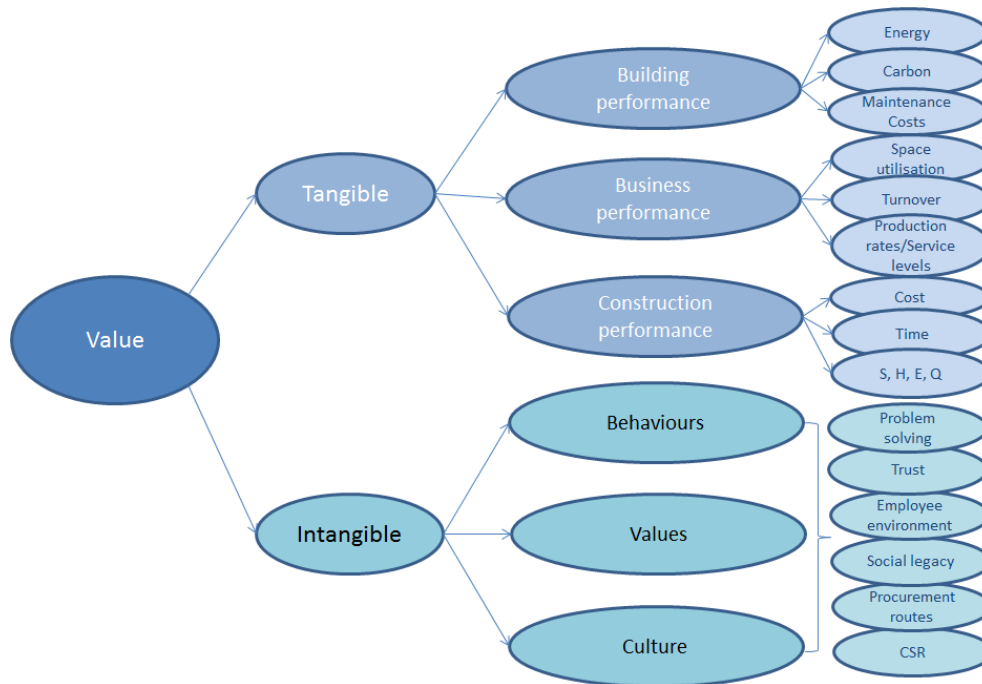


Figure 4.10 Aspects of value

The challenge for the integrated solutions provider is therefore how to ensure that all these aspects of the customer’s definition of value are understood, and how this understanding can then be made to flow through the value stream (Womack & Jones, 2003) or value chain (Porter, 1985) – in this case, through the phases of the integrated solutions lifecycle - given all the people and parties involved such that it can be realised. In other words, the research proposition (research question 3) is that creating flow along the value stream (the integrated solutions lifecycle) will enable the products-to-service transition and therefore delivery of the customer’s value proposition.

Porter’s (1985) value chain theory of the firm, which is understood as a theory of production as well as focusing on the competitive position of the firm, characterises the firm as being a system of interdependent activities that are related by linkages within the value chain, where “the value chain formulation focuses on how these activities create value”. (p.39). Koskela’s (2000) TFV (Transformation/Flow/Value) concept of production combines Porter’s transformation concept of production with flow and value concepts, suggesting that they

should be used in combination since emphasis on one model neglects issues addressed by the others. The transformation view of production is primarily concerned with managing the tasks required to transform inputs into outputs, breaking down the production activity into discrete, ordered tasks with a focus on production efficiency. The flow view considers production from a material flow perspective, with the aim being a smooth flow that is achieved through the elimination of waste. Koskela (2000) identified 7 flows in the construction process – information, materials, previous work, crew (people), equipment, space and following work – that need to be realised in order to achieve the project targets and customer satisfaction. The value generation view sees production as a means of creating value for the customer through fulfilment of their requirements. Combining these approaches connects the delivery of value, as defined by the customer, to the concept of flow. Creating the 7 flows transforms the inputs into the output, i.e. the finished solution, as they progress through the activities in the value stream.

Whilst Koskela's TFV theory (2000) has largely been applied to construction activities (Salvatierra-Garrido et al., 2012), the need for value to flow through the design phase of a project has also been identified, with Emmitt (2007) calling for mapping of information flows being a prerequisite for the management of design. Further, Tribelsky and Sacks have showed that indicators of poor flow, for example long cycle times, accumulation of work in progress and large batch sizes, are evident in the design phase of civil engineering design (Tribelsky & Sacks, 2010 and 2011), supporting the assumption that integrated solutions providers need to information to flow through all phases of the lifecycle.

The Last Planner™ system (Ballard, 1994, 2000a, 2000b) is a production control method consisting of a number of stages that has been developed for construction and which has been shown to facilitate flow and therefore enable delivery of value. The master scheduling

activity, or collaborative programming, involves the supply chain foremen in the creation of a visual programme that is challenged in terms of batch size, next customer needs and target milestone dates. Having collaboratively agreed a programme, the next step of the process is to make the tasks on the programme ready to be carried out. The 7 flows identified by Koskela (2000) are potential constraints to flow if they are not ready, i.e. if materials for a task are not available, that task cannot start. Look ahead, or make ready, planning therefore involves systematically reviewing the potential constraints concerning each task, and agreeing actions to remove those constraints prior to the planned task start date. Once tasks are constraint free, and only then, they can be assigned to a weekly work plan. Weekly work planning involves the collaborative development of next week's plan of work – with only constraint free activities that are required from the master programme being put on the weekly plan by the trade foremen responsible for carrying them out. Finally, a daily meeting at the work face ensures everyone is safely set to work and is clear on their activities for the day. Last Planner™ has been shown to enable management of the 7 flows, primarily through the look-ahead sessions (Koskela, 1999; Bertelsen et al., 2007), which systematically review the constraints associated with the 7 flows and ensure tasks are ready to be carried out. In addition to applying these concepts to the construction activity (the systems integration phase), they can also be applied to the design phase of a project.

In addition the Koskela's 7 flows, Pasquire (2012) and Pasquire and Court (2013) discuss an 8th flow, that of 'common understanding' – a 'soft' flow that is necessary to support the 7 'hard' flows that are tangible and physical. 'Understanding' is described as being more than having the skills and information to carry out a task – it includes the desire to 'do the right thing' from a moral point of view. A number of lean principles, tools and techniques have been identified that expressly or indirectly help to manage understanding: having an overarching management philosophy/approach in itself promotes a shared understanding,

visual management, problem solving which requires an understanding of the problem, going and seeing for yourself, the use of a big room where everyone can gather to work, share and problem solve (Liker, 2004; Pasquire, 2012), team-working and collaboration and make ready/look ahead which facilitates the understanding of what the next customer in the process needs (Mossman et al., 2011; Pasquire, 2012).

The standard processes and tools implemented in the first action research cycle (described in Chapter 4.5) had identified the tasks along the value stream that would be required for value to be delivered (and wastes eliminated), drawing on the transformation and value models of production. The aim of this next stage of change was to combine these approaches with that of creating flow, as advocated by Koskela's TFV model (Koskela, 2000).

The 'operational framework for service delivery' and 'service delivery plan' that have been developed have drawn on all these concepts, as will be explained in the following sections, with the fundamental assumption being that in order to provide integrated solutions, the client's definition of value (as proposed, negotiated and agreed with the integrated solutions provider) must be understood and then articulated to all those involved so that they can achieve the 8 flows that will enable the value proposition to be realised.

4.9.2 SEMI-STRUCTURED INTERVIEWS TO UNDERSTAND THE PROBLEM

Eight semi-structured interviews were undertaken with people involved with projects that were experiencing difficulties with the transition from the work winning to project delivery phases of the project lifecycle, the result being a dis-satisfied customer that the delivery team were left to deal with. Those chosen for interview had interfaced with the client and were representative of each discipline within the work winning and project delivery teams, i.e. commercial, estimating, bid management, construction senior management, construction build management. The interviews revealed the following problems and issues:

- The ‘handover’ – meant to be a structured meeting where the work winning team would ‘handover’ relevant information to the project delivery team – was not being held, and where it was it was deemed to be “cold”, i.e. there was “no transfer of understanding of what the bid team had in mind” and “handover of (the client’s) key drivers was missing”. Members of both the front end and back end teams highlighted that there is a “need to get the delivery team to understand the client relationship” (that has been built between the client and work winning team) so that the delivery team can “understand their logic”. It was stated that “we haven’t passed the client’s value proposition from the work winning team to the project delivery team”.
- It became apparent that the client “saw two faces of SCL” (the work winning team and the project delivery team), with the project delivery team being seen as coming in and making changes (to the design and the costs) that was moving away from the vision that they had been sold by the work winning team. The delivery team felt they were left to resolve issues of cost as a result of the work winning team over promising, prompting poor behaviours between the SCL teams in front of the client – project delivery teams would state “I don’t know what ‘they’ (the work winning team said) but...” The result was the client stating “you’ve over-promised and under delivered.”
- It was felt that the project delivery team and sub-contractors had not been engaged early enough in the process, and that the lack of commercial and construction experience in the work winning team had led to cost issues that were highlighted only after handover to the project delivery team.
- Team continuity, of both the work winning team and project delivery team, was also identified as a problem, with new people having to spend time “getting themselves up to speed understanding the job and client”. It was also felt that the work winning team

should not just “disappear”, but maintain a relationship with the client to at least start on site. Someone stated that the “major issue of the project is the continuity of client relationship and our behaviours with the client”.

- Finally, the project delivery teams acknowledged that at handover they “don’t know what we are building” and that they spend the “first 50% of the construction phase re-doing what the work winning team has already done” as they don’t understand the decisions that have already been taken place and they don’t know what work has already been undertaken. However, the delivery team also felt that the work winning team should have some responsibility and accountability for the project post-handover, where as it was felt the work winning team could walk away and leave any problems for the delivery team to overcome.

Note that many of these comments mirror the feedback from senior managers in the business given via the maturity assessment (refer to Chapter 4.3.4).

Evidence of the path dependencies was also found: one work winning team member stated “we are acting like a building contractor” rather than a solutions provider, with the silos between the regional project delivery teams and centrally based work winning teams being evident in many of the points listed.

4.9.3 IDENTIFICATION OF GOOD PRACTICE

Site visits, semi-structured interviews and attendance at post project reviews and best practice sharing sessions were undertaken in order to identify good working practices that were being implemented on projects that were receiving positive customer feedback and had successfully undertaken the transition from the work winning phase to the project execution phase. Good working practices were considered to be those that did not damage the realisation of the value proposition (and indeed which were actively facilitating the flow of information about the

value proposition across the team), and/or which reflected the principles of lean thinking and/or reflected the characteristics of an integrated solutions provider business model.

Good practices identified were:

- Co-located teams, consisting of people from the company and supply chain (both during work winning and project delivery), in a big room, open plan environment that engendered communication.
- Commercial and construction expertise being embedded into the work winning team.
- Early involvement of third party experts and supply chain partners.
- Single point of leadership that started in work winning and remained the same throughout project delivery.
- Clear roles and responsibilities.
- A robust project execution plan.
- Joint processes with supply chain, e.g. programme, work in progress meetings, mid-month reviews, where SCL were working with other companies in the group.
- Aligning the contract documentation to the client's rather than creating a new set of documents, i.e. agreeing amendments to the employer's requirements (ERs) rather than creating a set of contractors proposals that would have differences to the ERs.
- Use of mock-ups and tests (which were signed off by the client) to ensure everyone in the team was clear on the client's requirements and standards.
- Work-wear branded with the project name and worn by the whole team (SCL employees and supply chain) to engender a team spirit and to set a standard, aligned with the customer's expectations.

- Site inductions that included a video of the customer explaining their drivers and what is important to them.
- Clear customer KPIs that are regularly monitored and reported back to the client.
- Corporate social responsibility activities, some of which included the client, and many of which included the supply chain, to engender team spirit and promote behaviours aligned to the client's expectations.
- Use of 3 dimensional (3D) models to aid planning and communication of the plan to people in the team, promoting the 8th flow of common understanding.

4.9.4 DEVELOPMENT OF THE OPERATIONAL FRAMEWORK FOR SERVICE DELIVERY

The outcome of the interviews, site visits and sharing sessions was the development of an 'operational framework for service delivery' that results in the production of a 'service delivery plan' which documents how the team will deliver the required service to the client.

The operational framework for service delivery is a practical tool, resulting in plan for service delivery, which enables the teams to manage the work winning phase of the project, make ready (drawing from Last Planner™) for the transition from work winning into project delivery, manage the project execution phase, and then make ready for the transition from project delivery into operation of the asset. The framework ensures that the customer's definition of value, captured as information and knowledge relating to the 8 flows, flows through all phases of the project lifecycle and to all the people involved, enabling them to co-create and deliver that value: the output for the customer is the desired solution that meets their business targets and project targets (tangible) as well as the experience they expected (intangible) – refer to Figure 4.10.

Figures 4.11 and 4.12 show the operational framework for service delivery, firstly as a template form and then as the company's best practice version (these will be explained in the following sections.)

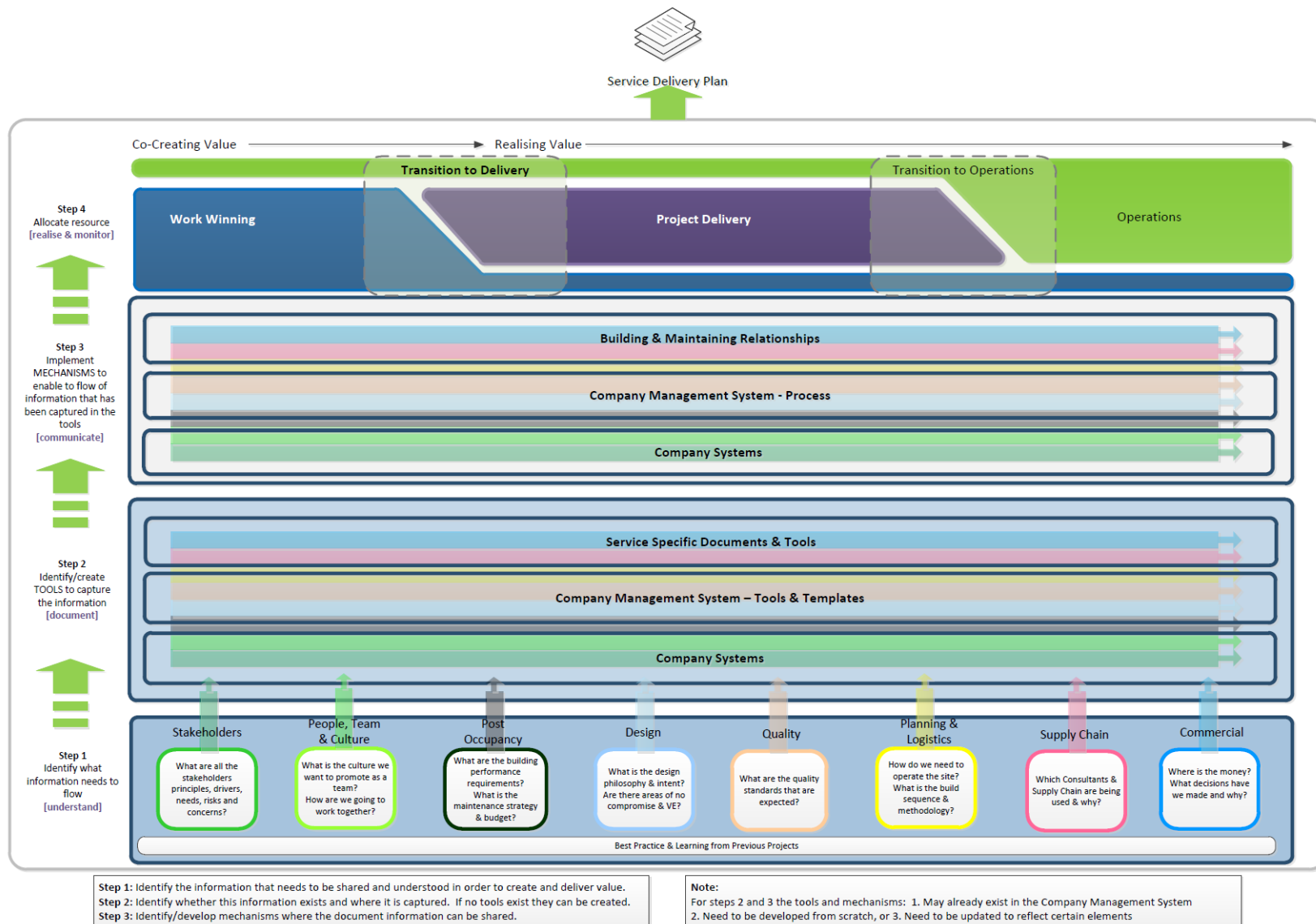


Figure 4.11 Operational framework for project delivery template

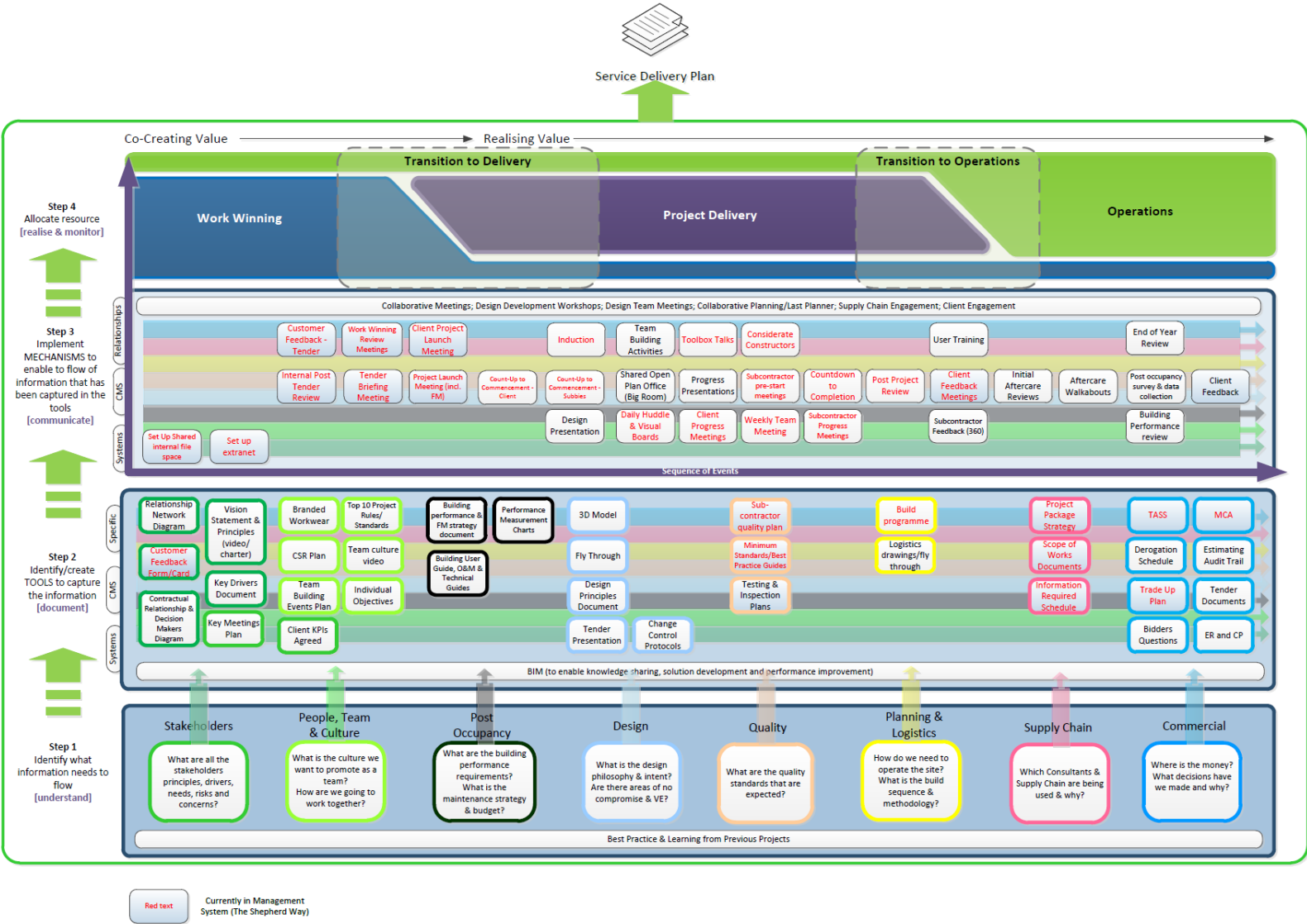


Figure 4.12 Operational framework for service delivery best practice version

4.9.4.1 How the framework was developed

The logic behind the framework was based on the need to identify all the information relating to the 7 flows (Koskela, 2000) – information, materials, previous work, crew (people), equipment, space and following work – that the team (SCL, supply chain, consultants and clients) would need to have a common understanding of – the 8th flow (Pasquire, 2012; Pasquire & Court; 2013) - in order that the information could flow through the project lifecycle and all the parties involved. In addition to these tangible aspects of value, the customer’s intangible value proposition also needed to be understood and communicated as highlighted by the interview feedback.

Eight categories of information, relating to the customer, the operation of the asset and the aspects to be managed throughout the project lifecycle were identified. Key questions relating to these categories, that would prompt the team to obtain the relevant information, were then written, with the feedback and observations being the basis for determining what these would be. An example of two of the categories is presented in Figure 4.13.



Figure 4.13 Snapshot of Step 1 of the framework showing 2 information categories

Having identified what information the team would need to know in these eight categories, it was thought necessary to capture this information in the form of a document. The feedback interviews had highlighted a lack of documentation of decisions and information, making it more difficult for it be handed over or explained to new team members. Therefore,

tools/templates that would capture these pieces of information were identified from the existing company management system (i.e. ‘The Shepherd Way’ - the processes and tools already developed and listed in Chapter 4.5.2.3) as well as new tools/documents being proposed in areas where there were gaps in the current system.

The framework therefore prompts that the necessary tools might be part of the existing company management system, ‘CMS’, might be embedded in the ‘Systems’ (in this case embedded in the company’s Mosaic system) or project ‘specific’ tools that might need to be created to meet the needs of that project.

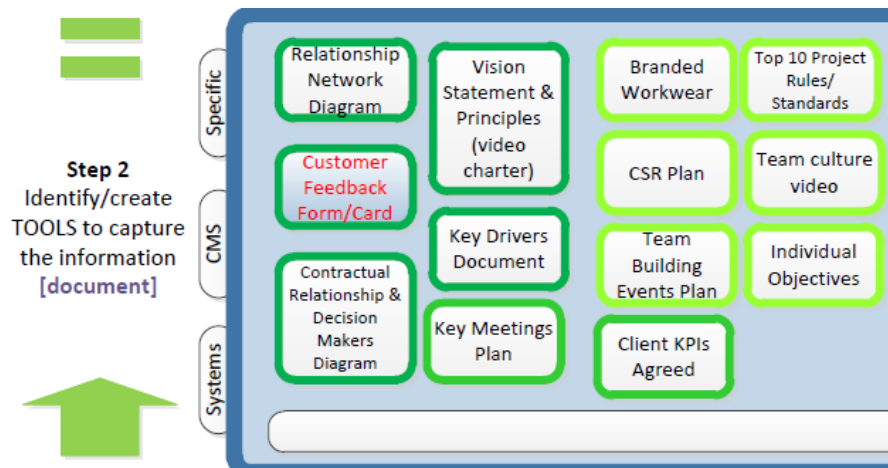


Figure 4.14 Snapshot of Step 2 of the framework showing tools to capture information relating to the 2 categories

In Figure 4.14 the text in red denotes that the tool already exists in the company management system that have already provided a standard, consistent basis for achieving the work winning and project delivery phases of the integrated solutions lifecycle.

Having identified the tools that would capture the information, it was then considered that there needed to be a time and place where the tools would be used, and thus the information contained in them would flow from one party to another. Meetings, forums and mechanisms for the information in the tools to be shared were then identified: again, these were either existing meetings in the company management system or new mechanisms proposed as a

result of the feedback, for example design presentations that had been done by the design team to the project team at various stages in the project lifecycle. The framework shows the order in which these mechanisms might be implemented in relation to the project lifecycle. Note, a tool might be used in various meetings/mechanisms, for example 3D models could be used in collaborative planning meetings and client meetings, or the Information Required Schedule (IRS) would be used at design team meetings and client meetings (Figure 4.15).

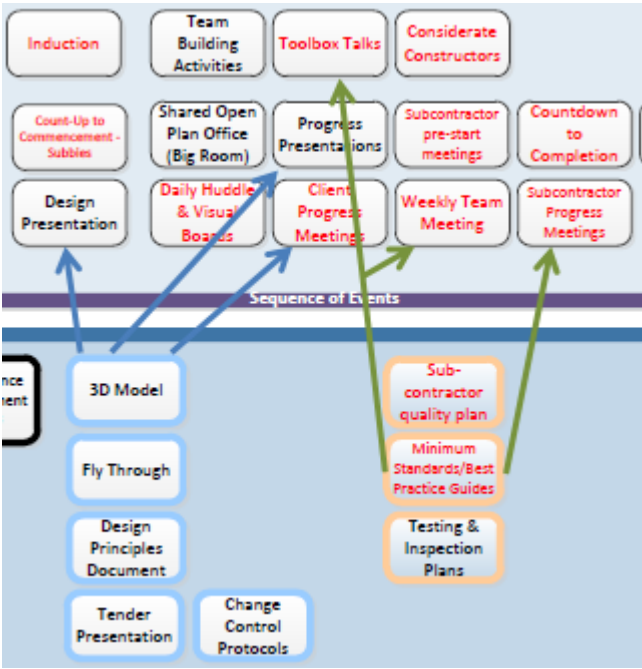


Figure 4.15 Snapshot of framework showing tools can be used at various meetings/mechanisms

As with the tools, and as illustrated by Figure 4.16, the framework also prompts that mechanisms can either be ‘systems’ related, for example extranet/web based portals to aid collaboration, within the company management system, ‘CMS’, or could be concerned with ‘relationships’ – maintaining regular contact and collaboration to specifically engender the intangible aspects of the value proposition.

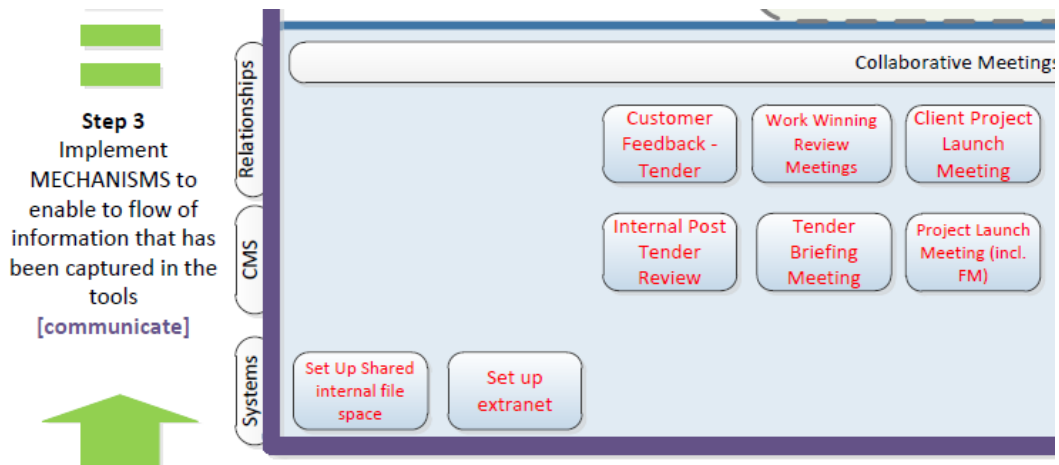


Figure 4.16 Snapshot of Step 2 of the framework showing mechanisms for information flow

Having identified the information that needs to flow, the tools in which that information will be captured, and the mechanisms that will be implemented to enable the flow of information contained in the tools, the framework then addresses the resource needed, particularly whether that resource is from the front end or back end team and the overlap of these teams at the transition points – the transition into delivery from work winning, and the transition into operation of the asset.

It was then considered that having undertaken each step of the framework - firstly identifying the information, then the tools in which it would be captured, and then the mechanisms where the tools would be used and by whom – the final step should be the production of a document that summarised the thought process undertaken and which would therefore describe how the team would be delivering the desired service to the customer. The outcome of the framework is therefore a ‘service delivery plan’ which documents how the team are going to deliver the project – using the tools and mechanisms identified – and which can be used to communicate that to the client and the project team throughout the project. The service delivery plan template is included in Appendix F.

4.9.4.2 How to use the framework

The operational framework for service delivery can be used in a number of ways. Firstly it can be used in ‘template’ form, where the team, ideally as early as possible in the work winning process, start at step 1 and identify the information in each of the categories that will need to flow throughout the project and which they will need to ensure a successful bid. Having identified the information, the team would then identify the tools that they will use to capture that information, either from an existing company management system, or systems if for example the company was working with other group companies, or by developing new tools if required. These tools would be noted on the framework template. Similarly, the mechanisms for sharing the information captured in the tools would then be identified, again using any existing systems where possible, and noted onto the template. Finally, the team would agree resource and would document the approach they had developed by undertaking the steps of the framework in the ‘service delivery plan’ template. Following from this, the service delivery plan would be put into practice: the information would be compiled into the relevant tools, involving the necessary people, with many of the tools becoming live project documents that will be used throughout the life of the project to manage the flow of information. The tools would then be used at the meetings/mechanisms as documented in the service delivery plan. The service delivery plan would be updated monthly, initially by the bid manager. Both the tools and the resulting service delivery plan embody the value proposition and define how it is going to be communicated to and delivered by the team. As soon as the project delivery manager (who is critical to preserving and realising the value proposition) is identified, they would then read the service delivery plan that was being used by the work winning team and then take ownership of it, undertaking each of the steps on the framework and updating the service delivery plan for the project delivery phase. Tools and mechanisms relevant to the delivery phase of the project would be identified and

implemented, and the team would pull the information that they needed from the work winning team. Throughout the project delivery phase reviews and updates of the service delivery plan would be undertaken, with the client, to ensure that it reflects the latest status of the project and what is of particular importance to the client at that time. The interviews with the project delivery team members had revealed that as the project progresses what the client worries about changes. One project manager acknowledged that on his project the client was confident in the completion date, however was worried about the installation of new ICT equipment for their classrooms: continually reviewing the service delivery plan, and the client drivers, is expected to allow these issues to be identified, shared and addressed across the team. Note that if the service delivery plan was not commenced at work winning phase, it could be commenced as soon as the project delivery team was assigned in order to firstly manage the transition from work winning to project delivery and then manage the project delivery phase and transition to operation. Finally, as the operation phase nears, the operational team would take ownership of the service delivery plan, pulling the information they need from the project delivery team. Used in this way, the framework, and the resulting service delivery plan ensure that the value proposition flows through one iteration of the integrated solutions lifecycle, i.e. one project. The learning from that project is then used as an input into future projects so that the service the company offers is continually improved.

Alternatively, rather than always starting from a blank framework template, a business could create a 'best practice' framework (as has been done here for SCL – refer to Figure 4.12), which already includes the tools and mechanisms that are part of their company management system. This would provide a basis for the team to start from, with only project specific tools and mechanisms having to be identified.

Lastly, working through the framework template could provide a means of developing a company management system from scratch, or challenging an existing company management system with a view to identifying any gaps where new tools and mechanisms to enable solutions provision need to be created.

4.9.4.3 Framework key points and link to lean thinking

The key points of the operational framework for service delivery, how they have been informed by the interviews, site visits, maturity assessment feedback (refer to Chapter 4.3.4) and sharing sessions, and how they draw on lean thinking and the theoretical models/characteristics of integrated solutions provision are highlighted in the following points:

- The resource section at the top of the framework shows that there remains a single point of contact with customer throughout the project by the front end, work winning team, as suggested by Foote et al. (2001) in their Model for Strong Solutions.
- The two transition phases, from work winning into project delivery and project delivery into operation of the asset, show a gradual reduction in one team and a gradual introduction of the next team. This aim is to ensure a gradual transition, where the incoming team would ‘make-ready’ and ‘look ahead plan’ for their phase of the project (Ballard, 2000a, 2000b) and ‘pull’ (Womack & Jones, 2003) the information they require by obtaining the tools (and therefore the information contained therein) and attending the meetings identified on the framework, rather than the current situation where work winning teams are said to “disappear” after a pushing the information they have onto the project delivery team at a single handover meeting.
- The framework prompts post occupancy and facilities management (FM) considerations much earlier in the project lifecycle, with the FM company/team being involved from the

start at the value co-creation stage. This will also allow information from previous projects, for example FM costs, to be incorporated into the work winning proposals.

- Similarly, the first step of the framework, identification of the information that needs to flow, prompts the consideration of what learning and best practices from previous projects needs to be considered. This is aligned with principle 14 of the 14 Management Principles of The Toyota Way (Liker, 2004) which advocates continuous improvement through reflection and learning from previous projects but which was deemed to be lacking by the senior managers who completed the maturity assessment (refer to Chapter 4.3.4).
- Collaborative meetings, for example design team meetings and collaborative planning meetings, are used throughout all phases of the lifecycle to promote co-creation of value, negotiation and agreement on the value proposition, trust and collaboration across all disciplines – the company, supply chain, consultants, client and client’s representatives. In addition, collaborative planning, a version of Last Planner™, includes the activity of look ahead planning, with the supply chain partners, which promotes the 8 flows and reduces the 8 wastes (recall Chapter 4.5.1). Since Last Planner™ is a well-established technique many organisations will already have a basis for enabling integrated solutions provision.
- Elements of BSRIA’s Soft Landings Framework, (Useable Buildings Trust, 2009) have been incorporated into the transition to operations stage. The aftercare reviews and aftercare walkabouts are aimed at ensuring contact with the users is maintained post-handover of the building such that issues and concerns can be identified and addressed. The purpose of post occupancy and data collection, and building performance reviews tasks are to ensure that the asset is performing as planned, but will also enable the

company and its partners to capture information that can be used to inform at the strategic engagement phase of the integrated solutions lifecycle: this type of data will provide the business with the information it needs to develop the business consulting capabilities that are required at this stage of the life cycle.

- The framework prompts an increased focus on tools to capture information concerning stakeholders and people, team and culture. Notably these are missing from the existing company management system and were highlighted as being lacking in the interviews and maturity assessment comments, despite the fact that “integrated solutions project managers also have to pay attention to an increasingly important fourth constraint – customer satisfaction” (Brady et al., 2005a). The identification of tools such as the ‘key drivers document’, ‘relationship network diagram’ and ‘top 10 project rules’ along with work-wear branded with the project name, all to be used and incorporated in inductions, progress presentations, weekly team meetings and client progress meetings, are designed to place more emphasis on understanding what the client values and the standards and culture that the team need to set to achieve them.
- Complementing this, the creation of the overarching ‘service delivery plan’, with the term ‘service’ being used to promote the culture change to being customer facing rather than insular, provides a basis for the project team and client to regularly review the way the project is being delivered and managed, with attention being paid to always ensuring the client’s latest issues, concerns and expectations are being understood, communicated across the team and met.
- Many of the tools and mechanisms employ visual management (Toyota Principle 7, Liker, 2004) to aid common understanding, for example the use of 3D models, information

required schedules that are colour coded, use of the big room/open plan shared office space, daily huddles and huddle boards.

- The framework itself enables a standardised approach to the development of a service delivery plan in line with principle 6 of The Toyota Way (Liker, 2004) which deems standardised tasks to be the foundation for continuous improvement and employee empowerment.
- All the company management system tools and mechanisms on the ‘SCL best practice’ framework are based on lean principles and techniques as described in Chapter 4.5.2.3 ensuring tasks are free from waste and will add value. The framework and resulting service delivery plan serve as a means of defining how these are to be used throughout the life of a specific project, along with any project specific tools and mechanisms, to ensure information and value flows.
- The overarching purpose of the framework, and the tools and mechanisms within it, is to eliminate the eight wastes thereby enabling the eight flows throughout all phases of the integrated solutions lifecycle and across all parties involved such that the project realises all aspects of the client’s value proposition (refer to Figure 4.13).

4.9.5 IMPLEMENTATION OF THE OPERATIONAL FRAMEWORK FOR SERVICE DELIVERY

The ‘operational framework for service delivery’ and resulting ‘service delivery plan’ have been implemented on one of the company’s major, complex projects on which they are working closely with SES, one of the other group companies. The approach was implemented at the work winning stage and carried through into the project delivery phase by the project manager who has led all phases of the project, meaning there has been continuity throughout. The approach was also driven and supported by senior management in the group,

whose support and direction – providing a strong centre (Foote et al. 2001) – has facilitated team continuity and encouraged the tools and mechanisms implemented. In addition to the tools and mechanisms that are part of the company's management system (identified by the red boxes in the 'best practice' framework) the team also implemented the following aspects of the framework: the use of a big room, shared office space to promote collaborative working; project branded work-wear to promote standards and a team ethos; use of client videos to capture what is important to the client and which are shown at inductions and team meetings; regular presentations by one part of the team to the rest of the team, for example by the design team to provide an update on a key element of the project in order to gain a common understanding; mock ups and sample facilities that have been used to operator training and will also be used for user training; collaborative design team meetings; project extranets for sharing documents. Also, project specific tools and mechanisms were implemented. For example, clean areas of the building were designated and workers had to change into overalls and appropriate footwear, helping to promote the quality standards and culture required by the client. Results are reported further in Chapter 4.10.1.

In addition to this project, the framework and service delivery plan are also being implemented on new projects that are currently nearing the end of the work winning phase and which are about to enter the transition phase to project delivery. The project delivery managers are undertaking the task of working through the framework and developing the service delivery plan, identifying the information they need to pull from the work winning team. Observations show that initially project managers perceive the activity of developing the service delivery plan as an 'extra' task – however, once they have undertaken the activity they begin to see the benefits and understand that pre-planning, or making-ready, is a valuable exercise, albeit against their natural tendency to want to start on site and then solve problems as they arise. Early assignment of the project manager is also proving problematic. Often a

manager will be assigned to a project only then to be re-assigned elsewhere – this is where strong management is necessary to ensure the correct resources are allocated early enough and remain with the project. Production of the service delivery plans also shows that project managers struggle most with the customer facing elements of the plan, in particular understanding and capturing the client’s drivers and what is of value to them. More work needs to be done to improve the tools that are being used at work winning stage to capture this information so that the delivery team have information they can readily pull from them. This also needs to be supported by training for project managers, both in the development of the framework and service delivery plan, but also in terms of customer facing skills. Finally, the resource requirements of the framework, for example early involvement of FM staff (whether from the group FM company or a third party) and maintaining a single point of contact with the client by a member of the front end, work winning team, do not currently fit with the organisational structures, which are still based on specific front end and back end teams that report to a single manager.

4.9.6 SUMMARY

This section has described how an ‘operational framework for service delivery’, which results in the production of a ‘service delivery plan,’ was developed and implemented as a result of the literature, site visits and feedback. The framework provides a structure for identifying what information regarding the client’s value proposition (relating to the 8 flows) needs to flow, how that information will be captured and then what mechanisms will be used to facilitate the flow of that information throughout the life of the project. The framework particularly ensures there is a focus on the transitions between the phases of the integrated solutions lifecycle - shown as the arrows between the phases on the integrated solutions lifecycle in Figure 4.3 - directly tackling the organisational path dependency of there being a silo mentality between front and back end teams.

The framework, itself a form of standardised work, draws on lean thinking to provide a structured, yet flexible, means of developing a plan for service delivery that is focused on the client and ensuring the client's definition of value flows through the integrated solutions value stream and is therefore continually understood, and ultimately delivered, by the whole team as the project progresses.

Along with steps 7 and 8, completion of this step 9 fulfilled Objective 4, which was to use the learning from Objective 3 to refine and further develop practices to enable the achievement of the desired future state of solutions provision.

4.10 STEP 10: EVALUATE ACTION

The research process has firstly resulted in the development and implementation of standard processes and tools whose purpose is to ensure the strategic engagement/value proposition (work winning) and systems integration (project delivery/execution) phases of the integrated solutions lifecycle are carried out, waste free, to the required standard. Following this, an operational framework for service delivery, and a service delivery plan format, have been developed which provide a framework for the use of those tools and processes throughout the integrated solutions lifecycle such that flow of value can be achieved, especially between the phases of the lifecycle, i.e. the transitions between work winning and project delivery and then project delivery to operation.

The final Objective 5 was therefore to assess the impact of these practices developed and establish the contribution of this project to differentiating the business in the integrated solutions marketplace.

4.10.1 BUSINESS ANALYSIS

The first stage of change was the development of standard processes and tools, based on lean thinking, which defined how tasks within the phases of the integrated solutions lifecycle

should be carried out in order that they would add value, as defined by the customer (refer to Chapter 4.5). These processes and tools – the company management system - have become an embedded part of the company and ‘The Shepherd Way’, the collective name for those tools and processes, has become everyday parlance in the organisation. That ‘The Shepherd Way’ has endured for three years despite various organisational re-structures and five CEOs is testament to how embedded it has become within the business – this is backed up by audit compliance scores from across the business. Given that ‘The Shepherd Way’ contains processes and tools that inform the strategic engagement and value proposition (work winning) phases and systems integration (project delivery) phase of the integrated solutions lifecycle (as described by Figure 4.3), the contribution of this aspect of the research project to integrated solutions provision is that it has provided the foundation for repeatability of those phases, and a basis on which the business can continually improve. Table 4.8, and the associated discussion in Chapter 4.6.1, shows the resulting quantitative improvements in business performance. Recent new starters at senior level in the business report that they are impressed with ‘The Shepherd Way’, saying it is more detailed and encompassing than processes at their previous, comparable organisations.

The second stage of change was the development of the operational framework for service delivery and service delivery plan which were aimed at enabling the value proposition agreed with the client to flow through the phases of the integrated solutions lifecycle. Previous projects had seen a marked loss in customer relationship/satisfaction at key handover points in the project lifecycle which was evidence of a disruption to the flow of understanding of the agreed value proposition by the team (refer back to Figure 4.8). Customer feedback from the project where the operational framework for service delivery and service delivery plan have been implemented shows a high level of customer satisfaction, with the customer stating that “the personal and professional feeling from the SCL team has given them a secure feeling

throughout the project duration.” The fact customer satisfaction has been achieved ‘throughout’ the project lifecycle, including the handover points where historically an understanding of the customer’s value proposition was lost, shows that the framework and service delivery plan have enabled flow of the agreed value proposition across the phases of the integrated solutions lifecycle and supports the research question (research question 3) that creating flow across the phases of the integrated solutions lifecycle enables the P-S transition.

A best practice sharing session delivered by managers working on this project also highlighted how collaboration with the other group companies working on the project has been improved. Shared construction programmes, information required schedules and monthly reporting has been implemented, with the result now being that, since the project is in commissioning phase, the sister company SES (a mechanical and electrical sub-contractor) are leading progress meetings with the client in the absence of SCL, such is the level of trust and ‘one-team’ culture that has been created. In addition, the project is currently on programme and predicted to make a profit margin higher than forecast.

The terminology ‘service’ delivery plan has also been enthusiastically adopted by senior management as a means of emphasising the desire to become more customer focused and solutions driven.

The assessment of whether this research has differentiated the business as an integrated solutions provider in the marketplace should ultimately be assessed by the customer’s perception of the business. A brand audit undertaken by a third party organisation on behalf of the company has provided an independent means of assessing how the business is perceived in the marketplace. The brand audit included interviews with employees and clients. The findings show that the company has “differentiating attributes like: a burgeoning reputation for being a solutions provider,” and that while the “construction and engineering

industry is characterised by unhelpful attitudes” the company is “breaking the habits” (Radley Yeldar, 2013). The feedback from the brand audit suggests that the research has contributed to differentiating the company as an integrated solutions provider in the marketplace, but refers to the organisational barriers, also uncovered in this research (refer to Chapter 4.6.3.3) that the company must be wary of (for example the organisational silos) and continue to work to overcome. Continued application of the practices developed by this research will enable the products-to-service transition, that has been shown to have commenced, to progress.

4.10.2 THEORETICAL ANALYSIS

In addition to the contribution of this project to the business, the project has also contributed to the theoretical debate concerning the products-to-service transition signified by the presentation of the appended papers in international, peer-reviewed conferences and journals. The research design used the existing theoretical models and characteristics of solutions provision, primarily developed in the manufacturing and service sectors, as a baseline for defining the desired future state. Through the action research implemented it can be seen that application of these existing theories is problematic in a construction context – which has led to the development of the practices described in this thesis - and that the existing models do not account for these problems.

Current theoretical models described the phases of the integrated solutions lifecycle, however they did not account for the transactions *between* those stages and the importance of creating flow so that information learned at one phase would pass to the next. The fact that people allocated to the project change as the phases progress makes this flow critical. The importance of providing feedback to previous phases in the lifecycle is also omitted from current models. The integrated solutions lifecycle proposed by Davies & Hobday (2005) and included in Brady et al. (2005a) is too linear, with only outputs from the operational service

phase being seen to be an input into the next project. In reality, especially given the duration of projects, feedback loops are required between each phase. Dialogue is constantly required between teams to promote the flow of information and ensure learning is quickly embedded into all phases of future projects. This dialogue and feedback must include the client. As such, Figure 4.17 shows amendments to the initial model used as the benchmark for this research.

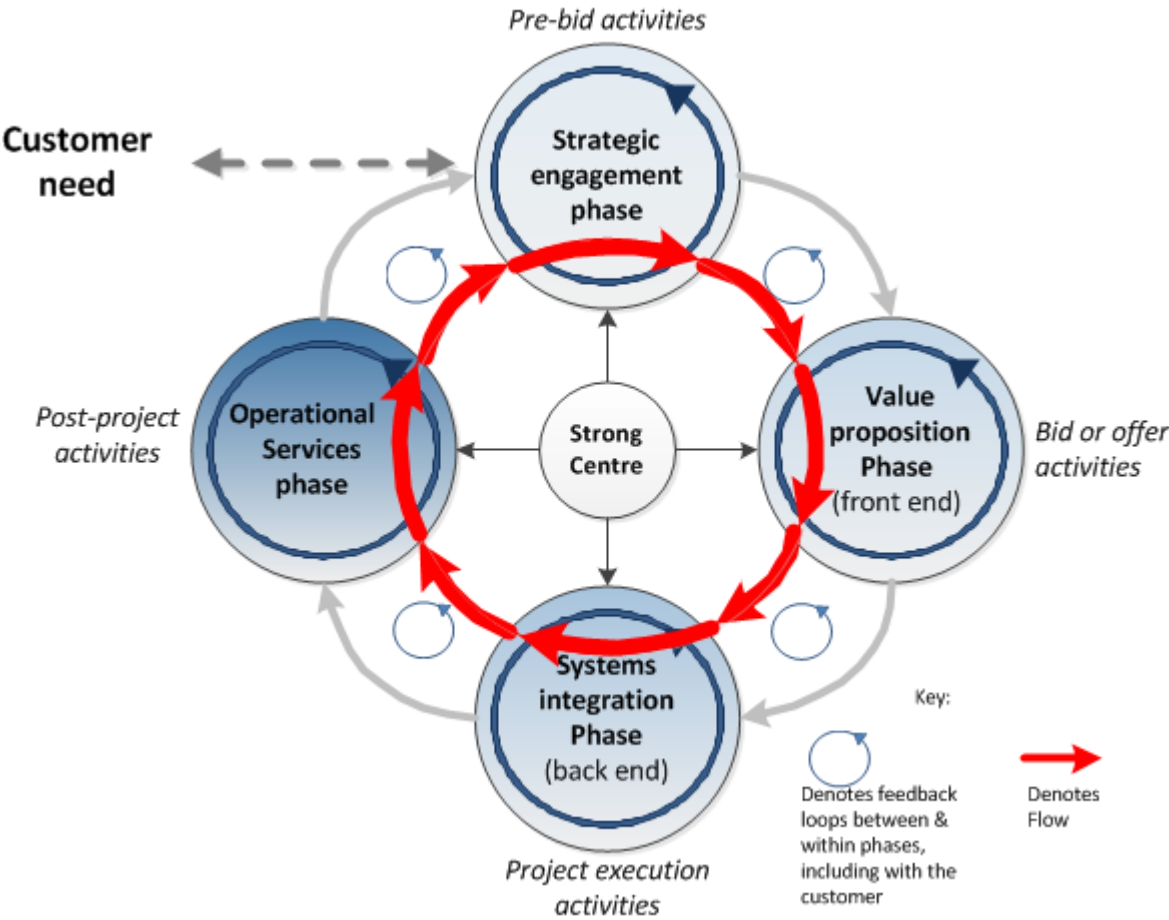


Figure 4.17 Hybrid integrated solutions lifecycle model

The need for flow, along with feedback loops, is shown within and between each phase of the lifecycle. As the business delivers more and more solutions in this way it is expected that the strong centre will no longer need to be so strong, as the culture of integrated solutions provision and customer focus will have become embedded in the culture of everyone

involved, supported by processes and organisational structure that promote continuous improvement and learning.

In addition to the above model, the service provider maturity assessment (refer to Appendix G) is a further contribution to theory as well as being a tool that can be implemented in practice. The existing literature has been translated into a construction context, using the case study organisation as a guide, and the learning from the research has been incorporated into the maturity assessment criteria resulting in a theoretical foundation for solutions provision against which others can assess themselves. While current literature makes vague suggestions (Johnstone et al., 2008) as to what organisational aspects need to be addressed, the maturity assessment criteria define these to a level of detail that can be understood, assessed and then acted upon. For example, existing literature states that rewards need to be aligned to the strategy of solutions provision, whilst the maturity assessment describes specifically that in an organisation that wants to provide solutions, front end and back end teams both need to be rewarded based on client satisfaction measures that are assessed post occupancy. This is in contrast to only back end teams being rewarded for achieving practical completion (PC) which would likely be seen in an organisation that was a product manufacturer or systems integrator and which is the currently still the case in the sponsor organisation.

4.10.3 CHAPTER SUMMARY

The group vision, and vision for the company, Shepherd Construction Ltd, was to become a ‘true’ integrated solutions provider, meaning that it wanted to fully embrace the characteristics of integrated solutions provision rather than just implementing a veneer through rhetoric and sales pitches. The fact that the practices developed through this research – the standard processes and tools, operational framework for service delivery, service delivery plan and service provider maturity assessment – have all been implemented on live

projects, and have been shown, quantitatively and qualitatively, to have contributed to achieving aspects of integrated solutions provision, shows the contribution of this research project to the vision. Nevertheless, it also acknowledges that the company is still on the P-S journey and that there is still much to do to extract maximum value from the company and group's potential offering as will be discussed in Chapter 5.

5 FINDINGS & IMPLICATIONS

This final chapter summarises the key findings of the research, the contribution of this project to existing theory and practice, and the implications and impact on the sponsor organisation and wider industry. A critical evaluation of the research is then presented followed by recommendations for future work in the sponsor organisation. The chapter concludes with recommendations for future research.

5.1 THE KEY FINDINGS OF THE RESEARCH

The overarching aim of this research project was to develop practices to enable SCL to consistently deliver high value integrated solutions, and in doing so provide a basis for the wider group vision of the operating companies working together to pool their expertise and deliver a service offering unique in the industry. Five objectives were defined to achieve this aim, and these objectives have been met through completion of the research process presented in Figure 3.3 and as described throughout Chapter 4. The resulting practices developed, which have been shown to have enabled consistent delivery of integrated solutions are:

- The standard work winning and project delivery processes and tools (9 processes and 102 tools) that have been embedded into the company management system, known as ‘The Shepherd Way’. (A schematic of the whole company management system, including these processes and tools, along with company policies and other management system documents is included in Appendix I.)
- The ‘operational framework for service delivery’ (refer to Figures 4.11 and 4.12)
- The ‘service delivery plan’ (refer to Appendix H)
- The ‘service provider maturity assessment’ (refer to Appendix G)

In addition to the aim and underpinning objectives, a number of research questions were posed. Some questions were asked at the start of the project, while others emerged as the research progressed.

The key finding of this research is that lean thinking has a role to play in the enactment of product-to-service transitions – research question 1. Standard processes and tools (The Shepherd Way), based on lean thinking, were designed and implemented and resulted in improved and more consistent performance in the phases of the integrated solutions lifecycle, satisfying research question 2. Having achieved consistency in delivery of the phases of the integrated solutions lifecycle, the question of whether creating flow through and between the phases (research question 3) was then investigated and confirmed through the development and implementation of practices (the operational framework for service delivery and service delivery plan) that enabled information relating to the customer's value proposition to be identified, documented and shared across all parties involved, throughout the integrated solutions lifecycle. Flow of information, across all parties and all phases of the integrated solutions value stream, has been shown to be necessary for successful integrated solutions provision, and therefore the creation of flow enables the company to transition from being a product to an integrated solutions provider. The application of lean thinking to the P-S transition, and the fact that the company adapted lean to suit its own needs, answered research question 4, providing evidence that there is not a one-size fits all approach to the implementation of lean.

The research also identified a need for assessing/benchmarking the maturity of an organisation throughout its P-S transition, answering research question 5. The action research cycle, based on planned change, required that the desired future state of integrated solutions provision be defined, and the current state of the organisation assessed against this definition,

in order that the changes required to move to the future state could be identified. Given that the transition to service provider has not been possible within one action research cycle (two have been undertaken as described in this thesis and it is acknowledged that the transition is not complete) it follows that it is necessary to continually assess the maturity of the organisation throughout the journey in order to define the next steps required. The service provider maturity assessment developed through this research has been used in this way during the project.

Three final research questions emerged during step 6 of the research process when the changes implemented as part of the first action research cycle were being evaluated. The questions (research questions 6, 7 and 8) resulted in the finding that path dependencies impede the implementation of P-S strategies, and that gaining an understanding of these path dependencies will allow future changes to be tailored to account for them or overcome them. Finally, it was found that implementation of practices based on lean thinking could enable path dependencies to be overcome, thereby enabling the products-to-service transition.

These findings have been reported in refereed conference and journal papers (refer to Table 3.1 and Appendices K-N). A further paper is also being written which is a development of the ARCOM paper (Paper 1, Appendix K), and proposes lean thinking as a means of overcoming the issues faced by an organisation attempting to make the P-S transition. An abstract for this paper, which it is anticipated will be submitted to Construction Management and Economics journal, is included in Appendix J.

5.2 CONTRIBUTION TO EXISTING THEORY AND PRACTICE

Johnstone et al. state that “the change and transition required of P-S is largely portrayed as unproblematic and uncontested within the existing literature” and that “in order to advance the debate there is a real need for more empirically informed and critical debates around the

meaning, operationalization and implementation of current P-S strategies” (2009, p.524 & p.535). This research has shown that there isn’t a smooth transition pathway to solutions provision. The organisation has had to identify and overcome cultural barriers to change as well as addressing problems such as inconsistency in performance.

Baines et al. in their literature search into product-service systems find that “a range of methodologies exist for designing PSS, however these tend to lack a critical in-depth evaluation of their performance in practice.” (2007, p.1550). Johnstone et al. (2008) also find that literature concerning enactment of P-S transitions tends to be vague and provide little real guidance. In contrast, this research, in trying to implement current models, has problematised the P-S transition within the construction industry, filling a gap in the existing literature, and in doing so revealing the deficiencies in the existing models, proposing developments to these models through the service provider maturity assessment and hybrid model for integrated solutions (Figure 4.17), and showing that the application of lean thinking provides a theoretical framework to enable the P-S transition.

- The service provider maturity assessment articulates in detail the characteristics of integrated solutions provision in a construction context and has been produced through the process of trying to articulate and implement these characteristics in practice and experiencing the real life problems encountered.
- The hybrid model combines elements from current models and incorporates missing elements, namely flow and feedback loops within and between the phases of the integrated solutions lifecycle.
- Standard processes and tools, based on lean principles, have been shown to provide a basis for consistent and repeatable performance within the phases of the integrated solutions lifecycle.

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- Flow of information relating to the client's value proposition has been shown to be required across all parties, through and between all phases of the integrated solutions lifecycle, in order to ensure that value proposition is realised. The operational framework for service delivery and service delivery plan have been designed to enable flow, with the hybrid model also showing flow being required through and between all phases of the integrated solutions lifecycle.

Baines et al. (2009) suggested that future product-service systems research should include the development of guidance, tools and techniques that practitioners could use to effect the transition. This research has made a practical contribution in this area, having developed and implemented practices within the sponsor organisation that have been shown to have contributed to enabling the characteristics of integrated solutions provision and therefore the P-S transition - namely the standard company management system, the operational framework for service delivery and service delivery plan (all of which were founded on lean thinking) and the service provider maturity assessment.

This research also contributes to the lean construction literature, evidencing the role lean thinking can play in the products-to-service transition. Lean thinking, philosophy and techniques, have been adapted throughout the four year research project to meet the specific aims of the organisation and the organisational path dependencies, showing that lean needs to be defined according to organisational context and should not be considered as a one size fits all approach. Path dependencies have been shown to inhibit the implementation of lean, and therefore the products-to-service transition, and as such the issue of path dependency needs to be considered by organisations when developing their strategies for implementing change.

5.3 IMPLICATIONS/IMPACT ON THE SPONSOR

The implications and impact on the sponsor have been monitored and presented to the senior management team throughout the duration of the research, with management decisions following certain research steps informing the next stage of the research process.

The first output from the research was the standard company management system – ‘The Shepherd Way’- which has been shown to have contributed to improved project delivery performance and work win rate (recall Table 4.8), tangible measures of the strategic engagement/value proposition and systems integration phases of the integrated solutions lifecycle. This has now become the standard way of working and is used on all projects and monitored for compliance through management checks and audits by internal and external parties. The fact that ‘The Shepherd Way’ is a term used by people across the company day in and day out shows the impact it has had and how embedded it has become. People from across the company also now suggest improvements to The Shepherd Way, showing that it has become the foundation for continuous improvement and employee engagement. The company must ensure it responds to these suggestions in order to sustain people’s engagement.

Following development of ‘The Shepherd Way’, the operational framework for service delivery and the resulting service delivery plan have provided a means of creating flow between the phases of the integrated solutions lifecycle, turning the focus onto what is of value to the client and ensuring that it is understood throughout all phases of the project and all parties involved. Client feedback on the project where this approach has been used evidences the benefits of these practices and their contribution to the company’s desire to become more customer-focused and deliver solutions. The service delivery plan and underpinning framework are currently being rolled out across the business as new projects

commence. This implementation will have implications for resource management, organisational structure and individual capabilities that will need to be resolved as each project comes on line. The researcher will be required to work with the project teams to support them in the development of their service delivery plans, with senior management being required to address resource issues and HR to support in the provision of individual training requirements. Audit checklists and management checks will also be updated to ensure they include monitoring of this new practice.

The service delivery plan and operational framework for service delivery should also provide a means for engaging with other group companies, thereby promoting the Shepherd Group vision of solutions provision. Projects where a number of group companies are involved should be encouraged to use the framework to develop a holistic approach to managing the project, rather than each company in the group using their own processes and ways of working, which leads to duplication and opportunities for error since information is passed from one company to another rather than shared from a single source. Use of the operational framework for service delivery and service delivery plan would allow the identification of common practices, for example a shared programme, a shared cost plan, which would in turn promote the desired culture of collaboration and result in a better flow of value for the customer. Implementation of this will require direction and support at group level so that the silo thinking between group companies can be broken down and the benefit to group as a whole can be considered more important than maximisation of individual company performance. Achievement of this will require the leaders of individual companies to be directed towards different measures of success, i.e. group performance not the individual performance of their own companies, with accounting systems needing to be put in place to enable this approach.

The implementation of feedback loops, as identified by the proposed hybrid model (Figure 4.17) is also essential to the future success of delivering solutions. Sharing learning across all phases of the integrated solutions lifecycle will create a flow of common understanding as well as providing the business with information on which it can develop further solutions. Alignment of the company's BIM implementation plan to this work is essential.

The service provider maturity assessment produced, and scored by some senior managers, proved a useful tool to engage top management in the organisational aspects that need to be addressed to promote the transition to solutions provision – for example rewards systems, accounting practices, FM engagement. Senior management now need to tackle these issues; lack of resolution will mean project teams can only progress so far until these organisational concerns, outside of their control, impact on how they manage projects and how they behave. For example, rewards systems that reward only the back end teams and pay out at practical completion (PC) promote a culture that is at odds with a business that wants to become more customer focused and solutions led.

Arguably, competitive advantage has been gained through the practices/processes developed through this research. The competitive advantage of a firm is seen as being a combination of its managerial and organisational processes (routines), its asset position (its technology, customer base, relationships, etc.) and the paths that are available to it, which in turn are dependent on the paths already taken (Teece et al., 1997). This research has created new routines that, if repeated through more trial projects (Brady et al. 2005b) can be learned and reinforced over time to provide the organisation with a competitive advantage. As more projects follow the integrated solutions lifecycle proposed in this research, with feedback loops being implemented between all phases, the transactional bonds will become stronger and stronger as the organisation learns through working together. As the corporate memory

of the organisation gradually changes, the need for a strong centre will reduce as the culture of solutions provision is enacted day in day out by the people in the organisation.

5.4 IMPLICATIONS/IMPACT ON WIDER INDUSTRY

Although this research has been carried out within a single organisation many of the methods, findings and practices produced can be transferred and applied to wider industry.

The path dependency study, described in Chapter 4.6.3, could be undertaken by any business looking to undergo change as a diagnostic tool to understand the organisational barriers to change and allow change programmes to be tailored to overcome or capitalise on the path dependencies.

Development of standard processes and tools described in Chapter 4.5 has been shown to produce improved performance in the phases of the integrated solutions lifecycle. The process undertaken to develop the company's processes and tools, if not some of the tools themselves, could be applied within other organisations to aid the P-S transition, or just to provide a stable baseline for business performance from which improvements can then be made.

The service provider maturity assessment (refer to Appendix G), developed as a synthesis of existing literature and models and incorporating the learning from this research project, is a diagnostic tool that can be used by other organisations to assess their own level of maturity with respect to integrated solutions provision, and in doing so identify areas to tackle to enable their transition to providing solutions.

Similarly, other contracting organisations looking to make the P-S transition could pick up the template version of the operational framework for service delivery and the service delivery plan template (refer to Figures 4.11 and Appendix H) and follow the logic of the approach, tailoring it to meet their specific business needs, systems and processes. In addition they

could use the ‘best practice’ version (refer to Figure 4.12) to understand what has worked well in another organisation and embed that learning into theirs.

Lastly, given that the practices developed through this research – the standard processes and tools, the operational framework for service delivery and service delivery plan – have been based on lean thinking and have been shown to enable the P-S transition by creating flow through the integrated solutions value stream, it follows that other organisations can also apply lean thinking as a means of enacting their P-S journey.

5.5 CRITICAL EVALUATION OF THE RESEARCH

It is acknowledged that a common concern about case studies, particularly those based on a single case, is that they provide little basis for scientific generalisation. However, as Yin (2009) states, the same can be said about generalising from a single experiment. Rather than treating a single case study as a ‘sample’ size of one that can be statistically generalised, Yin (2009) describes the goal of cases studies is the production of general theories. Given that the case study organisation in which this research was undertaken can arguably be considered to be typical of other main-contracting organisations in the construction sector – as they experience similar/same market conditions, procurement routes, clients, governing bodies, skills requirements - and the fact that half of the top twenty UK construction companies state they have a desire to provide solutions, it follows that the theories and practices developed can reasonably be assumed to be applicable and relevant to these other organisations, even though their specific path dependencies might be different. Ultimately though, this can only be confirmed by further applying the theories and practices developed here to other cases.

Throughout the research project, the sponsor company has undergone two major organisational re-structures and been led by five Chief Executive Officers. The resulting changes in strategic intent and company priorities, along with the views and style of top

management, have therefore influenced the aims and design of the research project. That the research design and aims have adapted to the company's needs should, the author believes, be seen as positive, particularly since the Engineering Doctorate is specifically designed to address the problems faced by industry. These changes undoubtedly impacted on the company in terms of its performance and people, making it more difficult to quantitatively assess the impact of the planned changes arising from this research, i.e. were changes in quantitative performance due to the planned changes arising from this research or the organisational changes? The choice of an abductive approach, drawing on the meanings and experiences of those in the company, was therefore appropriate, with the range of qualitative methods providing multiple sources of evidence that pointed to the same issues, thereby providing construct validity. Despite the changes in the company that occurred outside of the research process, the qualitative feedback evidences the success of the practices developed, justifying the research journey being directed by the company's needs and evidencing that the changes brought about by the research have been significant enough to prevail and endure during a challenging time for the company.

The researcher acknowledges that her background in the application of lean thinking in other organisations, notably as a lean consultant with CLIP, and her position in the sponsor organisation as a senior manager, had the potential to bias the research process. In order to ensure objectivity, regular meetings were held with academic supervisors who challenged the research process and specifically the decisions being taken in order to check they were not dictated by the researcher's sphere of influence in the company. Investigating the propositions and gaining approval to implement the resulting practices often required the researcher to gain buy-in from senior managers, with justification having to be based on more than the researcher thinking it was a good idea. Ideas and approaches were also discussed and debated with senior managers and operational personnel in the company, each of whom

contributed their own ideas and experiences – this also helped to ensure internal validity as opinions and meanings could be corroborated or challenged. Exposing the ideas generated and investigated through this research at industry workshops and conferences, and through refereed journal and conference papers, also provided a critical audience, external to the sponsor organisation, from both industry and academic backgrounds. These external influences and opportunities for learning provided a means of calibrating and benchmarking the research, ensuring internal influences – such as the researcher or organisational issues – did not cloud objectivity.

5.6 RECOMMENDATIONS FOR THE SPONSOR ORGANISATION

For the sponsor organisation, the operational framework for service delivery, the service delivery plan and the standard tools and processes which it draws together have provided a foundation for integrated solutions provision. However, within SCL, and the wider group, more work now needs to be done to tackle the organisational issues identified via the maturity assessment. For example, organisational structures and lines of reporting do not enable the resource profile suggested by the framework, i.e. early integration of FM resource and a single point of contact from the front end team with the client throughout the lifecycle of the project, which in turn would also help improve collation and sharing of best practice by that point of contact who would become a sector expert. The reward system should also be re-designed to ensure that emphasis is on achievement of the customer's requirements and not just achievement of a date in time, i.e. PC, and should equally reward front end as well as the back end teams, in doing so increasing the level of accountability of the front end team. Where businesses in the group work together, a shared service delivery plan should be developed, with parties collaboratively working through the framework to determine how the service should be achieved. There have been initial successes in this area, with group

companies working on the same project having shared construction programmes, information required schedules and management review meetings. Extending this approach to a shared profit and loss account would further collaboration and focus on the customer, rather than the current focus of maximising an individual company profit to the detriment of the whole project.

The operational framework for service delivery should be developed further with regard to the work winning stage, where the value proposition to be delivered is developed. Tools and mechanisms to improve the development, negotiation and documentation of the customer's definition of value need to be developed such that the agreed value proposition to be delivered is clearly defined and therefore measurable. This recommendation acknowledges "the change of emphasis towards customer-centric rather than product-centric thinking has major implications for the kind of activities that need to take place in the project life-cycle, particularly at the early stages (Brady et al., 2005a, p.363).

There is also scope for the FM business to be integrated into the team at work winning stage so that they can provide expertise on building performance and FM requirements. Improved information in this area, based on out-turn information from buildings in use, should be used to influence the design of the solution as well as ensuring earlier consideration of what the client needs in these areas.

A means of capturing, storing and accessing information, not only with regard to FM data but with regard to all aspects of the project lifecycle – for example cost information, programme information, client information, client post occupancy feedback – is therefore required to underpin this approach. Creation of an enterprise content management system (ECM), which is aligned with the BIM implementation plan, is necessary to provide the basis for the data and measures that can then be used to enable the development of solutions and continually

assess progress of the company's P-S transition. ECM strategies consider how an organisation stores, categories and accesses information, pertaining to all aspects of the organisation and their products, such that it can be accessed and used in day-to-day business decision making, product development and business improvement.

Feedback loops and best practice sharing between and within projects also need to be implemented, with information gained from these feeding into the ECM system. The ability to factor in the learning from previous projects into future solutions then needs to be developed such that estimating can confidently make price adjustments based on improved productivity, build-ability and lifecycle costs to achieve competitive advantage.

The company should also implement regular post occupancy reviews with the customer, as well as commencing post occupancy data capture in order to assess performance of the asset with respect to the agreed value proposition and customer targets.

5.7 RECOMMENDATIONS FOR INDUSTRY/FURTHER RESEARCH

This research has described how the application of lean thinking in the case study organisation has enabled the P-S journey. However, as evidenced by the recommendations for the sponsor organisation and the feedback on the changes implemented, the P-S journey is not yet complete and there are areas of further research that should be carried out.

While lean thinking has been shown to enable the P-S journey in the case study company, the approach taken as described in this thesis responded to the specific needs of the company and their current state position with regard to integrated solutions provision. It should therefore be investigated as to whether lean thinking is only an element of the overall P-S journey, in which case other approaches to enact the P-S strategy need to be defined, or a means of enacting the whole journey.

Similarly, the relative importance of each of the characteristics of integrated solutions provision – business consultancy, systems integration, operational service and financing (Davies et al., 2001; Davies, 2004; Brady et al., 2005b) and creating a strong centre (Foote et al., 2001) – ought to be investigated along with the priority in which they should be addressed. In this case, attention was given to the systems integration and value proposition (which incorporates business consultancy) aspects of the integrated solutions lifecycle in response to the case study company's poor performance in these areas which was detrimentally impacting their business performance. This raises the research question as to whether a range of P-S approaches, giving priority to different characteristics, need to be developed in order to respond to the specific current state of the organisation that is embarking on the P-S transition. Use of the service provider maturity assessment in other organisations could help identify these priorities and the resulting approaches to enact the P-S transition.

These priorities could lead to research concerning further definition of and metrics associated with the 'strong centre'. Not only for example in terms of the development of appropriate rewards systems, mechanisms to mediate between front-end and back-end teams with regard to resource, and the setting up of shared profit and loss accounts (project bank accounts), but in questioning whether 'strong centre' includes cultural aspects such as the firm's values, brand, behaviours and leadership style. Whether/what role these cultural aspects have on the P-S transition should be answered, resulting in consideration of how P-S theories can encompass them.

Whilst SCL and the group are looking to become integrated solutions providers, it is not the case that the company wants to transition irreversibly from product provider to service manufacturer. The company will need to operate concurrently in a number of states,

potentially depending on the client and their requirements, market conditions and willingness of the group to provide financial investment. In other words, sometimes SCL will need to operate as a systems integrator, sometimes a product manufacturer and sometimes as an integrated solutions provider. The research question as to whether an organisation can operate in more than one state at any one time needs to be answered, along with how much of the organisation to dedicate to each state at any one time, how to decide the balance between operating modes (what criteria would it depend upon – client, prospective forward workload?) and how the organisation could become agile enough to operate, concurrently, in a range of states with regard to processes, people, systems and organisational structure. The impact of path dependencies would need to be considered; for example is path departure required – for example the creation of a whole new business that has different ways of working - and if so, how can the positive aspects of the company history not be lost.

Quantitative measures have been used throughout this thesis to support the qualitative data as a means of evidencing and assessing the impact of changes made. Typically the company prefers the use of quantitative measures for monitoring and evaluating performance. More research could be done to develop useable, business metrics and targets to measure a business' success in delivering solutions, with emphasis on the customer's assessment of the company and how to measure the 'strong centre' and the associated activities that it needs to control – for example resources (numbers and allocation with regard to the phases of the integrated solutions lifecycle), reward systems and mediating between front end and back end teams.

Since provision of integrated solutions relies heavily on the supply chain, the impact on the supply chain needs to be investigated. The operational framework for service delivery includes, for example, collaborative meetings and approaches to working together that supply

chain are involved with and need to buy into. The impact on supply chain partners working with solutions providers should be understood, along with whether/how supply chain organisations themselves need to change in order to be able to work with integrated solutions providers.

Consideration should be given as to whether there are specific people capabilities that are required for integrated solutions provision, how these can be defined so that they can be articulated and assessed, and how to embed them into the organisation, taking into account the impact that training/new starters/acquisitions have on the operation and culture of the business.

Finally, for the integrated solutions provider, the paradox of developing bespoke solutions for each client versus creating standard offerings that can be picked to create a client specific package, potentially giving economies of scale for the provider, warrants research, especially given that client's obtaining competitive advantage by working with integrated solutions providers, rather than traditional contractors, is still an assumption that needs to be proven.

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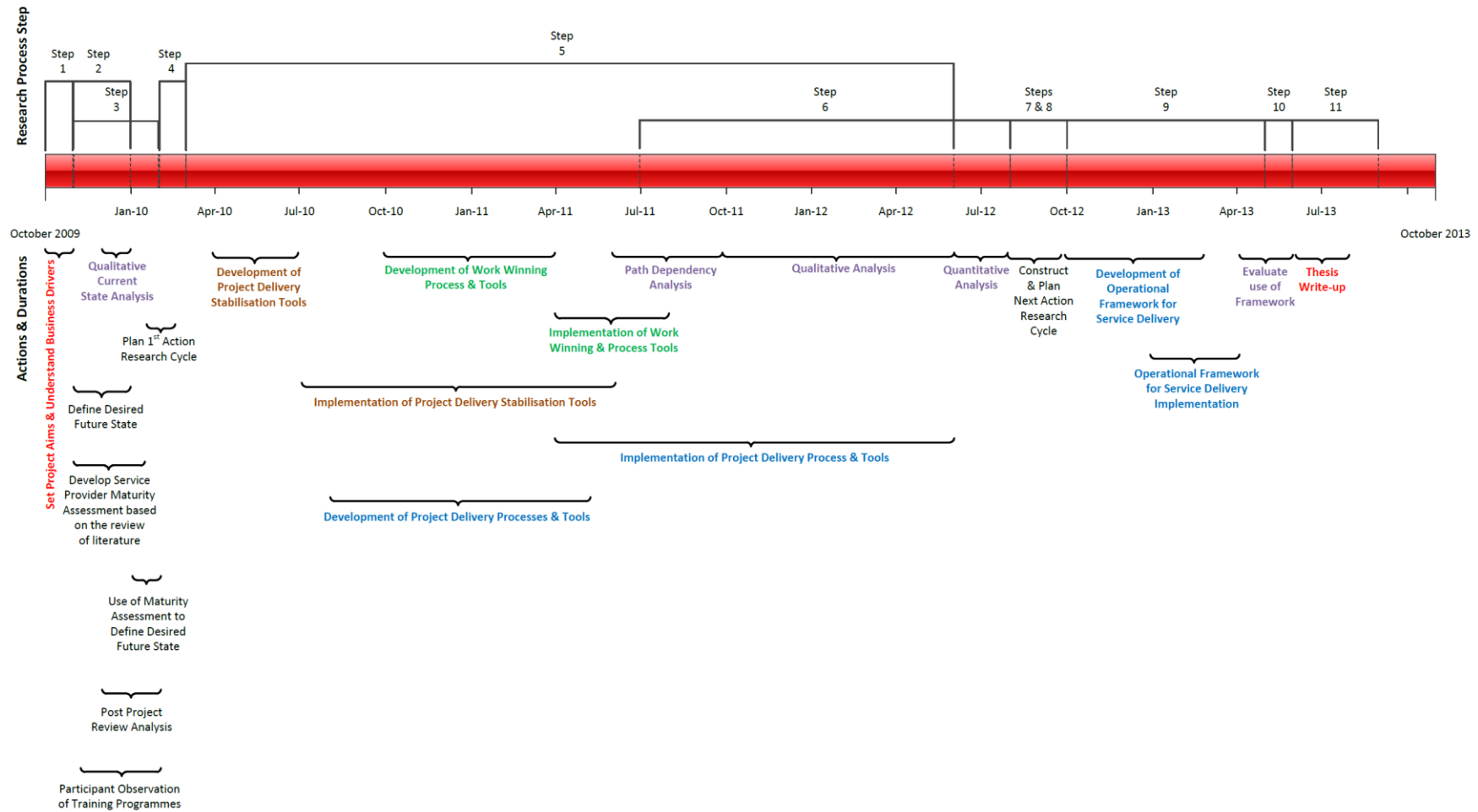
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APPENDIX A TIMELINE OF ACTIVITIES IN RELATION TO RESEARCH PROCESS STEPS



APPENDIX B SOLUTIONS PROVIDER CHARACTERISTICS FROM THE LITERATURE

Characteristics/ requirements for solutions provision	Reference	Means to create the characteristics required as stated in the literature	Barriers/issues with regard to that characteristic as identified in the literature
Build value propositions for customer outcomes	Foote et al., 2001(see “Model for strong solutions”)	Start by understanding customers desired outcomes Need new skills in order to understand all aspects of the value proposition and the customer’s business	There are barriers to what value can be delivered by product alone
Include strange bedfellows	Foote et al., 2001(see “Model for strong solutions”)	Engage with third part experts and competitors Need to develop new market knowledge Need new customer relationships Need to share financial information Need to share design information Need to share feedback and openly challenge and criticise performance Need to accept shifts in strategic relationships	Protecting brand integrity and engaging with external parties when used to being self sufficient
Choose your customers	Foote et al., 2001(see “Model for strong solutions”)	Find customers with no existing loyalties and who are open to partnerships Find customers who are looking to use others to manage non-core aspects of their business Develop new networks Need to keep capabilities ahead of clients Might have to walk away from (existing) customers who no longer fit with the business	Best customers for solutions might not be the same as existing customers – might be uncomfortable stepping outside existing networks
Guarantee delivered value	Foote et al., 2001(see “Model for strong solutions”)	Offer a guarantee with the solution Assume risks normally borne by the customer Develop capabilities to understand the customer’s requirements and offer the right guarantee & back up service	Risk are normally borne by the customer

Characteristics/ requirements for solutions provision	Reference	Means to create the characteristics required as stated in the literature	Barriers/issues with regard to that characteristic as identified in the literature
Form strong front end solutions units	Foote et al., 2001 (see “Model for strong solutions”)	Give front end units P&L responsibility Front end teams need to be able to source products and services for solutions from the back end and external parties Front end team needs a broad range of skills, including deep understanding of the customers’ business, ability to negotiate Front end teams need to be amorphous – they must reconfigure around individual customer needs	Product business units (back end units) feel they lose their customers and therefore control and power
Refocus the back end	Foote et al., 2001 (see “Model for strong solutions”)	Back end needs to be more flexible so it can cope with competing demands for resources from the front end Need to collaborate on customer account planning and solutions development, including with external suppliers Need to rethink business planning and product development – need to show the front end what new products they are capable of developing and delivering	Back end lose direct control over customer accounts Back end have to compromise over internal margins and pricing
Develop a strong centre	Foote et al., 2001 (see “Model for strong solutions”)	Need a forceful direction for solutions <ul style="list-style-type: none"> - An activist top team made up of people from front & back ends - Designating accounts for solutions - Electing to sell other companies products - Hiring outside talent - Removing employees who resist Need effective links between front and back end Need aligned performance management system and rewards for front and back end alike Need to rotate assignments across front and back end	Accountability is passed back and forth between front end and back end

Characteristics/ requirements for solutions provision	Reference	Means to create the characteristics required as stated in the literature	Barriers/issues with regard to that characteristic as identified in the literature
		<p>units to encourage networking and collaboration so they become custom and practice</p> <p>Make public commitments to becoming a solutions provider that have to be backed up (to drive progress)</p>	
Capability based back end units	Foote et al., 2001 (see “Model for strong solutions”)	<p>Back end serves as internal supplier to solutions (front end) units while selling products directly to customers</p> <p>Standardise, simplify and modularise product lines to be solutions ready</p> <p>Respond with flexibility and openness to demands of front end</p> <p>“Push” and “pull” with front end to tailor products to solutions packages</p> <p>Collaborate on account planning and solutions development, product specifications, sales priorities, and pricing of solutions packages</p>	
Customer based front end units	Foote et al., 2001 (see “Model for strong solutions”)	<p>Develop and deliver integrated solutions</p> <p>Assume profit and loss type responsibility for customers or segments</p> <p>Configure and reconfigure teams around solutions opportunities and delivery</p> <p>Utilise core team and pool of internal and external experts</p> <p>Form alliances with other firms for sourcing products and services for a solution</p>	
Top management strong centre	Foote et al., 2001 (see “Model for strong solutions”)	<p>Lead the drive for solutions</p> <p>Support lateral interaction between front and back end units</p> <p>Manage common account planning process and common performance assessment systems</p> <p>Mediate between front and back end</p>	

Characteristics/ requirements for solutions provision	Reference	Means to create the characteristics required as stated in the literature	Barriers/issues with regard to that characteristic as identified in the literature
		Include leaders from each unit Promote cultivation of rich interpersonal networks Ensure high degree of interdependence and accountability across units Ensure on-going reliance on negotiation and arbitration Ensure flexibility to disaggregate and re-aggregate	
Systems integration	Davies et al., 2001; Davies 2004; Brady et al., 2005.	Capabilities to design and integrate internally and/or externally developed components into a functioning system Develop ability to develop a whole system that integrated sub-systems such that the whole can deliver the outcomes Governance, not just to ensure technical integration but also system compliance and networks of relationships	
Operational service	Davies et al., 2001; Davies 2004; Brady et al., 2005.	Develop ability to maintain, update and operate a system throughout its lifecycle	
Business consulting	Davies et al., 2001; Davies 2004; Brady et al., 2005.	Develop ability to understand a customer's business and offer advice and solutions to meet their business needs	
Financing	Davies et al., 2001; Davies 2004; Brady et al., 2005.	Develop ability to provide assistance in purchasing new systems and in managing their installed asset base	
Ability to develop new approaches to create customer value	Brady et al., 2005 Foote et al., 2001	Involve customers in forming a council/steering group/advisory group	
Ability to build new capabilities	Brady et al., 2005		
Ability to harness learning (to exploit economies of repetition)	Brady et al., 2005		

APPENDIX C IMPLEMENTATION OF THE STANDARD PROCESSES AND TOOLS

The processes and tools developed, as described in Chapter 4.5 were implemented across the company following their development and sign off by senior management. The implementation plan incorporated a range of activities, as shown in Figure 1.

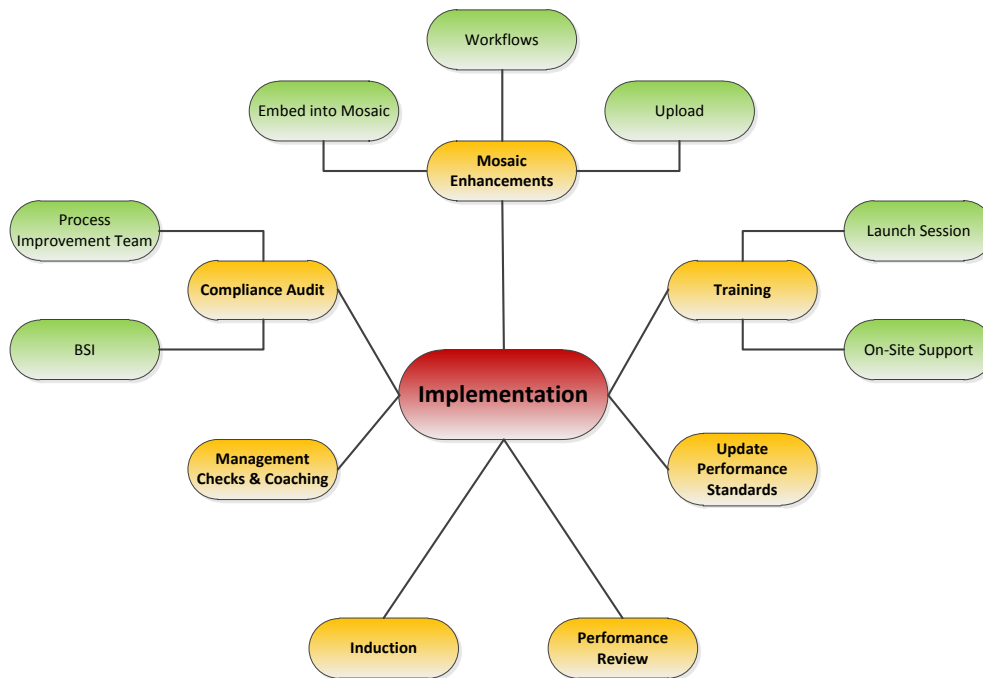


Figure 1 Means of implementing the processes and tools

Training was carried out in the form of launch sessions where groups of people were taken step by step through the processes and tools developed, being shown completed examples and undertaking exercises. Following this, the researcher and her team visited each site periodically, working with them to implement the processes and tools in practice, supporting the site team until they were confident to carry out the tasks alone.

Performance standards were updated in collaboration with the Human Resources (HR) team. These documents outline the purpose and responsibilities for each role in the company, and were updated to reflect and reference the processes and tools developed. Performance reviews, carried out with reference to the performance standards, would then ensure people were assessed with regard to these standard working practices. The induction process was

also updated so that new starters, or people new to role, would be directed to the processes and tools relevant to their role and would work with their line manager to become capable of using them. The ultimate aim was to develop exceptional people as advocated by Toyota Way Principle 10.

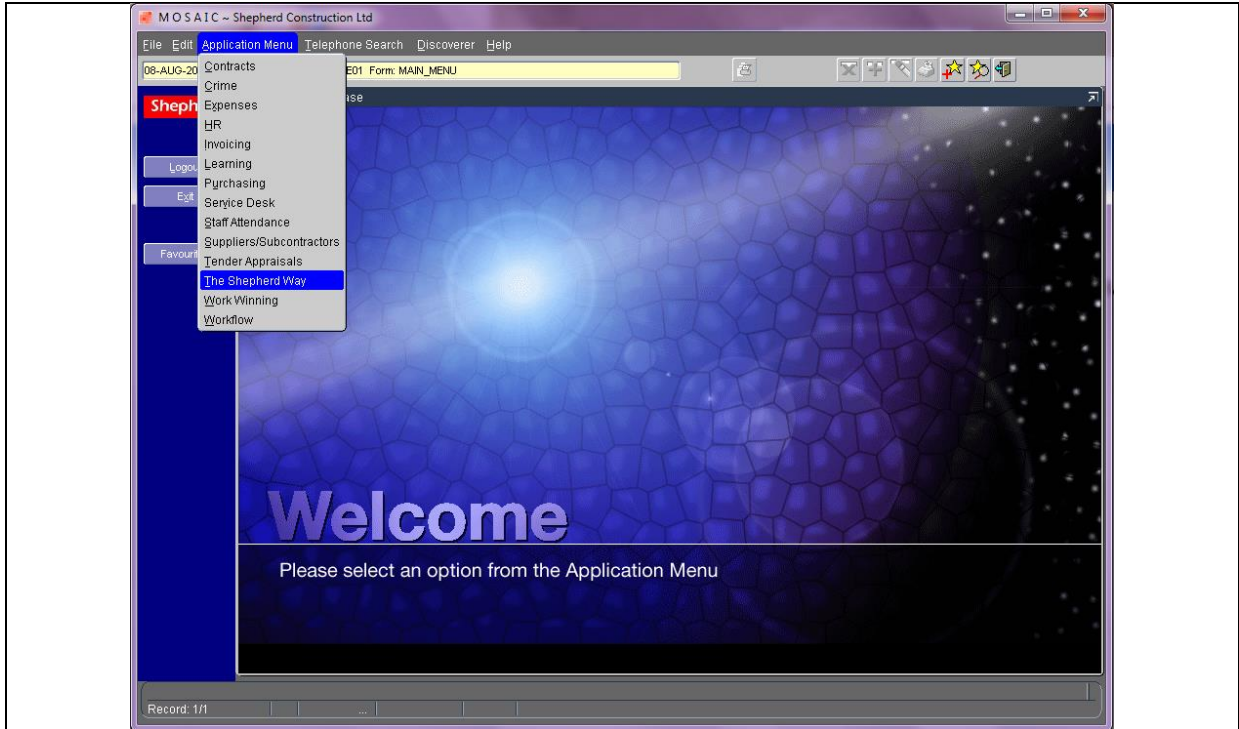
Management checks, which were embedded into the processes, were also implemented to ensure managers were checking that their teams were carrying out their roles in line with the processes and tools developed and Toyota principle 9 which advocates the growth of leaders who understand the work and teach it to others.

Internal audits, carried out by the Process Improvement team, were also instigated. Internal audits are a mandatory requirement of the ISO9001 Quality Management System standard. Previously however, there had been a disconnect between the quality management system documents and what people actually did, with teams filling out documents in preparation for external audits by the BSI but not actually using those documents in practice. The processes and tools developed as part of this activity replaced the old quality management system and became an integral part of the new integrated company management system. Internal and external BSI audits are therefore now checking compliance with these new processes and tools, which are actually being used day in and day out.

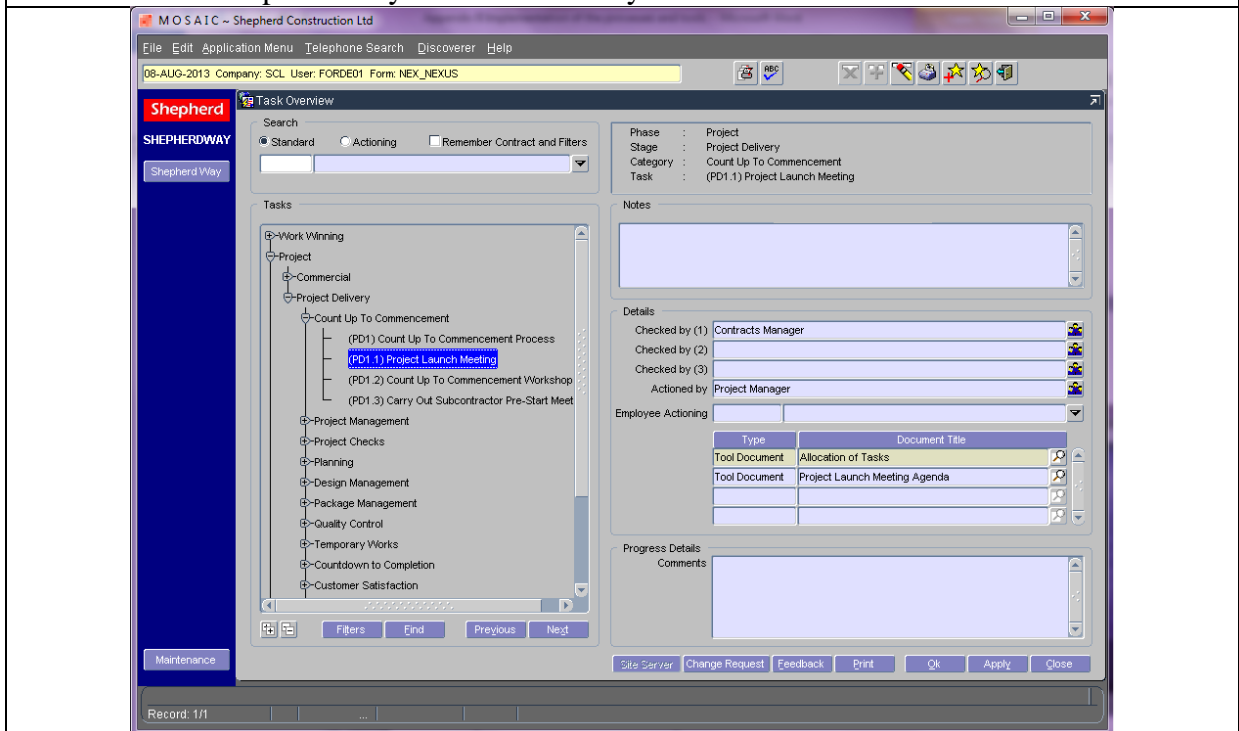
Finally, implementation involved creating a space where everyone in the business could access these processes and tools. Access was given through the Mosaic system, an in-house developed enterprise requirements management (ERP) system, through which activities such as invoicing, purchasing, absence requests, estimating and work winning are carried out. Since Mosaic was an established system in the company it was deemed to follow Toyota principle 8 of using only reliable, thoroughly tested technology. A new area of Mosaic was developed, called 'The Shepherd Way' and all processes and tools were uploaded to that location so everyone in the company could access them as templates, download them into

project network drives and fill them in to create project specific documents. The method of accessing the processes and tools through the Mosaic system is shown as follows in Table 1 below:

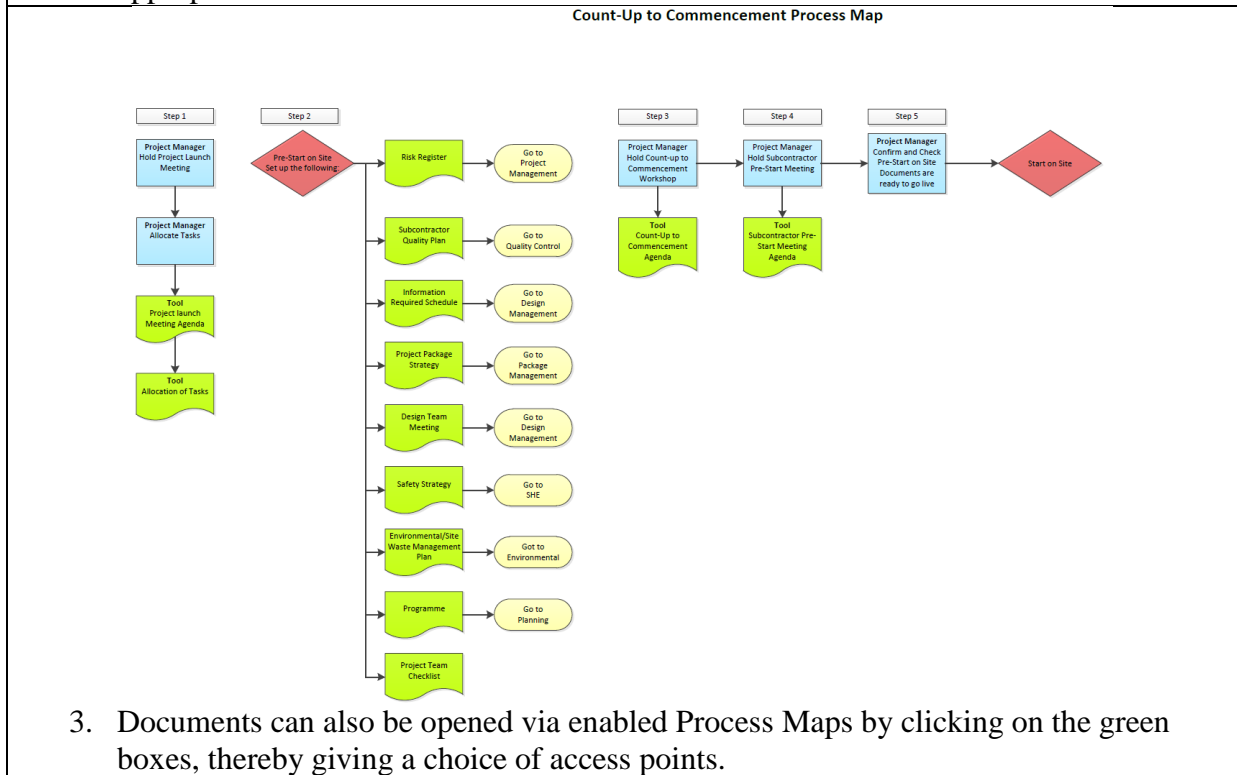
Table 1 Access to process and tools through the Mosaic system



1. Access Shepherd Way via the Mosaic System.



2. Documents can either be opened from the relevant section within the process to which appropriate tool documents are linked as shown on the left hand side of the screen.



3. Documents can also be opened via enabled Process Maps by clicking on the green boxes, thereby giving a choice of access points.

Project Delivery	PROJECT LAUNCH MEETING AGENDA	Shepherd Construction Ltd Quality Management System Accredited with ISO 9001
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CONTRACT NR			
CONTRACT TITLE			
DATE		TIME	
LOCATION		CHAIRPERSON	

REQUIRED ATTENDEES	
ROLE:	NAME:
Managing Director (MD)	
Construction Director (CD) (arranges and chairs)	
Commercial Director (CoD)	
Contracts Manager (CM)	
Project Manager (PM)	
Build Manager(s) (BM)	
Commercial Manager (CoM)	
Sub-contract Surveyor (SS)	
Lead Planner (LP)	
Lead QS (LQS)	
Other attendees can be invited as required, please add details below:	
e.g. H&S Advisor (HSA)	

Ref	Item	Owner/Presenter
1.0	PROJECT BRIEF / OVERVIEW	
	• The Project – description of building elements and the Site	CM / PM
	• Client	CM / PM
	• Client Objectives (Key Requirements)	CM / PM
	• Design Team (inc. consultants)	CM / PM
2.0	TENDER REVIEW	
	• Contract Value	LQS
	• Consultant Responsibilities	LQS
	• Prelims / Construction Budget	LP/LQS
	• Employers Requirements / Contractors Proposals	LQS
	• Tender Handover	CM / PM
	• Key Tender Decisions	CM / PM
• Tender Documentation / Document Control Format (4Projects, etc)	PM	

4. The same document will be returned whichever route is taken for access.

In addition to uploading the process maps and tools, some elements of process were also enabled through Mosaic. Rather than a tool being created in Microsoft (MS) Word for example, some tools were created as a Mosaic screen, where people would go into that system and input the data into the screen. This then allowed a button to be pressed that would send a workflow to a manager to sign off that request rather than paper copies having to be sent around the business. Figure 3 shows a decision to pursue screen from the work winning process – originally created as an MS Word template, this was created directly in Mosaic so that work winning teams could input information and then send an electronic workflow requesting approval to pursue that bid. Enabling the processes and tools through Mosaic has given an increased level of control and compliance, as well as eliminating waste from the process since lead time to sign off documents is reduced and the process itself is simpler than passing paper around the company.

	DECISION TO PURSUE	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

Word document
embedded into the
Mosaic System

Note: Items identified in grey are for guideline purposes only

FACTS			
Project Details 1			
Project Lead Ref			
Project			
Client			
Contract Value			
Location			
Sector			
Division			
Description 2			
Timescales 3			
OJEU			
PQQ Submission			
PQQ Interview			
Tender Docs Due			
Tender Return			
SOS (inc phasing)			
Completion (ditto)			
Relationships 4			
	Name	Contact	SCL Contact(s)
Client	attach client structure/organogram		Key contacts + velcro map
Project Manager (client)			
PQS			
Architect			
Structural & Civil			
M&E			
Other Consultants			
External Influencers/Others			
Novation Req'ts			

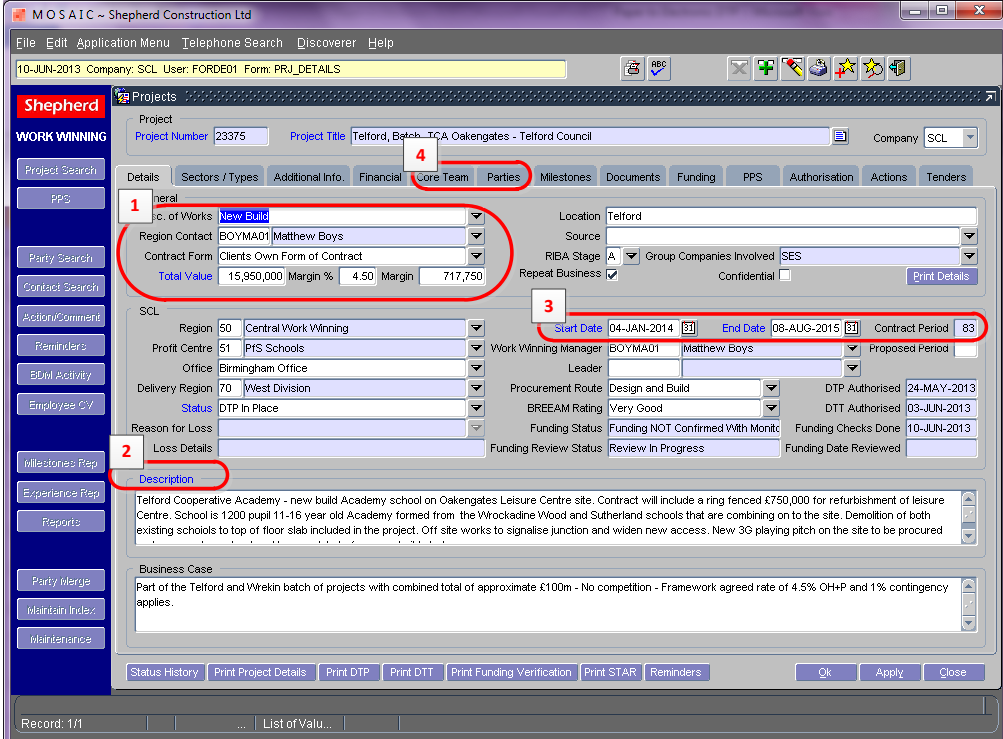
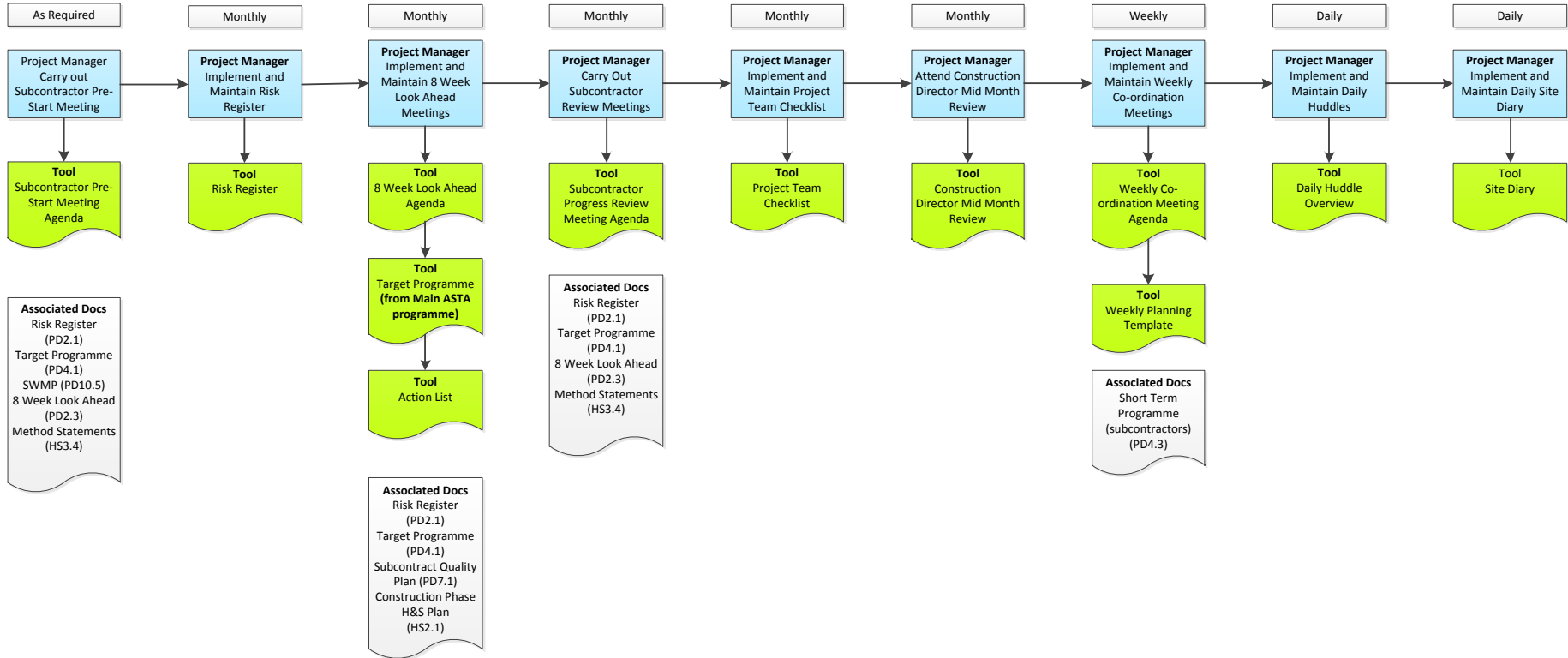


Figure 2 Decision to pursue too transferred from Word document to Mosaic

APPENDIX D STANDARD PROJECT MANAGEMENT PROCESS AND TOOLS

Project Management Process Map



	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

THIS IS NOT A CONTRACTUAL DOCUMENT AND IS WITHOUT PREJUDICE TO SUBCONTRACT TERMS AND CONDITIONS. ANY AGREEMENTS MADE HERE ARE WORKING AGREEMENTS ONLY. HOWEVER, IT DOES CONTAIN REFERENCES TO CONTRACTUAL ITEMS, SUCH AS LEGAL COMPLIANCE.

PROJECT NUMBER			
PROJECT TITLE			
DATE		TIME	
LOCATION		CHAIRPERSON	

REQUIRED ATTENDEES	
ROLE:	NAME:
Project Manager (PM)	
Build Manager(s) (BM)	
Health & Safety Advisor/Facilitator (HSA) (Optional)	
Temporary Works Coordinator (SC) (Optional)	
Design Manager (DM) (Optional)	


Meeting Inputs:

- Risk Register
- Subcontractor Quality Plan
- Construction Phase H&S Plan

1.0 Meeting Details and Management Structure	
Subcontractor	
Works Package	
Venue	
Persons Present	
	DISTRIBUTION: SUBCONTRACTOR/PM/BM/CSA/SC/DM

	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

1.1	SCL Operational Office Details	
	Address	
	Email address	
	Telephone/fax	
1.2	Site Details	
	Address	
	Email address	
	Telephone/fax	
1.3	Subcontractors Details	
	Address	
	Email address	
	Telephone/fax	
1.4	SCL Management Structure	
	Construction Director	
	Project Manager	
	Manager of Site (and title)	
	Project Quantity Surveyor (and title)	
	Project Planning Surveyor (and title)	
1.5	Subcontractor Management Structure	

	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

2.0 Purpose of the Meeting		ACTIONS
2.1	To agree the subcontractor's start date and method of working.	
3.0 Scope of the Works		
3.1		
4.0 Main Contract and Subcontract Conditions		
4.1	Sub-Letting	
	<p>The Subcontractor is reminded that any safety, quality and environmental requirements SCL have of him apply equally to any Sub-Subcontractor or self employed person he employs, and it is his responsibility to manage them effectively, ensuring appropriate and safe methods of work are employed.</p> <p>Under no circumstances will subcontractors sublet works without prior written notice to and approval by SCL.</p> <p>Sub-letting details are:</p>	

	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001


5.0 Drawings and Information		Actions
5.1	Person responsible for design work on this project	
	Name: _____ Position: _____ Qualifications: Experience:	
5.2	Number of drawings required	
	For approval - For issue -	
5.3	Distribution	
	(Include reference to project extranet sites and relevant email addresses).	
5.4	Specification for Subcontract Works	

	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

5.5	Raising of queries/request for information by the Subcontractor	
	<p>Queries and RFI's will be submitted in writing to SCL for the attention of the following:</p> <p>(These will include items regarding design issues).</p>	
5.6	Instructions	
	All instructions will be issued in writing by SCL.	
5.7	Information required from Subcontractor	
5.8	Information required by Subcontractor	

	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001


6.0 Programme		Actions
6.1	Design/Drawing Programme	
	Details of drawings the subcontractor is to produce, when and issue date received by SCL: YES / NO	
6.2	Approval Period	
	The period of approval/comment and re-issue date of drawing by Subcontractor will be:	
6.3	Manufacture/Delivery Programme	
	Details of long manufacture delivery items and duration received by SCL: YES / NO	
6.4	Schedule of Deliveries	
	Schedule of deliveries received by SCL: YES / NO Advice of sizes and weights of large items received: YES / NO Gatehouse must be informed at least 24 hours before delivery	

	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

6.5	Subcontract Works Programme Period (as stated in the subcontract)	
6.6	Sequencing/Co-ordination with other trades (sign offs etc.)	
6.7	Testing and Commissioning Programme Period	
	Provisional dates and durations.	
6.8	Participation in 8 week look ahead meetings.	
	Confirm the person authorised by the subcontractor to participate in the workshop.	
6.9	Participation in weekly co-ordination meeting and daily huddles	
	Confirm the person authorised by the subcontractor to participate in the meetings.	

	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

7.0 Site Management and Administration		Actions
7.1	Subcontractor's Proposed Labour Strengths for Programme Requirements:	
7.2	Subcontractor's Site Personnel	
	Labour details to be supplied to SCL. Subcontractor to maintain a daily record of staff and operatives on site. Subcontractor to submit weekly returns to SCL.	
7.3	Co-ordination	
	Items requiring co-ordination are:	
8.0 Quality		Actions
8.1	Subcontractor Quality Plan	
	Review and amend the relevant Subcontractor Quality Plan, add and amend as required.	
9.0 Safety and CDM		Actions
9.1	Confirm receipt and review of Construction Phase H&S Plan (or relevant parts) YES/NO	
9.2	Person responsible for the health and safety of your works on this project	
	Name: Position: Qualifications: Experience:	

	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

9.3	Person responsible for supervising the safety of your works on this project	
	Name: Position: Qualifications: Experience:	
9.4	Person responsible for safety training, advice and auditing of your works	
	Name: Position: Qualifications: Experience:	
9.5	Site inductions	
	<p>All staff and operatives employed directly or indirectly by your company will be required to attend a site induction. All new starters will be logged having had explained to them the project's specific health and safety, and environmental issues. Printed guidance notes will be issued to attendees.</p> <p><u>Inductions will be held at (time):</u></p> <p>SCL will induct the subcontractor's anticipated labour-force +50%, after which it will charge £25 per person for induction (unless inappropriate). Those observed not to be working safely, and their supervisor, will be required to attend another induction or relevant toolbox talk at £25.</p>	

	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
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9.6	Safety audit frequency	
	Frequency of visits by person named above to perform audits (period between audits must not exceed 1 month – copies to SCL):	
9.7	Safety meetings	
	On site safety consultation meetings will take place once a month minimum. A site-based representative (name of person who will attend) from each subcontractor must attend .	
9.8	CDM safety information	
	Person responsible for that information required for inclusion within the Health and Safety Plan and File for this project (also O&M Manuals):	
9.9	Safety policy and insurance	
	The subcontractor must provide a current copy of his safety policy (signed and dated) and insurance documents.	
9.10	Health and safety training	
	All subcontractors' employees must meet the UKCG requirements for competence, eg. CSCS card registration (further information is available). What additional/specialist training is required for your employees/subcontractors on this project? ie Work @ Height (leading edge alloy towers, Supervisor SMSTS certification etc) Records must be available prior to start on site for all existing skills.	
	The following SCL toolbox talks will be required prior to your works:	
9.11	Risk assessments and method statements	
	The subcontractor is required to submit site specific (generic documents are not acceptable) risk assessments and method statements at least 2 weeks prior to starting for SCL approval (delays will be in breach of contract). These must include hand-arm vibration assessment and monitoring details.	

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9.12	<p>Site Delivery Vehicles</p> <p><u>Deliveries</u></p> <p>All subcontractor deliveries to site must be co-ordinated and carried out in a safe manner. It is the subcontractors responsibility to ensure that;</p> <ol style="list-style-type: none"> 1. All deliveries are planned and co-ordinated with SCL Site Management. 2. Reversing of vehicles is NOT carried out unless there is someone nominated whom is competent to bank such vehicles into position. 3. Delivery drivers must comply with site rules and procedures ie mandatory PPE to be worn at all times (hardhat, gloves, safety footwear and hi-vis) and that speed limits and other relevant signage is adhered to. <p><u>Unloading/Loading</u></p> <p>It is the subcontractors responsibility to ensure that deliveries and pick up of materials which appertain to their works on site are carried out in a safe manner and that work at height is eliminated/mitigated wherever possible.</p> <p>The following safe methods of offloading/loading vehicles on this site will be done by either one, or a combination of the following; (√)</p> <ol style="list-style-type: none"> 1. Fork lift truck <input type="checkbox"/> 2. Alsipercha. <input type="checkbox"/> 3. Hand railed offloading bay. <input type="checkbox"/> 4. Air bags <input type="checkbox"/> 5. Other <input type="checkbox"/> <p>.....</p> <p>.....</p> <p>.....</p>	
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	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
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9.13	PPE	
	<p>All PPE identified by risk assessments will be provided by the subcontractor to all their employees/subcontractors.</p> <p>Safety helmets, gloves, safety footwear with steel mid-soles and high visibility vests are mandatory. SCL will charge £25 for each safety helmet it is required to provide (unless inappropriate).</p>	
9.14	Accident reporting	
	All accidents must be recorded in the site accident book and notified to SCL site management.	
9.15	Safety and environmental performance	
	Poor safety or environmental performance will be communicated to you by means of non-compliance/improvement notices. Any costs incurred by SCL due to poor performance will be contra-charged to you. This may include repeat site inductions or toolbox talks.	

	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
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10.0 Temporary Works	
10.1	Competent Individuals
	<p>Temporary Works Co-ordinator Name: _____</p> <p>Competence Check Completed? _____</p> <p>(refer to Temp Works Process Section 3.0 which lists required competencies) Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>List the named individual's qualifications as TWC</p>
	<p>Temporary Works Supervisor Name: _____</p> <p>Competence Check Completed? _____</p> <p>(refer to Temp Works Process Section 3.0 which lists required competencies) Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>List the named individual's qualifications as TWS</p>
	<p>Temporary Works Supervisor Name: _____</p> <p>Competence Check Completed? _____</p> <p>(refer to Temp Works Process Section 3.0 which lists required competencies) Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>List the named individual's qualifications as TWS</p>
	<p>Temporary Works Supervisor Name: _____</p> <p>Competence Check Completed? _____</p> <p>(refer to Temp Works Process Section 3.0 which lists required competencies) Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>List the named individual's qualifications as TWS</p>

	SUBCONTRACTOR PRE-START MEETING AGENDA	Shepherd Construction Ltd
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10.2	Subcontractor Temporary Works Risk Register review	
	Review and revise the relevant risks and opportunities from the Project Risk Register, add and amend as required.	
11.0	Environment	
11.1	Subcontractor Environmental Plan, Site Waste Management Risk Register review	
	Review and revise the relevant risks and opportunities from the Project Risk Register, add and amend as required.	
12.0	Attendances (as set out in the subcontract)	
12.1	Arrangements/key issues on site	
	Notes on any of the following that require explanation; welfare facilities, power, water, storage, access, security, roads, setting out and datums. Abuse or vandalism of any of these may result in company specific or site wide charges.	
13.0	Notes	
	The charges referred to in this document are intended to act as a deterrent and a penalty, where appropriate to implement, for issues where subcontractors fail to meet certain implicit previously costed responsibilities.	

Project Delivery			Risk Register									Shepherd Construction Ltd Quality Management System Accredited with ISO 9001		
Project Name:			No:			Last Updated:								
Identifying the Key Risk features				Assessing the inherent severity of Key Risks			Identifying what Existing Controls are currently in place		Assessing the residual severity of Key Risks			Determining Actions for Further Mitigation		
Risk Ref	Key Risk/Consequences	Cause(s)	Consequence types	Inherent Impact	Inherent Likelihood	Gross Risk Score	Existing Controls	Residual Impact	Residual Likelihood	Nett Risk Score	Actions for Further Mitigation	Action Owner	Due Date	
Risk Ref	Describe the potential event or scenario and its consequences were it to materialise	Describe the incident or situation that may trigger the Key Risk	See Impact Scoring Tab	1 to 4 (See Scoring Grid)	1 to 4 (See Scoring Grid)		What existing processes/controls are in place to manage the key risk including policies and procedures?	1 to 4 (See Scoring Grid)	1 to 4 (See Scoring Grid)					
				1	1	1		1	1	1				
				1	1	1		1	1	1				
				1	1	1		1	1	1				
				1	1	1		1	1	1				
				1	1	1		1	1	1				
				1	1	1		1	1	1				
				1	1	1		1	1	1				
				1	1	1		1	1	1				
				1	1	1		1	1	1				

Risk Register	
Guidance for Completion	
All possible risks associated with the project should be identified and detailed.	
What to input:	
Identifying Key Risk Features	
Risk Ref	The next number of the risk identified - no rows are to be missed out
Key Risk/Consequences	Describe the potential event or scenario and its consequences were it to materialise
Cause(s)	Describe the incident or situation that may trigger the Key Risk
Assessing the Inherent Severity of Key Risks	
This section records the consequence and likelihood of the identified risk occurring if no controls or mitigating actions were taken.	
Consequence Types	Which area of the business will the potential risk make most impact? R - Reputation F - Finance S/PD - Service/Project Delivery C - Compliance S - Strategy SAF - Safety
Inherent Impact (please refer to the Criteria and Scoring Tab)	What is the consequence to the project/Company of the event occurring? 4 = Catastrophic 3 = High 2 = Medium 1 = Low
Inherent Likelihood (please refer to the Criteria and Scoring Tab)	What is the likelihood to the project/Company of the event occurring? 4 = Almost certain 3 = Likely 2 = Possible 1 = Unlikely
Gross Risk Score	DO NOT FILL - Auto calculation. Risks with a score of 9 must be examined further
Existing Controls	What existing processes/controls are in place to manage the Key Risk, including Policies, Procedures and actions already taken
Assessing the Residual Severity	
The residual risk section asks for the consequence and likelihood of the identified risk to be re-assessed on the basis that the existing controls have been successfully completed, i.e. if the controls are in place what level of risk will remain?	
Residual Impact	What is the consequence to the project/Company of the event occurring if all the existing controls are in place? 4 = Catastrophic 3 = High 2 = Medium 1 = Low
Residual Likelihood	What is the likelihood to the project/Company of the event occurring if all the controls are in place? 4 = Almost certain 3 = Likely 2 = Possible 1 = Unlikely
Nett Risk Score	DO NOT FILL - Auto calculation. Risks with a score of 9 must be examined further
Determining Actions for Further Mitigation	
Actions for Further Mitigation	What other mitigating actions need to be taken if the residual risk (and therefore existing controls) are not acceptable. Note that once these further mitigating actions are completed they become existing controls and therefore move into that column. The residual risk, having completed these actions, is then re-assessed. If the residual risk score is still unacceptable, further actions might need to be agreed.
Action Owner	Initials of the person responsible for the mitigating actions
Due Date	Date by which the mitigating action is to be in place and effective.
When the document is completed, always save changes you have made before closing the file	

Criteria for Assessing Impact

	REPUTATION (R)	FINANCE (F)	SERVICE/PROJECT DELIVERY (S/PD)	COMPLIANCE (C)	STRATEGY (STR)	SAFETY (SAF)
4 = CATASTROPHIC	Loss of credibility key stake holders; Extensive adverse media; external intervention	Financial loss/opportunity missed exceeding £?m	Total sustained disruption to critical services or processes	Intervention by regulator; Serious breach of legal or contractual obligation	Very high impact on strategic objectives	Fatality
3 = HIGH	Significant loss of trust; Significant adverse media coverage	Financial loss/opportunity missed exceeding £?m	Significant sustained disruption to critical services or processes	Censure by regulator; Breach of legal or contractual obligation	High impact on strategic objectives	Serious injury or ill-health (disabling)
2 = MEDIUM	Significant complaints	Financial loss/opportunity missed exceeding £?m	Some short-term disruption to services or processes	Failure to meet recommended best practice	Moderate impact on strategic objectives	Injury or ill-health resulting in lost time
1 = LOW	Isolated complaints	Financial loss/opportunity missed less than £?m	Minor disruption to services or processes	Failure to meet internal standards or SLA	Low impact on strategic objectives	Minor injury (no lost time)

Criteria for Assessing Likelihood

	CRITERION 1 - OPERATIONAL RISKS	CRITERION 2 - STRATEGIC RISKS
4 = ALMOST CERTAIN	>90% chance of happening in the next 12 months	>90% chance of happening in the next 5 years
3 = LIKELY	>50% chance of happening in the next 12 months	>50% chance of happening in the next 5 years
2 = POSSIBLE	>10% chance of happening in the next 12 months	>10% chance of happening in the next 5 years
1 = UNLIKELY	<10% chance of happening in the next 12 months	<10% chance of happening in the next 5 years

Scoring Grid

Likelihood
 Almost Certain
 Likely
 Possible
 Unlikely

4	4	8	12	16
3	3	6	9	12
2	2	4	6	8
1	1	2	3	4
	Low Impact	Medium	High	Catastrophic

	EIGHT WEEK LOOK AHEAD MEETING	Shepherd Construction Ltd
		Quality Management System
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PROJECT NUMBER			
PROJECT TITLE			
DATE		TIME	
LOCATION		CHAIRPERSON	
OBJECTIVE			

REQUIRED ATTENDEES	
ROLE:	NAME:
SCL Build Manager/Package Manager	
Subcontractor Supervisors	
SCL Planner	


	Item	Who
	Inputs to Meeting <ul style="list-style-type: none"> ▪ Updated programme, complete activities and delays and causes ▪ Master/Target Programme/Design & Construction Programme ▪ Subcontractor Quality Plan ▪ Risk Register ▪ Construction Phase H&S Plan ▪ Action List 	
1	Status against programme <ul style="list-style-type: none"> ▪ Status against programme ▪ Review of planned activities complete and delay causes from weekly plans ▪ Agree actions to address issues 	
2	Review Action List <ul style="list-style-type: none"> ▪ Mark up action list where tasks are complete ▪ Discuss as required actions not yet completed 	
3	Collaboratively review and plan the next period. What may prevent the planned task from occurring, consider the following constraints: <ul style="list-style-type: none"> ▪ Contract/instruction ▪ Design – outstanding RFIs ▪ Method statement/risk assessment ▪ Weather Preceding tasks complete <ul style="list-style-type: none"> ▪ Access ▪ Resource – men/materials/plant/tools ▪ Safety Requirements ▪ Quality control activities as defined on Subcontractor Quality plans Update the Eight Week Look Ahead programme Record actions to remove constraints	

	EIGHT WEEK LOOK AHEAD MEETING	Shepherd Construction Ltd
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4	Close	
	<p>Meeting Outputs</p> <ul style="list-style-type: none"> ▪ Updated Eight Week Look Ahead programme ▪ Updated Action List: actions to remove constraints on new tasks recorded ▪ Updated Construction H&S Plan as necessary <p>Distribution</p> <p>Copies of action list to be given to subcontractor representatives</p>	

	SUBCONTRACTORS PROGRESS REVIEW MEETING	Shepherd Construction Ltd
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	1.03	Total number of accidents to date		
	1.04	Total number of reportable accidents		
	1.05	Total number of H&S non compliances		
2.0	MATTERS ARISING FROM PREVIOUS MINUTES			
	2.01			
3.0	SUBCONTRACTORS REPORT ON PROGRAMME STATUS			
	3.01	Procurement, Design and Manufacture activities including known constraints.		
	3.02	Site works package activities including known constraints.		
	3.03	Activities in delay, reasons and recovery proposals.		
	3.04	Participation and Commitment in 6 week collaborative planning.		

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	SUBCONTRACTORS PROGRESS REVIEW MEETING	Shepherd Construction Ltd
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	3.05	Participation and Commitment in weekly planning meetings.		
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4.0		DRAWINGS & DESIGN DATA SUBMISSIONS		
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	4.01	Time table for drawings to be submitted for acceptance		
	4.02	Drawings submitted for acceptance. Status reports:		
	4.03	Material Specifications and product selection including acceptance of alternatives.		

	4.04	BREEAM information received?		
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5.0		REQUEST FOR INFORMATION / TECHNICAL QUERIES		
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	5.01	Information request from the design team. Status report:		
	5.02	Information request from Shepherd and other supply chain partners. Status report:		

6.0		INTERFACE AND COORDINATION WITH OTHER TRADES		
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	6.01			
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	SUBCONTRACTORS PROGRESS REVIEW MEETING		Shepherd Construction Ltd
			Quality Management System
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7.0		DELIVERIES STORAGE AND PROTECTION		
	7.01	Forward plan storage, deliveries and methods		
8.0		QUALITY CONTROL (including samples and off site inspection)		
	8.01	Samples		
	8.02	Off site inspections		
9.0		LABOUR AND PLANT		
	9.01	Labour		
	9.02	Plant		
10.00		QS MATTERS		
	10.01			
11.00		ANY OTHER BUSINESS		

First Issue: 31Mar11	Revised: 25Jun13	Rev N ^o : 3	Ref N ^o : PD2.2	4 of 5	
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Project Delivery	SUBCONTRACTORS PROGRESS REVIEW MEETING	Shepherd Construction Ltd
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12.00	DATE OF NEXT MEETING		

Enacting Product-Service Business Models: The Role of Lean Thinking

Project Delivery	CONSTRUCTION DIRECTOR MID MONTH REVIEW	Shepherd Construction Ltd Quality Management System Accredited with ISO 9001
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Divisional Summary - (East/West/South delete as required)

Note: do not fill out any information directly onto this sheet unless otherwise stated. Fill out information in individual project sheets (which will automatically update this summary sheet)

Check	Check points	Check criteria	Project Names		
			Project 1	Project 2	
			Last Checked Next Check Date (insert)		
2 Health & Safety					
2.1	Monthly Return	Has Monthly Return been submitted for the period?	R = No G = YES	Y	0
2.2	4 Week Safety Plan	Has the meeting taken place for the period? Are actions closed out? Have the minutes been submitted to H&S Dept? (Minutes as evidence - check)	R = No Meeting A = Meeting held - minutes not distributed G = Meeting held and minutes distributed	A	0
2.3	Workforce Consultation Meeting	Has the meeting taken place in the period? Did all subcontractors attend Have all actions been closed out? (Minutes as evidence - check)	R = No Meeting A = Meeting held - minutes not distributed G = Meeting held and minutes distributed	G	0
2.4	Accidents	Consider: How many minor accidents have occurred in the period? Are there any trends evident in the minors? Are further actions required? Have RIDDORS occurred? Have they been investigated? Have they been closed out? Has the Snr. Management RIDDOR review been completed? Have RA/MS been reviewed and workforce re-briefed? Has all documentation been forwarded to H&S Dept?	R = Accidents not investigated or closed out A = Accident investigations not completed adequately. Records not sent to H&S G = All accidents investigated and closed out with corrective actions in place and info sent to H&S	G	0
2.5	Significant Incidents/ Near Hits	Consider: Have any incidents/ near hits occurred? Has the right action been taken to close them out? Have investigations been undertaken and lessons learned communicated? Have Accident Dangerous Occurrences Reports/ Near hit Cards been sent to H&S Dept?	R = Incidents not adequately investigated or closed out A = Incident investigations not completed adequately (or interim reports not completed) G = All incidents investigated and closed out with corrective actions in place	A	0
2.6	Non Compliance Notes	Consider: Have NCNs been issued? Have contractors responded and closed out necessary actions? What further action has been taken by contractors?	R = NCNs not issued when notification of safety violations is required A = NCNs issued but not signed off by the contractor G = NCNs issued and signed off and returned with corrective actions taken	G	0
2.7	On Site Training	Consider: Have all contractors carried out TBTs or training in the period required? Have copies of briefings/ attendance sheets been passed to Project Team? What current training requirements are there on the project?	R = Not all contractors have carried out required training and provided evidence A = Training carried out but evidence not received G = All required training carried out and evidence received	A	0
2.8	Improvements/ Best Practice	Are there any best practices to review? How can these be passed on through the business?	Y/N	Y	0
2.9	Cascade of H&S Information	Has any H&S information e.g. alerts, bulletins, posters or email communication from H&S dept been displayed/ actioned?	Y/N	N	0
3 Programme (design, procure, construct)					
3.1	Programme status (copy of programme required)	Brief summary and review drop down line on programme, including week number. Check progress against short term, target, contract programmes.	R:Behind A:On G:Ahead	R	0
3.2	Programme deviation in month	Review issues affecting progress (design, sub-contractors, quality, etc)	R = further slippage A = holding G = improving	A	0

Project Delivery	CONSTRUCTION DIRECTOR MID MONTH REVIEW	Shepherd Construction Ltd Quality Management System Accredited with ISO 9001
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Divisional Summary - (East/West/South delete as required)

Note: do not fill out any information directly onto this sheet unless otherwise stated. Fill out information in individual project sheets (which will automatically update this summary sheet)


Check	Check points	Check criteria	Project Names		
			Project 1	Project 2	
			Check 1	Check 1	
3.3	Forthcoming key works	Have these been identified and planned? Have risks been identified and actions agreed? Are there any long lead time items, client decisions required, etc?	Y/N	N	0
3.4	Subcontract Procurement & Packaging (copy of procurement schedule required)	Are the team completing work packages and getting them signed off in line with the procurement schedule?	R:Behind A:On G:Ahead	G	0
3.5	Are the team holding 8 week look ahead meetings?	Has the programme been developed collaboratively? Is the programme aligned to the master/target programme?	R = No A = Yes but imp req. G = Yes	R	0
3.6	Are the team looking ahead and removing constraints?	Review action lists. Are actions being completed?	R = No A = Yes but imp req. G = Yes	A	0
3.7	Are weekly planning meetings being held?	Review weekly plans. Are these being kept up to date throughout the week? Are causes of delay being recorded?	R = No A = Yes but imp req. G = Yes	G	0
3.8	Is daily meeting being held?	Is there a daily huddle board & is it up to date? Are all required sub-contractors attending?	R = No A = Yes but imp req. G = Yes	G	0
3.9	Site Diaries	Are site diaries being completed daily?	Y/N	Y	0
3.10	(If in last 12 weeks of the project) Is the countdown to completion process in place?	Review the delivery schedule and construction close out programme	Y/N	Y	0
4 Design					
4.1	Review status against the IRS (copy of IRS required)	Review the current situation (inc. sub-contract design) and progress against the IRS. Review planning and building control status. Are there any red flag issues?	R:Behind A:On G:Ahead	A	0
4.2	Are off site visits up to date/planned?		Y/N	Y	0
4.3	Review BREEAM Status	Is an internal Health Check required	Y/N	Y	0
5 Commercial and Costs					
5.1	Review Costs to Complete	Review Mosaic Costs to Complete are correctly profiled and include the latest programme and financial information	G: within +/- 3% of forecast; A: +/- 10% R: an excess of +/- 10% of forecast	G	0
5.2	Cost Movement Summary Review (copy of cost report required)	Fully review the Cost Report and the prelims, DCSS, contingencies & non recoverable schedule.	R: provisions not in place, forecast wrong A: some issues to be addressed G: team in control & managing the costs	A	0
5.3	Payment on time	Review valuations and payments received	Y/N	Y	0
5.4	Movement against planned margin		R< margin A=margin G> margin	R	0
5.5	Sub-contract accounts/ provisions/ claims	Do all sub-contract accounts have the right provisions? Are any VOs, EOTs and contra charges agreed?	Y/N	N	0
5.6	Warranties	Is the warranty tracking schedule up to date?	Y/N	Y	0
5.7	Client variations (copy of client VO schedule required)	Are all client variations, claims and EOTs agreed? Check no margins taken on submitted/ budgetary variations.	Y/N	Y	0
5.8	Review Project Trade Up Plan		Y/N	Y	0
5.9	Review Status of Signed Sub-Contracts	Are signed sub-contracts in place before any sub-contractor has started work on site?	Y/N	N	0
5.10	Review the Cash position on the Contract (overvalue and departures from standard sub-contractor payment and retention terms)		R: provisions not in place, forecast wrong A: some issues to be addressed G: team in control & managing the costs	A	0
6 Temporary Works					

Project Delivery	CONSTRUCTION DIRECTOR MID MONTH REVIEW	Shepherd Construction Ltd Quality Management System Accredited with ISO 9001
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Divisional Summary - (East/West/South delete as required)

Note: do not fill out any information directly onto this sheet unless otherwise stated. Fill out information in individual project sheets (which will automatically update this summary sheet)

Check	Check points	Check criteria	Project Names		
			Project 1	Project 2	
			Check 1	Check 1	
Last Checked Next Check Date (insert)					
7 Risk Register					
6.1	Competent Temporary Works Co-ordinator	Is the current TWC on the Competent Persons Register?	Y/N	Y	0
6.2	Temporary Works Register	Is the Temporary Works Register up to date?	Y/N	Y	0
6.3	Temporary Works Records	Are the necessary records being kept; CVs, competency checks, permits to load/dismantle?	Y/N	Y	0
7.1	Risk register (copy of risk register required)	Is this being updated regularly? Does it reflect current potential risks?	Y/N	N	0
8 Quality					
8.1	BSI/ SCL audit results	Have these been signed off and actions agreed?	Y/N	Y	0
8.2	Are subcontract quality plans in place and being managed?	Are all activities outlined in plan taking place as planned? E.g. stop checks, mock ups, etc.	Y/N	N	0
8.3	Sub-contract appraisals (print off up to date summary)	Have these been carried out as required? Have actions been agreed and taken?	Y/N	Y	0
8.4	Current status on Clerk of Works reports		Y/N	N	0
9 Environmental					
9.1	Environmental Incidents in period	Review incidents. Have there been any recent incidents?	Y/N	Y	0
9.2	Review Environmental and Sustainability Legal Register	Is Register in place and up to date?	Y/N	Y	0
9.3	Review Environmental Aspects and Impacts Register	Is Register in place and up to date?	Y/N	Y	0
9.4	Review Site Waste Management Plans including SmartER reporting toll (Energy, Water, Timber)	Are plans in place and up to date?	Y/N	Y	0
10 People					
10.1	Performance reviews and objectives	Are performance reviews up to date? Does everyone have individual objectives linked to project targets, and are these being monitored?	Y/N	Y	0
10.2	Review of absences and future staffing needs	Do staff levels meet future programme needs? (Are there any recurring absences & have reasons been addressed as appropriate? Are holidays being managed?)	R: staff levels problem now A: need to allocate staff within next month G: right staff levels	A	0
10.3	Is the Contracts Manager/Project Leader using the Project team checklist on a regular basis?		Y/N	Y	0
11 Other					
11.1	Marketing	Have future opportunities been identified and actions agreed?	Y/N	N	0
11.2	Best practice	Have best practices been recorded on the database? Are best practices being implemented?	Y/N	Y	0

	WEEKLY CO-ORDINATION MEETING AGENDA	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

PROJECT NUMBER			
PROJECT TITLE			
DATE		TIME	
LOCATION		CHAIRPERSON	
OBJECTIVE			

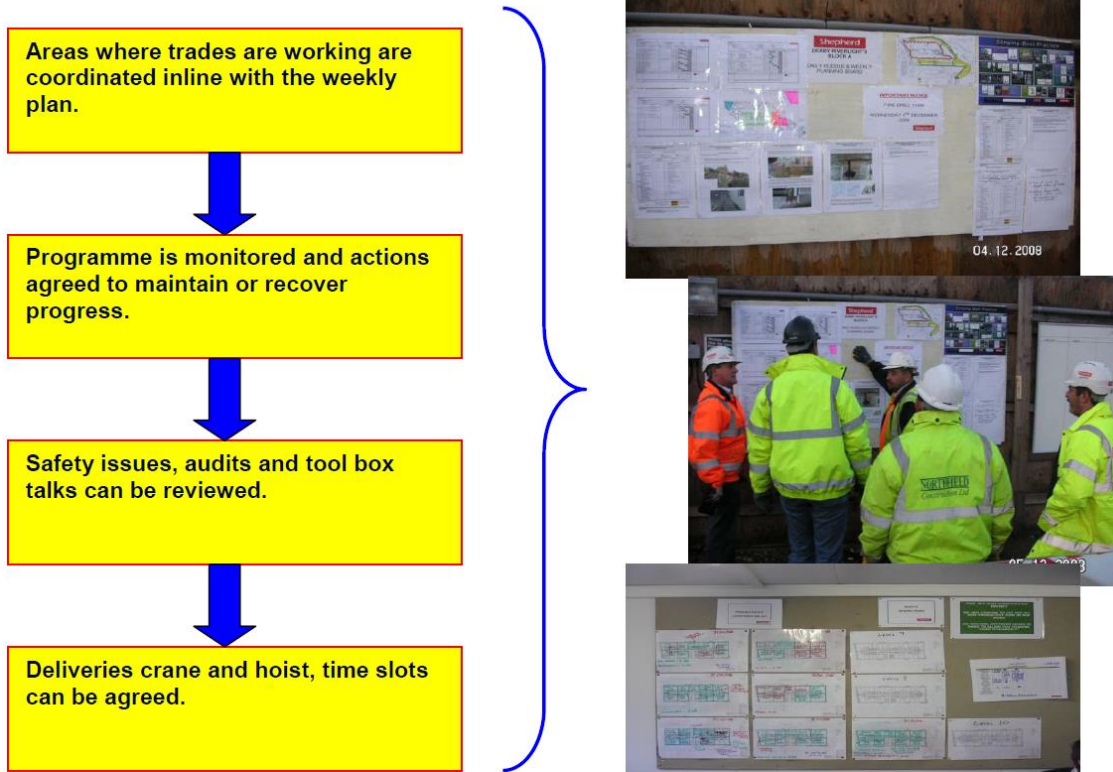
REQUIRED ATTENDEES	
ROLE:	NAME:
SCL Build Manager	
Subcontractor Supervisors	

Time	Item	Who
	Meeting Inputs <ul style="list-style-type: none"> ▪ Blank weekly planning template (to be completed during meeting) ▪ Planned activities complete scores (PAC) already calculated from previous week's completed weekly plans ▪ Delays and disruptions analysis from previous week's completed plans ▪ Target Programme 	
Start	Health and safety update/raise any new issues	
	Statement on last week's progress	
00:10	<ul style="list-style-type: none"> ▪ highlight any specific delays and disruptions and actions taken to address 	
00:20	Check progress of this week – are there any issues preventing delivery of the plan?	
	Plan next week's work	
00:30	<ul style="list-style-type: none"> ▪ Each subcontractor in turn to list what they will do next week and on what days ▪ Tasks stated must be measurable and no longer than 4 days in duration 	
02:00	Close meeting	
	Distribute weekly plan developed during meeting to all	
	Meeting Outputs <ul style="list-style-type: none"> ▪ Following week's plan recorded on weekly planning template 	
	Distribution Photocopy of weekly plan to all foremen	

	DAILY HUDDLE MEETING OVERVIEW	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001


The Daily Huddle is a daily stand up meeting with all trade foremen to highlight and resolve potential issues so the weekly plan can be achieved, and reviews progress of the weekly work plan removing constraints, safety and logistical concerns.


- ❑ Site manager and all trade foremen to attend.
- ❑ Approximately a 10 minute meeting
- ❑ Use visual board of the site to provide focus.
- ❑ Sharing issues quickly during critical stages of the programme.



Day to day issues collaboratively addressed and managed

7 Wastes: bad quality, inventory, over production, idle time, operator motion, transportation, process waste


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	SITE DIARY		Shepherd Construction Ltd
			Quality Management System
			Accredited with ISO 9001

Project Name:		Project Number:	
Date:		Week N^o:	
		Completed By:	

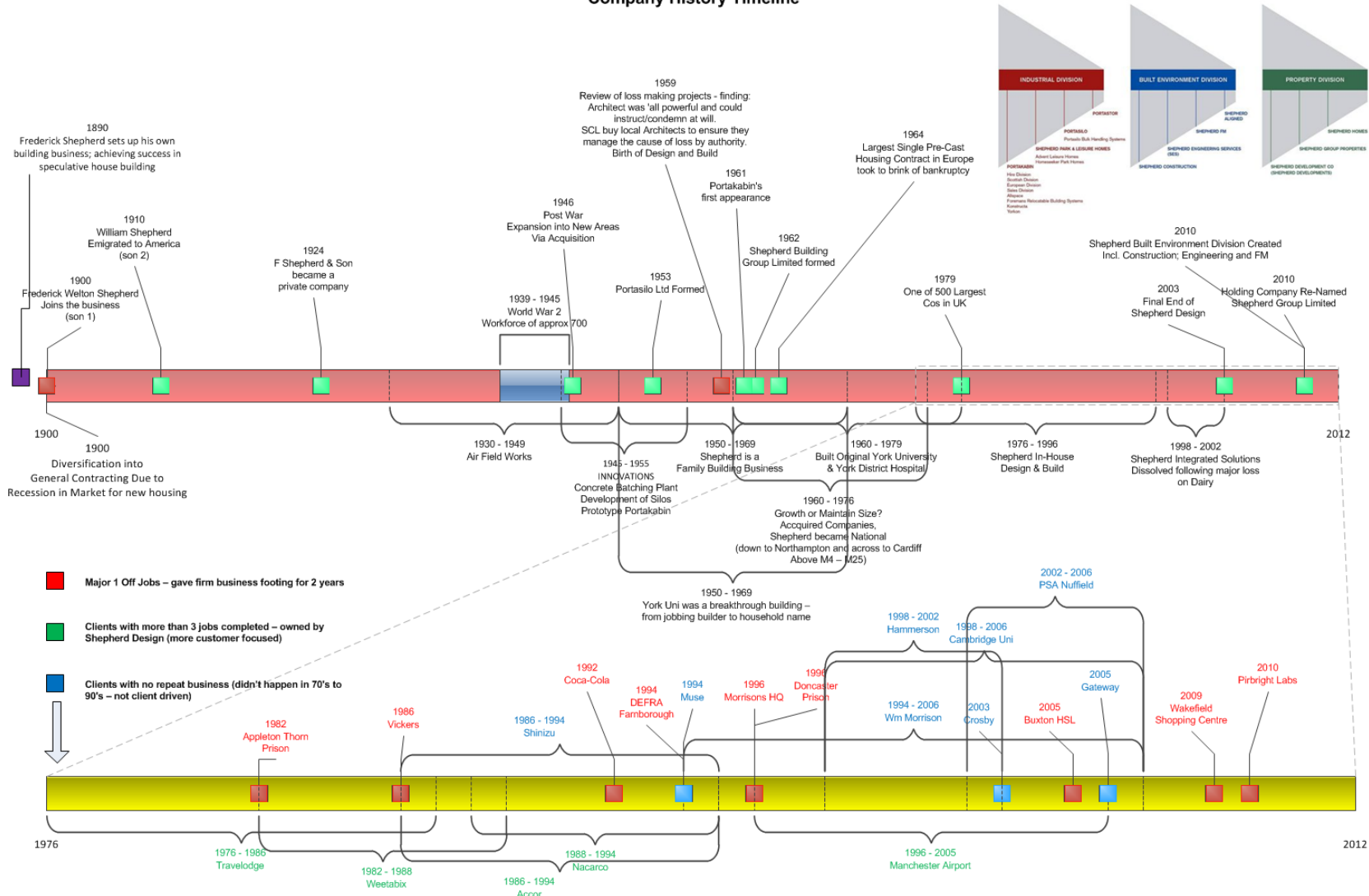
Details of Visitors on Site	Details of Additional Works Carried Out or Instructed	Any Other Comments

Subcontractors on Site (Split by Trade/Gang)	Number	Location Where Subcontractor is Working on Site	Note of Any Absence/Delays/Issues

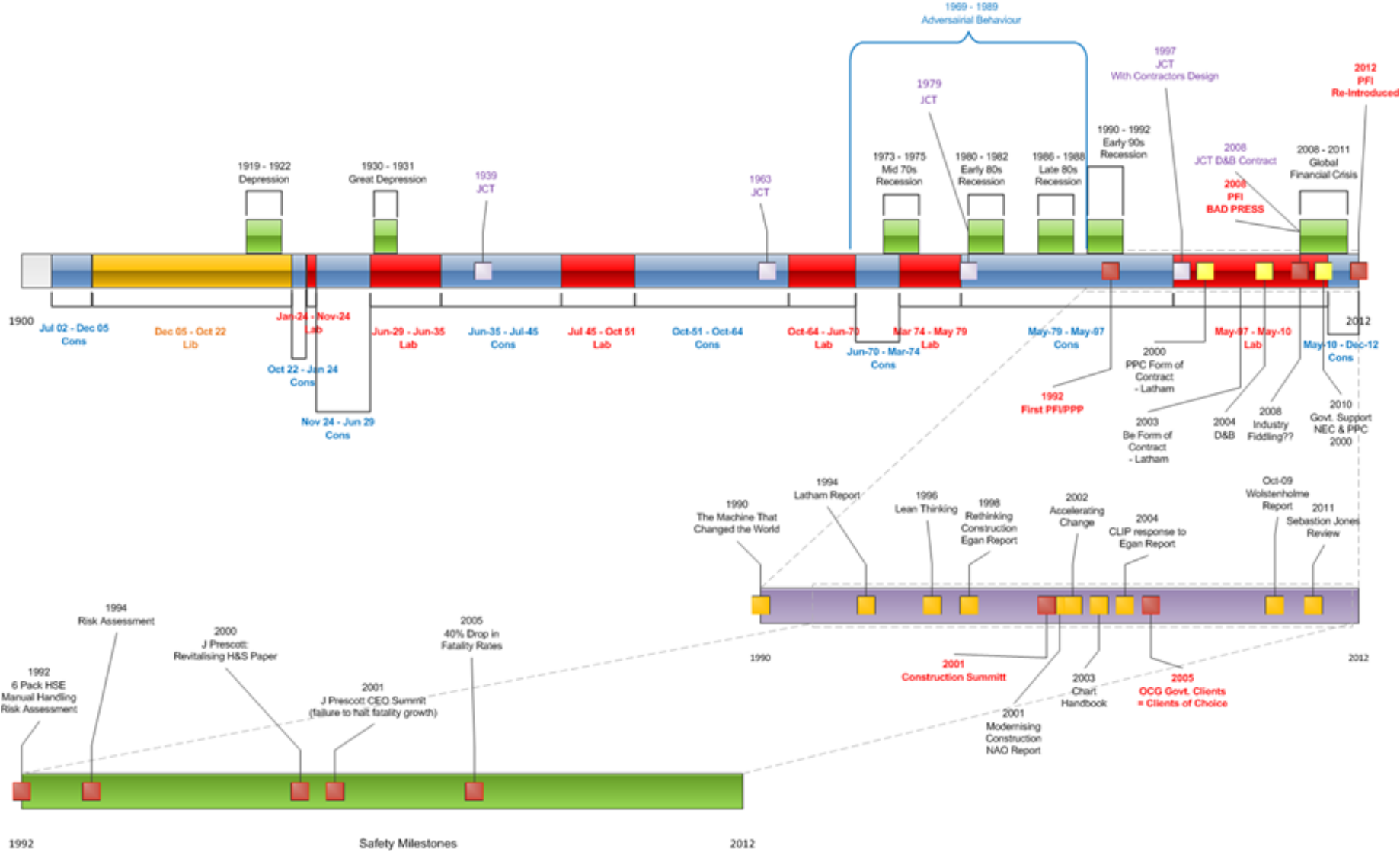
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APPENDIX E COMPANY TIMELINES

Company History Timeline



Industry Timeline



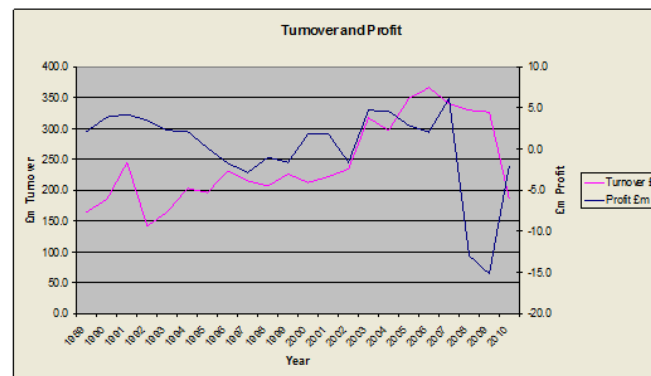
Company Performance Timeline

Jun-10
In Profit
Results to be Announced

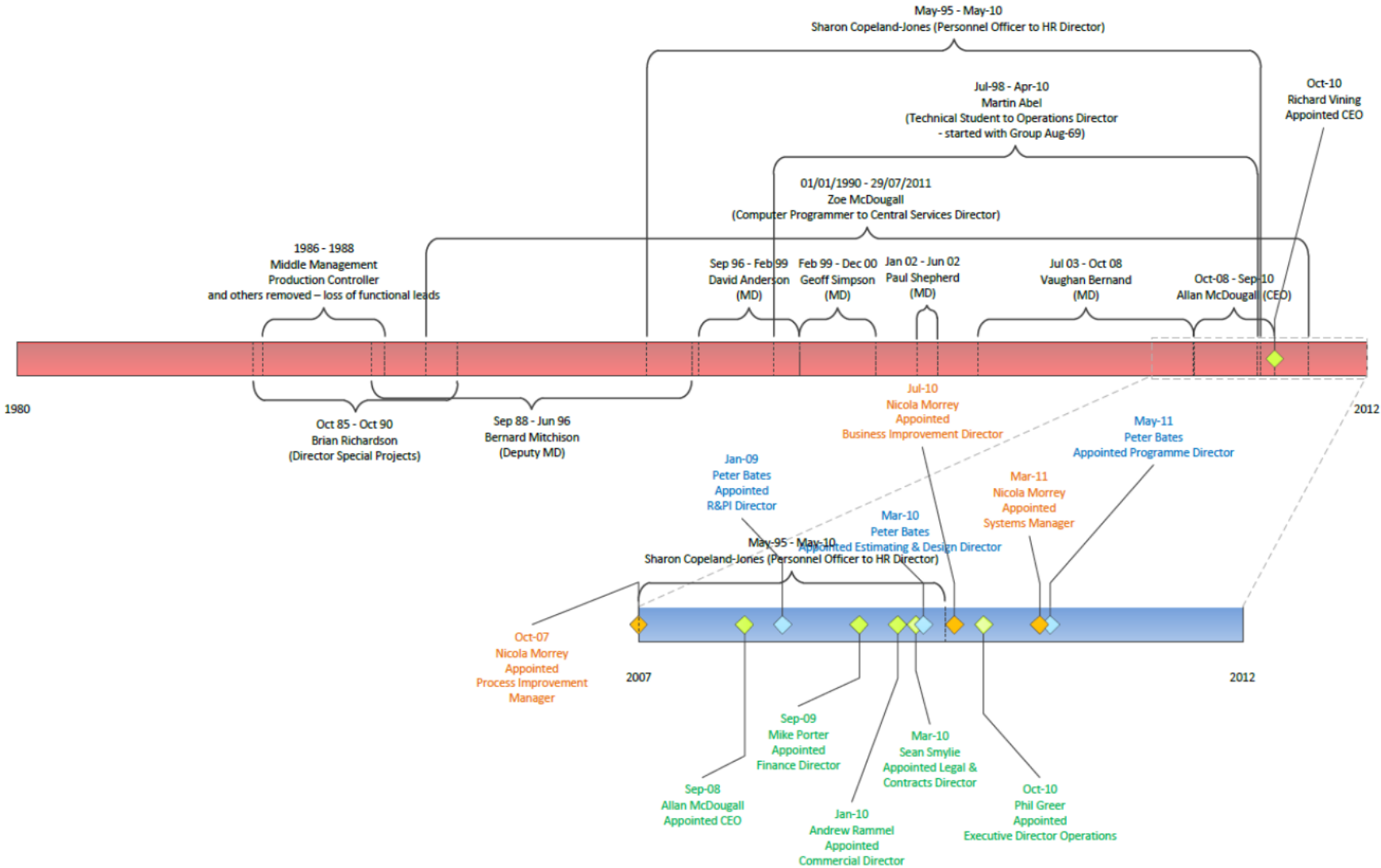
Feb-09
Major Financial Loss



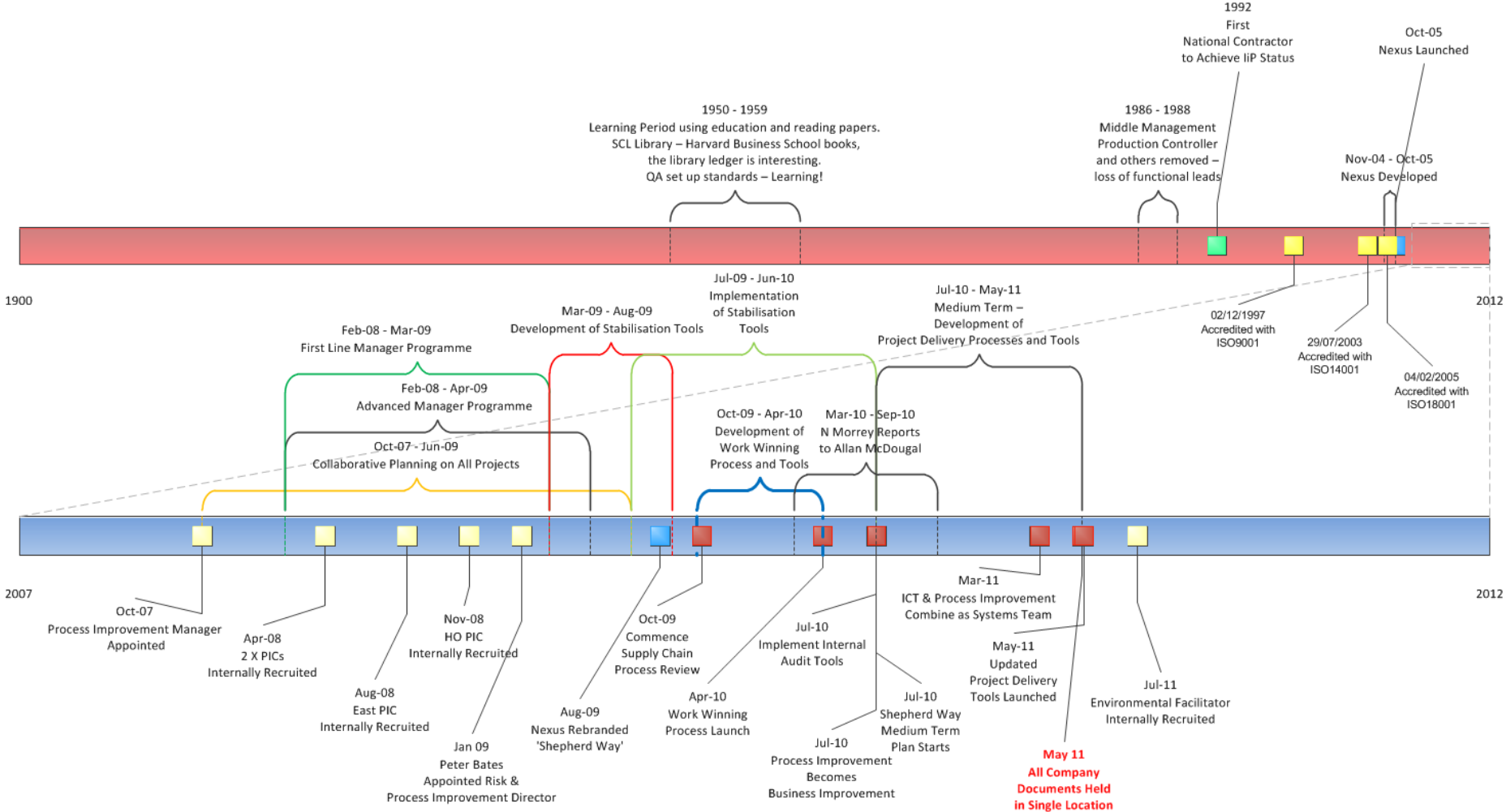
Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Turnover Em	165.0	185.6	244.4	141.7	164.4	202.8	196.1	231.3	214.8	206.3	225.8	212.1	221.6	233.6	317.5	296.6	347.9	366.5	339.7	329.2	326.9	185.2
Profit Em	2.1	3.9	4.2	3.5	2.2	2.1	0.1	-1.7	-2.9	-1.0	-1.6	1.8	1.8	-1.6	4.7	4.6	2.9	2.0	6.1	-13.0	-15.2	-1.9



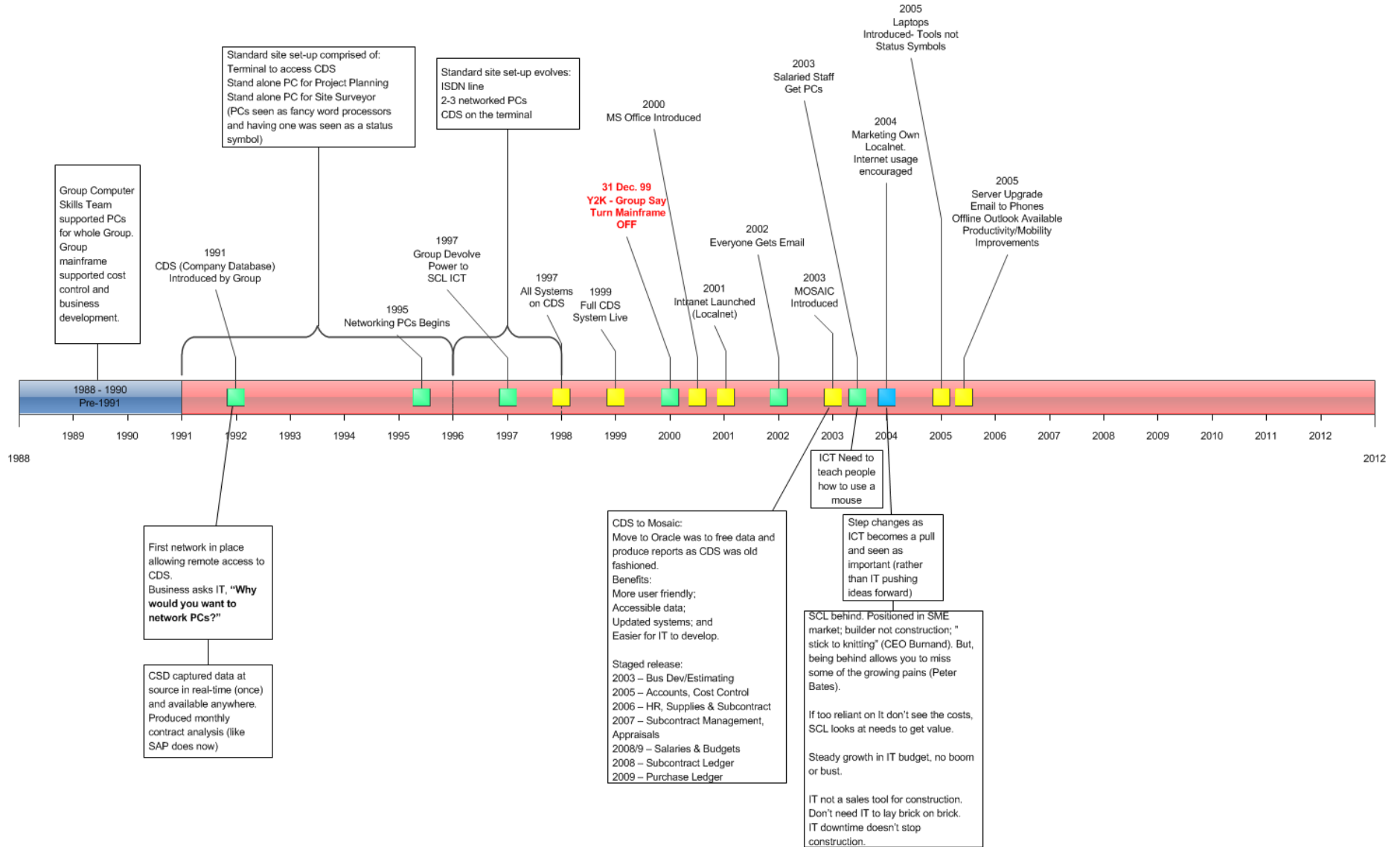
Organisational Structure and People Timeline



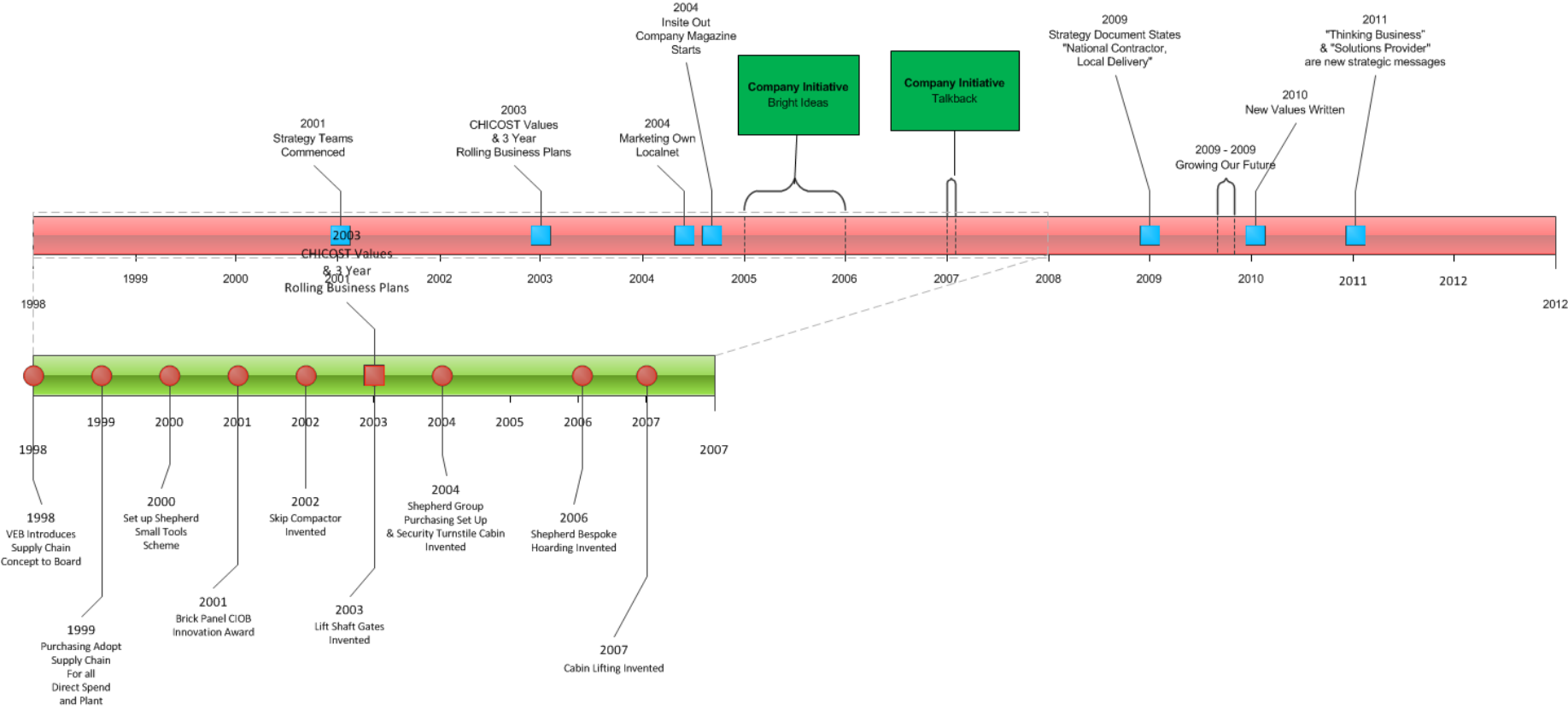
Process & Learning Timeline



ICT Timeline



Innovation, Marketing & Communication Timeline



APPENDIX F PATH DEPENDENCIES AND ACTIONS TAKEN TO ADDRESS THEM

Path dependency	Implications of the path dependency	Where knowledge of this path dependency was used to inform the research	Mitigating actions taken to address this path dependency through this research	Future actions identified to address this path dependency
Family owned business	Family business heritage has led to an ‘insular’ and ‘parochial’ approach that leads to reluctance to engage with third parties, lack of challenge and lack of accountability.	Awareness of this path dependency, namely that the company can be inward looking/insular, informed the second action research cycle. This aimed to increase the focus on the customer and delivery of value to meet their needs (rather than being inward looking and making improvements solely for the business benefit). (Refer to steps 7-9 of the research process). Engagement with third parties (consultants, sub-contractors), at both work winning and project delivery phase is also essential for development of the value proposition and systems integration and therefore informed the practices developed.	Standard processes and tools developed clearly allocate roles and responsibilities, with management checks designed to ensure people are accountable. Processes and tools also prompt the engagement of third parties (e.g. use of experts is prompted on the sub-contractor quality plan). The operational framework for service delivery also promotes and encourages collaboration with third parties throughout the integrated solutions lifecycle.	It is recommended that further work is done to integrate the facilities management company (SFM) into the project delivery lifecycle earlier – this will allow their expertise to be used to better inform solutions. Implementation of best practice sharing and feedback loops will also encourage people to extend their knowledge and become more open to new ideas.

Path dependency	Implications of the path dependency	Where knowledge of this path dependency was used to inform the research	Mitigating actions taken to address this path dependency through this research	Future actions identified to address this path dependency
We are a ‘builder’	The company still thinks of itself as a ‘builder’ rather than a main contractor/solutions provider.	Acknowledgement of this path dependency informed the need to give more consideration to whole life needs (not just the building phase) of the integrated solutions lifecycle and ensure value is defined not just in terms of the building, but also in terms of the client’s experience and business aspirations.	The operational framework for service delivery prompts the early engagement of facilities management as a means of focussing on the purpose of the building and not just building the building. The service delivery plan (developed by using the operational framework for service delivery) is designed to capture all aspects of the service that the team need to deliver to the client, focusing not just on the building but the experience and purpose of asset they are building – this should encourage a mind-set of service delivery rather than just building.	Future use of the service provider maturity assessment will allow the company to assess whether it is still behaving as a ‘builder’ or whether it is exhibiting more and more characteristics of integrated solutions provision, and in doing so continue to identify further actions to address this path dependency. It is also recommended to implement post occupancy reviews which will encourage involvement to extend beyond the building phase and extend thinking into operation of the asset.

Path dependency	Implications of the path dependency	Where knowledge of this path dependency was used to inform the research	Mitigating actions taken to address this path dependency through this research	Future actions identified to address this path dependency
Removal of functional heads/process owners	Removal of process owners has led to a lack of standardised approach and people being unaccustomed to being involved in development, management & improvement of processes.	Uncovering of this path dependency underlined the importance of having standard processes and tools (which had been developed) and confirmed that involving people in the development of new ways of working was important in the future in order to keep people engaged and improve compliance.	Involving people in the development and implementation of the operational framework for service delivery and service delivery plan has helped continue to make people accountable for the company's processes and give them ownership.	Continuous improvement of the company's standard processes will continue, with people already proactively proposing improvements.
The creation of regional businesses/operating regions	Organisational silos have been created as a result of regional businesses being acquired. Head office and regional departments have an 'us' and 'them' culture.	The identification of regional silos supported the identification of loss of the value proposition between phases of the integrated solutions lifecycle. This informed work on the need to create flow between the phases of the lifecycle. (Refer to steps 7-9 of the research process)	The operational framework for service delivery and service delivering plan are specifically aimed at addressing this path dependency by providing tools and mechanisms that promote collaboration between all parties involved in the integrated solutions lifecycle, thereby enabling the flow of value.	A future action recommended to address this is to change the reward system to ensure that both head office and regional departments are rewarded on delivery of customer requirements rather than just regional team being rewarded on achievement of practical completion.

Path dependency	Implications of the path dependency	Where knowledge of this path dependency was used to inform the research	Mitigating actions taken to address this path dependency through this research	Future actions identified to address this path dependency
The development of Mosaic	The perception that the company's in-house developed enterprise requirements planning system is not user friendly discourages people from accessing company ways of working and complying with processes.	The practices developed through this research have to be stored in the Mosaic system as it is the company's designated system for such documents. However, format and content of the practices that have been developed have not been restricted by the system.	Involvement of people in the practices developed, and implementation of those practices on live projects meant that people saw the practices outside of the Mosaic system, i.e. their first introduction was not by accessing them through Mosaic on their own but through on-site training and use. Despite having to later access them through Mosaic, introducing them in a practical environment has addressed this path dependency to some extent.	Further actions are on-going within the company to address this issue. A new intranet system, which will ultimately be the new portal for accessing company processes and practices, is currently being developed. There will be much focus on the user experience and people from the business will be involved, through workshops, in contributing to how they want the new system to operate.

APPENDIX G SERVICE PROVIDER MATURITY ASSESSMENT

Service Provider Maturity Assessment

For each item number read the maturity level descriptions and decide the current level of maturity in your organisation (insert into the "Current Level" column.)

Terminology

- Product provider - A building business that tenders for and builds construction projects. The product is the completed building. Value and margin are generated by the building alone.
- Systems integrator - A contracting business that tenders for work, using their expertise to integrate consultants and supply chain to develop the best product for that customer given the brief, and then managing that team to deliver the product (the completed building.) Value and margin are generated through design and the procurement of sub-contract packages in addition to the building itself.
- Service provider - A business that services a client's business needs through the provision and maintenance of an asset from which that client can realise their business objectives. Value and margin are realised through a range of services which are based around the production of a building, for example financing, design solutions and expertise that will enable realisation of client business targets, building maintenance and operation.
- Front end team - work winning team
- Back end team - operational delivery team (construction team)

Item Number	Relevant phase(s) of integrated solutions lifecycle & model for strong solutions	Maturity Level			Current Level	Current State Comments	Areas for Improvement	Barriers to Improvement
		Level 1 Product Provider	Level 2 Systems Integrator	Level 3 Service Provider				
1	Strong centre	The business provides its product to its client. Any integration with other parties is led by another party. The business has a project manager responsible for its works who reports P&L to the business and uses the business' own processes.	The business co-ordinates the activities of all the parties they have engaged to deliver the contract, i.e. they are a systems integrator. However each company engaged by the systems integrator acts as its own separate entity, each having a project manager and team responsible for their element of works, monitoring P&L from their own perspective and using their own processes.	A team of people from across all the companies needed to deliver the service are identified as required, based on skills and customer requirements, and work together as a single entity under an account manager for that client. One team, one P&L, and one set of processes for that client. Each company represented do not have their own commercial, planning staff, etc.				
2	Strategic engagement; value proposition	The business works with any client under any form of contract and secures work through competitive tendering, with the client most likely having a project manager/project OS acting on their behalf. Front end teams are responsible for work winning and do not collaborate with back end teams on customer account planning.	The business targets specific clients and/or specific forms of contract and aims to secure repeat business and frameworks in addition to some competitive tendering (although the client may have a project manager/PQS representing them.) Front end teams are responsible for the work winning, but the business has mechanisms in place for the back end teams to share information and customer feedback with front end teams. Customer account planning is led by front end teams who provide a pipeline of work to back end teams.	The business only works with certain clients that fit its business model and values, and under preferred forms of contract, winning work based on relationships, sector expertise and early engagement - this is a direct relationship with the client, rather than through a project management third party. The business has long term relationships with its clients, having visibility of their future pipeline of work. The business rejects work from clients that no longer fit their way of working and little turnover is won through competitive tendering. Back end teams work to develop solutions and technical expertise that front end teams can offer to clients, thereby being integral to customer account planning.				
3	Value proposition; systems integration	Front and back end teams are fixed in the organisational structure and work as separate teams	Front and back end teams are fixed in the structure, but individuals from back end teams are seconded to work with front end teams during work winning stage	The organisational structure is fluid. Front end & back end teams are reconfigured around opportunities & the capabilities needed to understand and deliver the customers requirements				

Enacting Product-Service Business Models: The Role of Lean Thinking

Item Number	Relevant phase(s) of integrated solutions lifecycle & model for strong solutions	Maturity Level			Current Level	Current State Comments	Areas for Improvement	Barriers to Improvement
		Level 1 Product Provider	Level 2 Systems Integrator	Level 3 Service Provider				
4	Strategic engagement; value proposition; systems integration	The front end teams engage with the client and develop an offer based on the client's specification and tendering process. Front end teams, perhaps supported by individuals from back end teams who are drafted in for that tender, do enough work to win a contract, after which the contract is handed to the back end team to deliver.	Front end teams, supported by back end teams and external third parties, engage with the client to understand the purpose of the product (the building) and the client's aspirations so they can offer alternative designs and solutions. Front end teams have the capability to carry out design development and planning activities, however this is often re-worked by the back end team after the contract is handed over to them.	Front end teams have the consultancy skills, sector knowledge and specialist construction discipline knowledge (design, planning, logistics) needed to understand the client's business such that they can offer a solution and service that will enable delivery of the client's business objectives. Consultancy skills would include writing business plans, arranging financing solutions, development of systems/protocols, asset management expertise, sector expertise, etc. The front end teams can draw on the technical expertise from across the business and external third parties to develop the best solution. Front end teams create a fully developed solution and methodology that the back end team can then deliver without re-working. The front end team carry out a detailed handover to the back end team and have a checking role throughout the delivery phase to capture out turn data and lessons learned.				
5	Value proposition; systems integration	Front end teams 'handover' to back end teams once a contract is won, ending front end team contact with the client at handover	Front end teams retain some contact with the client post handover, for example carrying out client feedback	Key account managers, allocated at the start of the relationship, provide a consistent point of contact for that client for the duration of the working relationship				
6	Strong centre	Profit & loss responsibility lies with back end teams and ends on completion of the product (i.e. at PC)	Back end and front ends teams have accountability for profit and loss performance that ends on completion of the product defects period. Any remaining contract for aftercare/maintenance is a new contract with a different provider or part of the business	Key account managers for each client have profit and loss responsibility for all the activities with that client which is monitored through to the attainment of the specific targets set out for that contract and on-going targets where the contract includes the servicing of the product (customer facing profit centres)				
7	Strong centre	The back end team structure is fixed and has little flexibility in how it plans resources and operates. Resources are planned and costed to certain teams/departments to meet budgets and workload.	Back end teams are flexible and can be made up of people from across the business, though the resources are allocated to certain teams/departments who charge for that resource when shared with other parts of the business. Resource planning is focussed on maximising utilisation, meeting individual team/department budgets and is negotiated through senior management agreement at local level.	The back end units of the business, or across a Group of businesses, are flexible; they can cope with demands for resources from the front end (any front end from across the Group) and can tailor their approach to deliver their element of the product/service in line with the overall service required, working for the account manager, irrespective of which company anyone actually works for, i.e. the group of companies can create temporary project organisations comprising their staff plus their sub-contractors, suppliers, etc. Resource planning is strategic and client focussed.				
8	Strong centre	Pain/ gain (profit/loss) is managed and reported within each individual business involved in the production of the product and are based around production targets	Mechanisms to share pain/gain are in place across the whole team, i.e. the systems integrator and their sub-contractors and consultants, and are based on production targets. Each individual business retains their own P&L management and reporting.	Mechanisms to share pain/gain are in place for those involved with all parts of the contract (production & service elements) and are based on targets agreed with the client				
9	Strong centre	Front end & back end teams are rewarded differently. The reward is triggered by completion of production (construction, i.e. PC achieved) and based on margin achievement.	Front end & back end teams have the same reward structure. The reward is triggered by completion of production (construction, i.e. PC achieved) and based on margin achievement.	Front & back end teams are rewarded based on client satisfaction measures developed with the client and assessed post occupancy (i.e. when the complete service has been delivered and operated)				

Item Number	Relevant phase(s) of integrated solutions lifecycle & model for strong solutions	Maturity Level			Current Level	Current State Comments	Areas for Improvement	Barriers to Improvement
		Level 1 Product Provider	Level 2 Systems Integrator	Level 3 Service Provider				
10	Strategic engagement; value proposition; systems integration	The options for sourcing materials, products and sub-contracts are open and selection is based primarily on price.	The business has a supply chain of preferred suppliers and sub-contractors, influenced by and signed off by back end teams, who can work with the business on solution development. Selection of third parties is based on previous performance, capabilities and solution development, in addition to price.	Front end teams engage with third party experts and develop strategic business relationships that include sharing financial and design information, and giving feedback/challenge for continuous improvement.				
11	Operational service	Asset management and operating concerns extend to the production of O&M manuals that are handed over to the client at PC.	Asset management and operating concerns are considered at the design stage and O&M manuals are handed over at PC. There may also be a handover to a facilities management company.	Asset management and operating/whole life concerns are considered and delivered as part of the solution development and service offering.				
12	Strategic engagement/value proposition	The business is not involved with providing financing for its clients	Typically the business is not involved in providing finance, however may consider doing so for PFI contracts or as part of a consortia	The business actively looks to provide financing options, where provision includes having the skills and/or access to capital to make an investment				
13	Strong centre	Each project is stand alone and learning from previous projects is not consciously fed into future projects	The business has learning/feedback loops in place as part of its processes and mechanisms are in place to share knowledge across the business, however there is no post occupancy information and information is not specifically used to inform future designs/solutions	Everyone in the business has the capabilities for knowledge sharing and implementing feedback loops. Knowledge and information from previous projects, including post occupancy data, is used to develop and improve future solutions				
14	Strong centre; strategic engagement	Risks are managed and resolved contractually	The business uses standard industry contracts to allocate and manage risk, but prefers collaborative contracts and resorts to contract enforcement as a last resort	The business offers guarantees and support for the services it has delivered (assuming risks that are normally borne by the customer)				
15	Strong centre	The business' management team run the business as a product provider, aligning people, processes, organisational structure and rewards mechanisms to achieve that business strategy. Management decisions are viewed from the business' immediate perspective.	The management team develop long term strategies with supply chain, consultants and clients, as well as aligning people, processes, organisational structure and rewards to systems integration. Decisions take consideration of retaining long term relationships, rather than short term gains.	The business has a strong central management team who provides vision and direction and create an environment, organisational structure and working practices that enable provision of services. The central management team mediate between front and back end teams, and also across departments/businesses, making decisions in the interests of the client.				
16	Strong centre; strategic engagement; value proposition; systems integration; operational service	The business has defined, documented, standard processes/procedures that inform how people carry out their work. These processes/procedures inform role definitions and people are trained to use the processes/procedures. Compliance to these processes/procedures is monitored.	The business has defined, documented, standard processes/procedures that inform how people carry out their work. These processes/procedures inform role definitions and people are trained to use the processes/procedures. These processes/procedures include how the business engages with third parties (supply chain and consultants) and training extends to these parties. These processes/procedures include how the interfaces between parties and transition between phases of the project lifecycle are managed. Compliance to these processes/procedures is monitored.	The business has defined, documented, standard processes/procedures that inform how people carry out their work. These processes/procedures inform role definitions and people are trained to use the processes/procedures. These processes/procedures include how the business engages with third parties (supply chain and consultants), financing teams, business consultancy teams and operational service teams, and training extends to these parties. These processes/procedures include how the interfaces between parties and transition between phases of the project lifecycle are managed. Compliance to these processes/procedures are monitored.				


APPENDIX H SERVICE DELIVERY PLAN

	Service Delivery Plan	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

Project Name:

Plan Owner: (Project Manager)

Approved By: (CD/MD)

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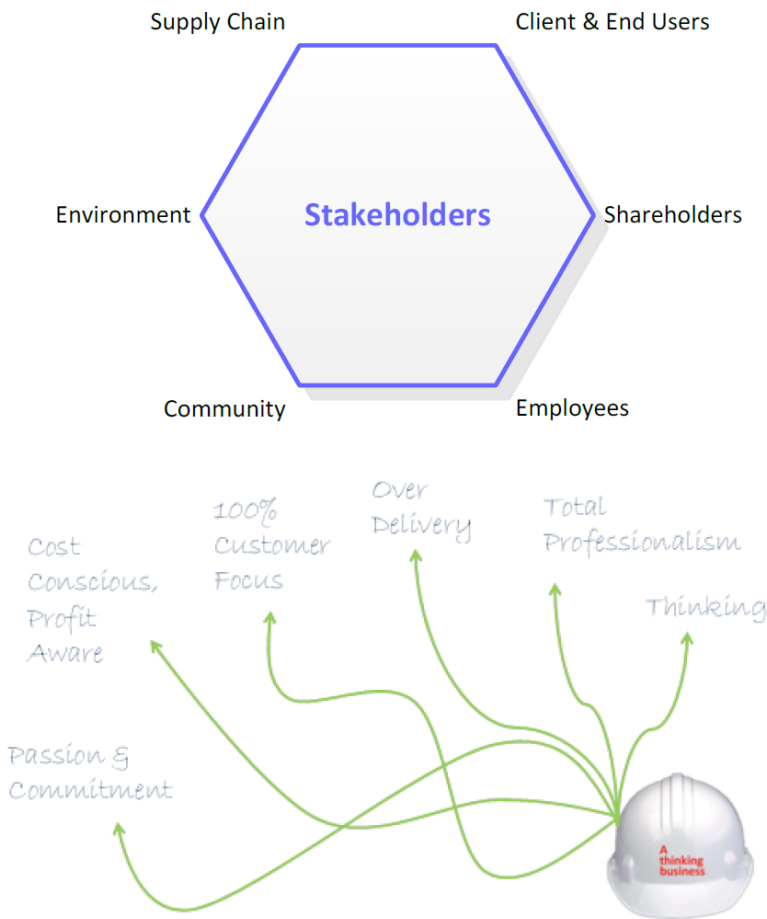
	<h2>Service Delivery Plan</h2>	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

Introduction

This Service Deliver Plan describes:

- How the Shepherd team will interface with the Client and key stakeholders such that their requirements and values are continually understood and communicated to the whole team throughout the project lifecycle, such that all project targets are delivered
- How the Shepherd team will use the Company Management System (The Shepherd Way) on this project to achieve stakeholder satisfaction and all project targets

This document is therefore the overarching Quality Plan for this project and as such will be audited as part of the Company's on-going accreditation to ISO9001.



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	<h2>Service Delivery Plan</h2>	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

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	<h2>Service Delivery Plan</h2>	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

Key Documents

This plan should be read in conjunction with the following documents:

Key Document	Document Owner	QMS Ref
Construction Phase Health & Safety Plan		HS2.1
Environmental Management Plan		PD10.8 (E7)
Risk Register		PD2.1
Subcontractor Quality Plans	refer to page 16	PD7.1
Temporary Works Register		PD8.2
Countdown to Completion Plan		PD12.1
Aftercare Plan		tbc
Complaints Register		tbc
Non-Conformity Register		tbc

Also included are the following appendices:

Appendix A	Schematic of Shepherd Company Management System
Appendix B	Commercial & Project Delivery Management System Tasks

Company Process	Service Delivery Plan	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

Customer Vision and Values

- Summarise the customer's vision and values
- What are their key drivers?
- Refer back to the tender process

	<h2>Service Delivery Plan</h2>	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

Project Objectives and Targets

Insert the customer's targets and aspirations that we have committed to delivering as part of our tender.

Customer Targets/KPIs

Q:

C: e.g. budgets

D:e.g. completion date

H&S: refer to pre-construction information provided by the CDMC

E: refer to pre-construction information provided by CDMC

Building Performance: i.e. lifecycle costs (refer to building performance and FM strategy document)

Facilities Management : i.e. maintenance costs (refer to building performance and FM strategydocument)

	<h2>Service Delivery Plan</h2>	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001


Shepherd Targets/KPIs

The following are the Shepherd specific targets and KPIs related to this project.

These targets are directly linked to Company Policies, company KPIs and business plan.

Delivery: <i>insert target dates and milestones</i>
Quality: <i>insert quality targets relating to audit and physical quality on site</i>
H&S: <i>insert AIR target, RIDDOR target</i>
E: <i>insert project specific water. Carbon, electricity & waste targets (take from Smartwaste)</i>
Cost: <i>insert expected margin from Trade up Plan</i>
Operation: <i>insert any handover & aftercare targets</i>

Client & Shepherd objectives and targets are cascaded to each member of the team through their individual Performance Objectives. Performance against these individual objectives is monitored through team meetings and annual individual Performance Reviews.

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Company Process	Service Delivery Plan	Shepherd Construction Ltd
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Team Principles

In order to ensure all project targets are met and a culture of customer satisfaction is developed and maintained, the team commit to working and behaving in the following way:

- *Insert team principles/charter etc.*
- *These can be developed with the team, including the client, at a team building event.*
- *The exact format of the output is at the discretion of the Project Manager*

Company Process	Service Delivery Plan	Shepherd Construction Ltd
		Quality Management System
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Relationships Diagram

The diagram below shows the key relationships between the client and the project team, highlighting the key decision makers, contractual relationships and lines of communication.

	Service Delivery Plan	Shepherd Construction Ltd Quality Management System Accredited with ISO 9001
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Current Concerns and Feedback

As the project progresses, the Client and end users focus and concerns will change. The table below will be used to capture the current hot topics, concerns and areas for the project team to focus on, thereby ensuring customer satisfaction throughout project duration. This section will also be used to record the feedback, complaints or compliments captured on the Customer Feedback Cards (sw ref tbc).

Date	Concern/Feedback/Complaint	Root Cause	Action	Who	By When

	<h2>Service Delivery Plan</h2>	Shepherd Construction Ltd
		Quality Management System
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Management of Correspondence and Document Management

Insert text explaining how documents and correspondence will be managed on this project, e.g. The 4Projects document control system will be set up as a document management tool on the contract, all information will be tracked using an IRS to help in the production, review and monitoring of the design information. It will be used to localise project information in a designated place for members of the project team to access, information stored will include:

- Contract Documentation
- Design Team Information
- Subcontract Design Information
- Design RFI's
- Design Team Meeting Minutes
- O&M Manuals
- Client Meeting Minutes
- Client Change Request

This system (accessed via the internet) will track newly uploaded information, the approval workflow and record the access history of each document. Because each document will sit in a workflow system (unless the information has merely been uploaded 'for information'), it will be clear what status each document is on the system (i.e. whether it is currently under design or construction approval). An individual depending on their user group may only see documents that are of a particular status, e.g. subcontractor personnel will only be able to view construction issue information. The system will also generate daily/weekly/monthly reports; it will also issue notifications to individuals when new information has been uploaded/updated for their attention.

There are three document statuses that may be generated:

- Status A - approved for construction
- Status B - proceed in line with comments
- Status C - rejected


All relevant members of the project team (consultant, contractor and subcontractor personnel) requiring access to the above information will be registered onto the 4Projects system by Shepherd Construction. A dedicated username and password will then be issued to the individual. Each individual will be assigned to a user group (e.g. your organisation's name) and each user group will access rights to the folders that they require access to.

It is noted that the Client wishes to maintain use of their collaborative portal P2.net. All proposals requiring Client's response or approval will be taken by the Shepherd Team from 4 projects and uploaded onto the T&W portal.

The client point of contact Paul North of Telford Council will be the conduit for coordinating comments on information available for client comment on P2.net.

We will keep paper copies of drawings, specifications etc. on site but will generally strive to use a paperless system for filing correspondence. We will have our own internal server installed on site that will incorporate our own document management and general filing systems.

- Refer to SCL Document Management & Control of Records (Policies/Procedures yet to be devised)
- Where BIM is to be implemented, refer to the project BIM Execution Plan.

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Company Process	Service Delivery Plan	Shepherd Construction Ltd Quality Management System Accredited with ISO 9001
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Meeting Schedule 2013
(update year as necessary)

January	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
February	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
March	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
April	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
May	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
June	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
July	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
August	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
September	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
October	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
November	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
December	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

Key:

Client Progress Meetings		Team Building Events		SCL Leadership Visits	
WIP		CSR Events			
Mid-Month Review		Countdown Meetings			
Design Team Meetings		BSI Audit			
Customer Feedback		Internal Audit			
Post Project Reviews		Group Audit		Bank Holidays	

	Service Delivery Plan						Shepherd Construction Ltd
							Quality Management System
							Accredited with ISO 9001

Quality Management for Build Stages and Major Packages

The table below outlines how the Quality Management System will be implemented for this project.

In each box state how the control will be implemented and who is responsible.

Quality Controls	Build stages/major packages							Notes
	QMS ref:	Ground Works	Concrete frame	Envelope	Internal fit out zone 1	Internal fit out zone 3	M&E	
Pre-start Meeting	PD1.3	✓	✓	✓	✓	✓	✓	
Collaborative Programming & Forward Planning Meetings	PD2.3	Every 8 weeks	Every 8 weeks	Every 8 weeks	Every 8 weeks	Every 8 weeks	Every 4 weeks	
Weekly Planning Meeting	PD2.4	✓	✓	✓	✓	✓	✓	
Daily Planning Meeting	PD2.5	✓	✓	✓	✓	✓	✓	
Sub-contract Progress Review	PD2.2	Monthly	Fortnightly	Fortnightly	Monthly	Monthly	Fortnightly	
Sub-contractor Quality Plan required	PD7.1	✓	✓	✓	✓	✓	✓	
Specialist Consultants required?				Cladtech to be appointed				
Mock-ups and Samples					On site mock up required	On site mock up required		
Handover Sign-offs	PD7.2		Staged handovers between zone sections		Trade to trade handover sheets required			
Stop Day Checks	PD7.2							
Quality Control Checklists to be used	PD7.2							
Inspection and Testing Plan required								

Compliance to the above will be monitored via Mid-Month Reviews (PD3.2) and internal audits (carried out by the Business Systems Team) and external BSI audits in accordance with the Company Audit Plan.

Company Process	Service Delivery Plan	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

Customer specific processes to be used (at customer request)		
Item	By Whom	Detail

	<h2>Service Delivery Plan</h2>	Shepherd Construction Ltd
		Quality Management System
		Accredited with ISO 9001

Change Control Procedure

Where there is a need for change control to be raised be it being a design or client change we propose to utilise our standard request for change form set out below which will be submitted and agreed and then summarised onto one master tracker document for review at our monthly meetings a sample of which is also shown in this section of the document.

A client change will be issued by Project Manager Paul North of Telford Council to Shepherd Construction Lead Rick Gray, these will be the only two people authorised to invoke and accept changes.

In the case of a proposed change instigated by Shepherd, a written request made by Rick Gray to amend the Employers Requirements / Contractors Proposals will be submitted to Paul North. The details to be submitted will include:

- Details of the original project brief and details of the proposed adaptation
- Reasons why the proposal is put forward
- Any cost implications
- Any programme implications / benefits

Any change in works may require a review and update of the subcontractor's Method Statement or Risk Assessment; this will be undertaken when required. Any CDM concerns will be incorporated within the design team agenda on a fortnightly basis.

The following documents will be used as part of this change control procedure.

REQUEST FOR CHANGE TEMPLATE

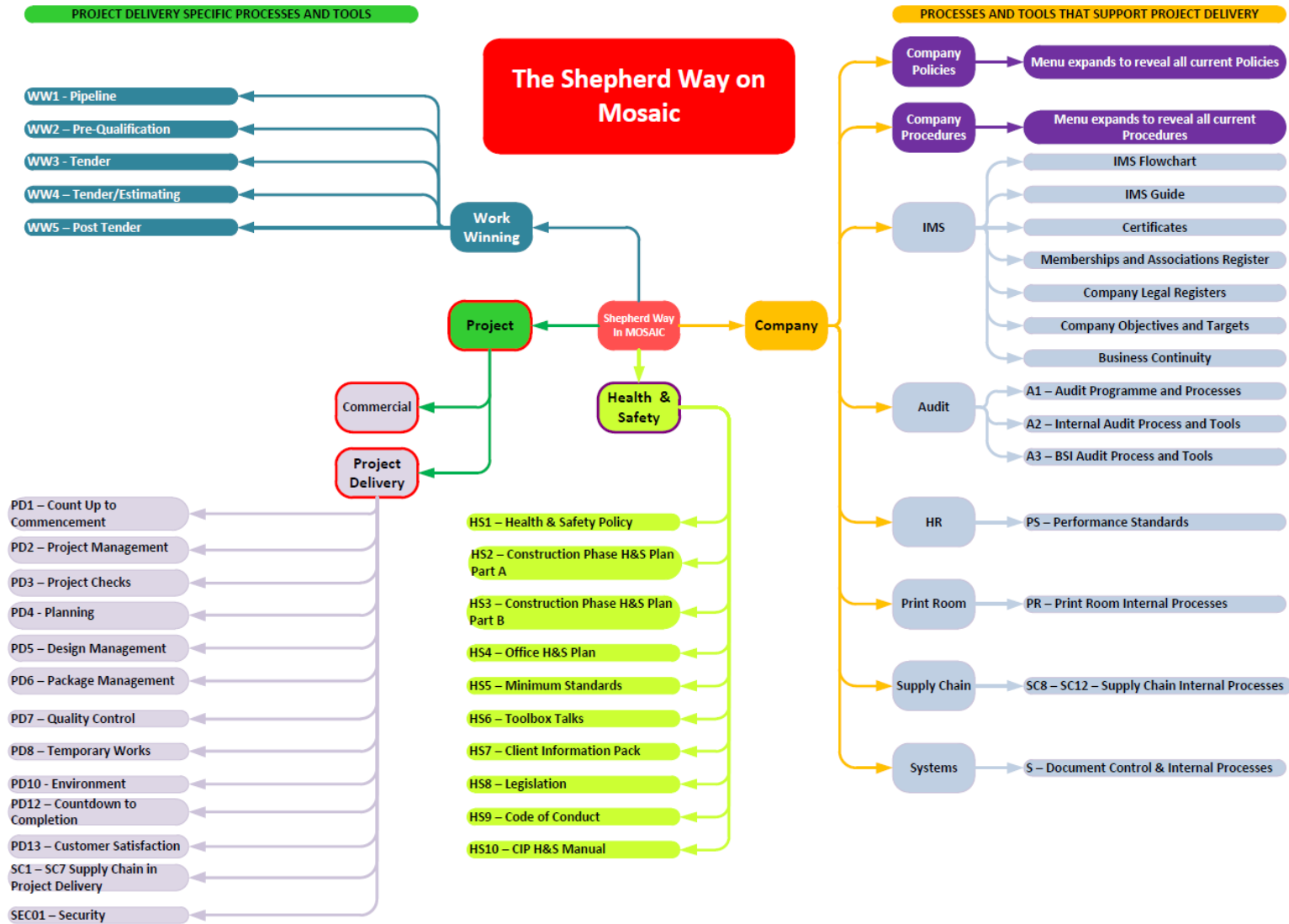
Request for Change			RFC No	<input type="text" value="0"/>	Shepherd
Project Name	<input type="text"/>		Date	<input type="text"/>	
Project Number	<input type="text"/>	Raised By	<input type="text"/>		
SOURCE OF CHANGE (Description of the request and originator including dates)					
<input type="text"/>					
SCOPE OF CHANGE (Description of the work necessary by design to carry out request)					
<input type="text"/>					
ESTIMATED TIME/COST OF CHANGE				EFFECT ON DESIGN PROGRAMME	
Staff member	Design Hours	Drawing Hours	Cost	<input type="text"/>	
Temp Works Mgr			0.00		
Temp Works Eng			0.00		
CDM Coordinator			0.00		
Design Mgr (Site)			0.00		
External Consultant			0.00		
			CHECK H2	CDM Implications to consider	
			Total Cost of change	<input type="text" value="£0.00"/>	
Supporting information as listed (Designer to complete to assist with evaluation of RFC/VO)					
<input type="text"/>					
No confirmation to proceed has yet been received <input type="text"/>					
DISTRIBUTION					
Divisional Construction Director	<input type="text"/>	<input type="text"/>	<input type="text"/>	NOTE : The above cost is based on 'internal' rates for the 2008/2009 financial year.	
Project Manager	<input type="text"/>	<input type="text"/>	<input type="text"/>		
Design Director	<input type="text"/>	<input type="text"/>	<input type="text"/>		
Design Manager	<input type="text"/>	<input type="text"/>	<input type="text"/>		

	<h2 style="margin: 0;">Service Delivery Plan</h2>	Shepherd Construction Ltd Quality Management System Accredited with ISO 9001
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Transition to Operation

Commissioning & Inspection (refer to Service Availability Checklist)
Countdown to Completion Leading to Handover and Occupation (refer to Countdown Action Plan)
Aftercare (including the management of defects – refer to Aftercare Plan/SFM Emergency Cover Plan)
Facilities Management (refer to FM Plan – where applicable)
Post Occupancy (data collection, feedback, support)

APPENDIX I THE SHEPHERD WAY



APPENDIX J ABSTRACT FOR FINAL JOURNAL PAPER

Delivering Integrated Solutions: A Need for Lean Thinking?

Over half of the top 20 UK construction companies aspire to provide services and solutions to their clients. This is a clear recognition that constructing on time, defect free and within budget is no longer a differentiator; instead competitive advantage can be gained from technical expertise, consideration of whole life costs and delivering the client's whole value proposition. The majority of literature addressing the evolution of products to service is theoretical, proposing strategic models and outlining the key characteristics of being an integrated solutions provider. In reality the transition pathway to becoming a solutions provider is difficult for organisations that have hitherto focused on product delivery. Through semi-structured interviews, observation of management meetings and project feedback, the problems encountered when trying to embed the characteristics of integrated solutions provision are examined within a leading construction firm undergoing such a transition. With flow of the value proposition between phases of the integrated solutions lifecycle lacking at crucial handover points in the delivery process, and inconsistent performance in core characteristics such as systems integration, lean thinking emerges as a proposed mechanism for 'how' to enact the products-to-service transition – something identified as lacking from the current literature.

Key words: integrated solutions provision, lean, value, flow, standardised work

APPENDIX K PROBLEMATISATION OF THE SHIFT FROM PRODUCTS TO SERVICES (PAPER 1)

Full Reference

Morrey, N., Dainty, A.R.J., Thomson, D.S., and Pasquire, C., (2013). Problematisation of the shift from products to services. *In: Smith, S.D. and Ahiaga-Dagbui, D.D. (Eds) Proceedings 29th Annual ARCOM Conference, 2-4 September 2013, Reading, UK. Association of Researchers in Construction Management, (1), 655-665.*

Abstract

Over half of the top 20 UK construction companies aspire to provide services and solutions to their clients. This is a clear recognition that constructing on time, defect free and within budget is no longer a differentiator; instead competitive advantage can be gained from technical expertise, consideration of whole life costs and delivering the client's whole value proposition. The majority of literature addressing the evolution of products to service is theoretical, proposing strategic models and outlining the key characteristics of being an integrated solutions provider. In reality the transition pathway to becoming a solutions provider is difficult for organisations that have hitherto focused on product delivery. Through semi-structured interviews, observation of management meetings and project feedback, the problems encountered when trying to embed the characteristics of integrated solutions provision are examined within a leading construction firm undergoing such a transition. It reveals a disconnect in approach between head office work-winning teams and regional project delivery teams that has resulted in a lack of continuity of service at crucial pinch-points in the delivery process. A silo mentality, resulting in a lack of common understanding across the team, can be traced to an organisational path dependency that stems from historical decisions, and is therefore very difficult to overcome. The paper suggests practical

mechanisms to help the business make changes to their working practices, routines and organisational structures. It is intended that these will drive the development of new capabilities allowing the organisation to break free from the paths it has become locked into to become a true solutions provider.

Keywords – integrated solutions, path dependency, service, transition, value.

Paper type – Conference

INTRODUCTION

The move towards service-led construction is becoming increasingly prevalent, with over half of the top 20 UK construction companies describing their intentions to provide services and solutions on their company websites. The service offering, also described as providing integrated solutions, involves "the bringing together of products and services in order to address a customer's particular business or operational requirements. Delivering integrated solutions to meet customer needs involves specifying, designing, constructing, financing, maintaining, supporting and operating a system/facility throughout its life cycle" (Brady et al. 2005b: 572.)

To date, the majority of work in the products-service field has focused on the development of theoretical models and the identification of the key characteristics of solutions provision (Foote et al. 2001; Galbraith 2002; Oliva & Kallenberg 2003; Brady et al. 2005; Gebauer & Friedli 2005; Baines et al. 2009). Empirical studies outlining the issues faced by companies undergoing transition are mostly concerned with the manufacturing and service sectors (Johnstone et al. 2009), with the few construction based examples being Private Finance Initiative (PFI) related (Johnstone et al. 2008; Leiringer et al. 2009). There is little comment on the specific difficulties that construction organisations face when they try to embed these characteristics, the root causes of these problems, or solutions available to enable them to overcome them.

Informed by semi-structured interviews and attendance at management and project meetings, the practical problems encountered when trying to embed the characteristics of service provision are explored in a case study of a leading construction organisation that is currently undertaking the transition from product to service provider. Following a discussion on the existing literature and an explanation of the research methodology, the issues faced by the

organisation are discussed along with some practical mechanisms that have been, and continue to be, implemented to drive change in the business.

TRANSITIONING FROM PRODUCTS TO SERVICES

The products-to-services literature originated in the manufacturing and service industries where the primary driver for the move to servitisation was the economic gains to be had through providing services centred on an installed base of products, i.e. service and maintenance contracts for products already sold (Oliva & Kallenberg 2003). The Institute for Manufacturing's high value manufacturing framework (Livesey 2006) classifies the types of manufacturer in a products-service matrix according to whether revenue is being generated by products or services, and whether the majority of costs are associated with production or non-production activities. Manufacturers that have the majority of their costs in production and generate the majority of their revenue from the sales of these products are deemed to be traditional product manufacturers. Those who have begun to generate revenues from services associated with the products they produce, yet whose majority of costs still lie in the production activity, are described as service-led producers. When the majority of costs lie in non-production activities the business is a systems integrator, undertaking the complex activity of organising third party specialists to design and produce components that they must integrate into a functioning product (often a one-off): the sale of which generates the majority of revenue. Finally, service manufacturers have shifted their focus to providing services associated with their products, generating revenue from services and therefore having their costs associated with these non-production activities. Ultimately these companies may sell off their production capability entirely, wholly basing their business on providing support and services across a range of products.

Applying this framework to construction, a product manufacturer would be a company whose revenue is generated mainly through the construction of the product, i.e. the building, with the majority of costs being associated with the production activity, i.e. labour, plant and materials. In other words, a product manufacturer in the construction industry is a building business that tenders for and builds construction projects, with margin being generated by the act of building alone. Should that type of business then begin to generate the majority of revenue through services associated with that product, for example maintenance of the asset, but with majority of its costs still being associated with the production activity, it would have become a service-led producer. Systems integrators, although still generating the majority of revenue through the production and sale of the building, have the majority of their costs associated with non-production activities, for example consultancy costs and design development costs: "These firms outsource detailed design and manufacture to external suppliers and contract manufacturers while maintaining in-house the systems integration capabilities necessary to co-ordinate a network of external component and subsystem suppliers" (Davies 2004:731). A systems integrator is therefore a business that tenders for work and uses their expertise to integrate consultants and supply chain members to develop the best product for that customer given the brief, then managing that team to deliver the product. Although value and margin are generated through design and procurement of sub-contract packages in addition to the building, the majority of revenue still comes from the production of the building. As with systems integrators, the majority of costs for a service manufacturer are also associated with the non-production activities, although these activities have now expanded into business consultancy, financing opportunities and engagement of third party experts. Therefore, the key difference for the service manufacturer is that revenue is generated not only from the construction activity, but also from financing opportunities and aftercare services, such as facilities maintenance and operation. Service manufacturers (solutions providers) are

therefore businesses that service a client's business needs, not just their building needs, through the provision and maintenance of an asset that has been tailored to let the client deliver their business objectives. Within the case study company, this concept of solutions provision as described by Alderman et al. (2002) is articulated as, for example, a desire to provide education facilities, rather than just building schools, which are designed and operated such that pupils achieve the desired exam results; or to provide healthcare facilities that enable the trust to achieve target waiting times and patient care costs, rather than just building a hospital and handing over the keys. However, questions remain as to whether this approach is viable given that service-led construction projects are not necessarily more profitable (Lind & Borg 2010).

The case study company is currently aspiring to make the transition from product manufacturer/systems integrator to service manufacturer. It would be easy for a business to claim that it develops "solutions" for its clients and is therefore a "solutions provider" or "service manufacturer." However, although companies claim they are delivering solutions, the underpinning requirements of solutions provision are difficult to embed in practice. The case study company is striving to implement these characteristics fully as opposed to creating a veneer of solutions provision through their marketing and work-winning activities: a transition that they recognise will require fundamental shift in the ways in which they mobilise and integrate their collective capabilities.

RESEARCH METHODOLOGY

Since the research aim was to uncover the problems associated with embedding the characteristics of solutions provision, a qualitative approach was taken within a case study organisation, allowing an in-depth view of life to emerge through observations and the opinions of those involved (Easterby-Smith et al. 2008; Fellows & Lui 2008).

The case study company is a national UK contractor. Originally founded as a local builder, the business now operates from a number of regional offices that are supported by central functions such as procurement, design, finance, information systems and marketing. The business is part of a group of business that, having historically worked independently, are now actively looking for opportunities where they can horizontally and vertically integrate their offering to provide a full service that ranges from financing, design, construction through systems integration, mechanical electrical services, off-site manufacture and facilities management.

A literature review identified the characteristics of solutions provision. Brady et al. (2005b:573) state that firms wishing to make the shift to integrated solutions need to develop capabilities that "coalesce around four areas: systems integration, operational service, business consulting and financing." These four areas have been used as an evaluative framework from which a set of semi-structured interview questions was derived and against which management and project team meetings have been observed and benchmarked.

Fifteen semi-structured interviews were carried out with people from work-winning and project delivery teams, information systems (IS) and senior managers within the case study company. Over the course of twelve months the researcher also attended project launch, post project review and bimonthly management meetings.

The problems uncovered have been considered with respect to a prior study that identified the organisational path dependencies that exist within the business. Path dependency refers to the idea that events and decisions that have taken place in the past continue to influence current decisions and ways of working such that an organisation becomes locked into paths from which it can't break free (David 2001).

THE PROBLEMS ENCOUNTERED IN PRACTICE

Using the characteristics identified by Brady et al. (2005b) as a framework, each of the four characteristics is discussed, along with the problems encountered when trying to implement them in practice. Comments in quotation marks that are not referenced have come from the interviews, visits and meetings observed, and remain unattributed to maintain participant confidentiality.

Systems Integration

Systems integration, deemed to be the core capability (Brady et al. 2005b), concerns the ability of the business to integrate and manage all parties involved, both internal and external, in the design, development and co-ordination of components and systems such that they come together as a functioning asset, i.e. a completed building.

From the 1980s, when the business grew through acquisition from a local, regional builder into a national contractor, it ostensibly became a systems integrator, managing sub-contractors, suppliers and consultants in the delivery of construction projects. More recently, the vertical integration of the construction, mechanical & electrical services and facilities management businesses within the group provided the opportunity for increased integration and whole life cycle offering to the client. Yet, despite, arguably, years of experience in systems integration, there remain challenges in embedding the characteristic to a repeatable standard.

Systems integrators need to maintain relationships with customers and ensure the integration of all parties throughout the project. However, "due to busyness of work-winning teams and time taken to convert projects, work-winning team involvement often ends at handover," i.e. on contract award the team who won the contract hands it over to a new team who are responsible for building it. Project managers, tasked with the construction phase of the

contract, speak of feeling "vulnerable as they don't understand the history (of the project to date) whilst others around the table (the client and consultants) do." Clients are therefore presented with a new set of faces at handover, resulting in deterioration of the customer relationship as the delivery team feel they "don't know what they are building" and that "someone else has sold something we can't deliver." In addition, there is duplication of effort as the delivery team re-work activities that have already been done by the work-winning team, but which haven't been communicated to them. Similarly, project delivery personnel are often unavailable to support work-winning teams as they are busy completing their current projects: one senior manager noted that "requests for resources are often made and sometimes given."

Systems integration fundamentally requires continual co-ordination of all parties involved: client, sub-contractors, suppliers, consultants, etc. This disconnect between work-winning and project delivery teams, the "front end" and "back end" business units described by Foote et al, (2001), is therefore an anathema to achievement of systems integration. Inadequate resource planning, lack of resources and transient project delivery teams determined by geography rather than project requirements are all underlying issues which result in inadequate handover and therefore a severing of the flows (Koskela 2000) (of, for example design information) that are critical to systems integration. These issues in turn are reinforced by commercial and accounting practices. For example staff costs have to be recovered to live projects, driving the behaviour of keeping the amount of time spent on work-winning activities to a minimum. Further, in the case study company, the disconnect between work-winning teams, which includes head office staff, and regional project delivery teams, is a path dependency rooted in historical events.

Systems integration with other group businesses is similarly influenced by history and continually reinforced by each business operating its own processes in isolation, having their

own project teams that duplicate responsibilities, and having to meet individual company profit and loss targets that drive competitiveness rather than collaboration. There are examples of commercial teams sending letters regarding variations and additional charges to their counterparts at another group business when they are working on the same project, essentially moving money around the group rather than taking an overall project perspective. Supply chain integration is inhibited by clients influencing forms of tendering, i.e. competitive, which often lead to "solutions" becoming value engineering alternatives that are driven by bid competitiveness rather than client needs. The case study company also reverts to its "builder" mentality: another ingrained path dependency. Intention to collaborate with supply chain members through sharing of future opportunities, open book costing and design development to achieve best solution often resorts to "scoping" of quotes at the last minute in order to ensure a competitive bid, i.e. reducing a sub-contractors quote by a certain percentage without their knowledge at tender stage with the intention to let the work to another sub-contractor/state they have to meet that price to retain the contract.

Business Consultancy

The transition to solutions provision necessitates a subtle but drastic shift in the understanding of what "solution" means. Presently, in the main, the case study company receives a tender enquiry and will work to develop alternative designs and solutions to the specification and drawings developed to date by the client and their team of consultants. Submitting a non-compliant bid, i.e. a building design that is outside the tender specification, is a gamble that may or may not pay off.

However, an organisation that is a solutions provider is not just looking to offer alternative building designs and specifications. Business consultancy capabilities should enable a deep understanding of the customer's business, not just their proposed building specification and

use. Business consultancy skills should be used to understand the client's business objectives and fundamentally assess how they might meet these business needs - a new building may or may not be a requirement. Solution refers to business solution, not building solution.

In the first instance, finding clients at this early stage is rare as traditionally they approach contractors at a later stage in the process and then choose forms of tender and contract that require competitive bidding. Much work is needed to enable earlier engagement with clients, along with likeminded clients who are prepared to embrace the aspects of business consultancy required to ultimately enable solutions provision.

Senior managers in the business acknowledge that the ability to resource work-winning teams is an issue as operational pressures take precedence. Despite a core of work-winning staff, additional staff supplement these teams as and when they are released from on-site roles. Work-winning teams therefore become 'jack of all trades and master of none,' with their focus being on design alternatives rather than client business solutions.

This situation is exacerbated by a lack of information and poor feedback and learning loops. Information relating to all aspects of previous projects, including post occupancy data, should be available to all in the group so they can use that intelligence and technical information to shape future solutions. In reality, there are "no real feedback loops, arrogance and availability of previous information is scant" and "post occupancy surveys currently not on the agenda." In addition, the in-house developed IS enterprise management system (used for example for managing project information, customer details and invoicing) is seen as not being user friendly, and since it cannot be accessed by other businesses in the group is a barrier to information capture, sharing and analysis.

The departmental silos, family business heritage and IS infrastructure are organisational path dependencies, uncovered in a previous study (Morrey et al. 2012), that can be seen to be influencing the transition to solutions provision. Historical decisions lead to the creation of

separate businesses and regions within businesses that still do not share information. The family business heritage is evidenced in the insular approach and unwillingness to learn, hence the "arrogance" regarding collecting feedback, exacerbated by systems that people are reluctant to use.

Operational service capabilities

One of the group businesses is a facilities management (FM) and interiors refurbishment business. This business has the capabilities to maintain, update and manage the operation of a building and its systems throughout its lifecycle.

The challenges associated with this characteristic of solutions provision are concerned with the ability of the group of businesses to overcome their organisational silos. Presently, information is not shared across the businesses in the group as each has separate systems and processes, and teams are not shared across projects. Involvement of the FM business is thought about as projects delivered by the case study company are coming to completion on site, rather than at the start of the relationship with the client when there is opportunity to use the FM business' expertise to inform the solution. This ineffective "handover" from the team in the case study company to the team in the FM business is the same as that discussed previously where the work-winning team hands over to the project delivery team. The client suffers at this pinch point where information flows are interrupted due to the arrival of new people with no prior experience of the project and a lack of process/mechanisms to enable them to quickly gain the knowledge they require.

Financing

Finally, the capability to "provide customers with assistance in purchasing new systems and in managing their installed asset base" (Brady et al. 2005b: 573) is a characteristic of solutions provision. PFI, a means of procuring public infrastructure developments, are probably the

most well-known means of private businesses providing funding for construction activities and the basis of the service manufacturer examples in the construction sector (Johnstone 2008; Leiringer 2009). The challenge within the case study company is finding a willingness to commit resource, and therefore find those with the skills, to proactively look for opportunities for manufacturing service. The wide range of funding opportunities, for example providing loans for construction phase, supporting the client's cash flow or making much longer term investments, on one hand provides plenty of options but on the other can seem daunting. With the business currently winning the majority of its work competitively and therefore reactively, encouraging people to spend more time up front in investment considerations is proving difficult: imminent work takes priority. The subsequent challenge having identified an opportunity is gaining approval from the Group Board and shareholders to provide funding to the client, which requires being able to evidence robust processes that are fully complied with, thereby proving there is appropriate governance and risk management protecting their investment. In an organisation that has grown through regional acquisitions and has regional silos that have led to local ways of working, satisfying the Group Board that there is appropriate governance is challenging.

Summary of findings

The problems encountered touch many aspects of the organisation: people, rewards, accounting practices, organisational design/structure, resource planning, processes and systems. At present, these are primarily designed to support production activities and, as such, associated measures and targets continue to drive the product manufacturer/systems integrator agendas rather than the new strategy for solutions provision and its inherent focus on customer needs.

In addition, the imbalance in focus - in terms of resources, capability, targets - between the front end and back end teams needs to be evened so that there is a mutually supportive arrangement. Front end teams need to have the business consultancy and financing time and skills to negotiate and develop opportunities, receiving the same recognition and incentives as the back end teams who need to continually develop their capabilities and improve the offering that the front end teams can sell.

A strong centre (Foote et al. 2001) that sets a clear strategy and mediates between teams across the business is therefore required in order to connect these aspects of solutions provision and ensure they are working towards the same goal. Similarly, feedback loops that prompt reflection and learning will also enable teams working in different phases of the project life cycle to connect their activities with the wider goal of developing and delivering solutions.

PRACTICAL MECHANISMS TO MAKE CHANGE

Despite the problems outlined in the previous section, the business has had some success in solutions provision, although there remains much more work to be done before it could be considered that it is able to do this repeatedly. As suggested by Brady et al (2005b), the learning gained from projects where the business has specifically focused on delivering solutions has been captured and is being used to develop company-wide processes and capabilities.

During the last three years, founded on lean philosophy, the business has involved its people in the development of standard processes that are aimed at ensuring consistency across all the business and repeatable systems integration. These standard processes, which include lean construction techniques such as Last Planner (Ballard & Howell 2003), have been implemented through in-house delivered training, compliance audits and management checks.

Changing the business' operating routines has been shown to help overcome some of the path dependencies (Morrey et al. 2012) and has also helped develop new capabilities as well as improve performance. These now need to be developed further, paying attention to ensuring there is a flow of common understanding (Pasquire 2012) across all parties involved in the project thereby enabling the co-creation (Vargo et al. 2008) and delivery of value.

More recently, the business has restructured its professional support services - IS, business systems, finance, marketing and human resources - so there is one team for each function that works across all group businesses. It is anticipated that aligning the strategies of these service departments to the group strategy of service manufacture will support the transition. For example, part of the IS strategy is an enterprise content management system that will provide the platform for shared processes and shared information, all of which can ultimately be extended to third parties to ensure full collaboration. Also, the Building Information Modelling agenda, being led by the UK government and some clients, and therefore arguably an accepted reason for change, is being used as a mechanism to improve information collection, encourage innovation and manage knowledge. This will support the business consultancy and systems integration characteristics of service manufacture.

CONCLUSIONS

This paper contributes to the growing construction related products-service literature by providing an insight into the practical problems faced by a contracting organisation that has a vision to become a service manufacturer, providing solutions to its clients. With the majority of literature primarily based in the manufacturing and goods sectors, and also consisting largely of theoretical models and generalisations in terms of what needs to change, for example, 'develop capabilities' and 'restructure' that make the transition seem simple

(Johnstone et al. 2008), by contrast this study describes the day to day complexities associated with making these changes.

Using the characteristics outlined in Brady et al. (2005) as a framework to examine where the problems lie offers a way of exploring readiness to provide integrated solutions, in addition to showing the relevance of these characteristics to the construction sector. What remains unclear are the relative importance of each of the characteristics to making the transition to service manufacturer, and the priority of addressing these in a business that is concurrently delivering a number of projects, not all of which demand an integrated solutions approach.

Having operated for over a century, for the majority of the time as a product manufacturer, the business is struggling to overcome its path dependencies, existing routines and organisational structure that have all hitherto been aligned to meeting internal performance targets. Realigning all these aspects of the organisation to attend to the new strategy of service manufacture, the purpose of which is adding value to the customer by "providing products and services that create unique benefits for each customer," (Brady et al. 2005a:362) has been shown here to be challenging.

Repeatable systems integration, arguably yet to be proven to be the core characteristic, remains problematic even in a well-established contracting business. The opportunity for deterioration in the understanding of customer value at specific "handover" points in the project jeopardises not only the customer relationship but also the chances of the team delivering the desired outcomes. Organisational structures, accounting practices and reward mechanisms, along with outdated processes, all serve to reinforce the old strategy.

Similarly, integration across the group of businesses is also problematic in practice. Historical decisions taken to ensure each business could operate independently now inhibit collaboration. The creation of Professional Services teams that serve all of the businesses is

aimed at developing human resources, information systems, finance, marketing and business systems strategies that will reach across the divides.

The problems discussed here are actively being addressed by the business which is currently juggling the implementation of a new strategy whilst also having to continue to deliver product in a traditional way. In particular, practical mechanisms are being developed that will bring operating routines in line with the new strategy, actively encouraging people to work differently and thereby develop new capabilities.

Finally, the paradox of developing bespoke solutions for each client versus creating standardised offerings that can be picked to create a client specific package has yet to be solved. In the relatively new and immature marketplace for integrated solutions in the construction sector, the company is currently pursuing a variety of opportunities in which it can engage with clients, focusing on their individual needs, rather than creating standard services and/or products that it tries to fit to customer needs. Whether economies of scale and learning from delivering solutions will drive the business down a certain route is yet to be seen, but will undoubtedly be considered in future work.

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APPENDIX L DEVELOPING A STRATEGY TO ENACT LEAN (PAPER 2)

Full Reference

Morrey, N., Pasquire, C., & Dainty, A.R.J., (2011). Developing a strategy to enact lean. *Journal of Engineering, Project, and Production Management*, 3(1), 35-45.

Abstract

This paper explains the strategy employed by a case study company to implement lean across the business, and to reflect on the success of this approach so other companies may consider this learning and how it might be useful to them.

The strategy to enact lean in the case study company was based on creating a number of standard tools/ways of working. These tools can be considered to be standardised work for key aspects of the construction process that the company undertakes. The aim of the tools was to ensure that critical tasks would be carried out to the correct standard (quality, time, cost, health & safety) every time, across the business. Achievement of this is expected to lead to improved performance and elimination of variation (waste).

To implement this strategy of using standardised work to eliminate variation and lead to improved performance, a step-by-step process was developed to create the tools/standardised work. The paper describes the process that was undertaken and how it aimed to not only produce a number of tools/standardised work, but also to involve people and managers from across the business such that lean philosophy and thinking might also begin to become embedded.

The paper will firstly explain, with reference to the relevant literature, how and why the strategy to implement standardised work was chosen, the process that was defined to develop the standardised work, and what happened when that process was put into practice.

The findings of the paper show that whilst the completed tools delivered business benefits, the development of the tools did not follow the planned process. The paper discusses how people within the business responded to this strategy and how the process had to be continuously adapted to cope with the current business environment and path dependencies, further evidencing that lean implementations need to be tailored to suit the needs of the individual firm, rather than there being a one size fits all solution.

Further, the conclusions will be set in the context of what lean has become to mean to the case study organisation, and how this sits in the wider debate of whether lean is an all-encompassing philosophy or a set of prescriptive tools and techniques.

Keywords – lean, standardised work, waste, strategy, change, process

Paper type – Journal

INTRODUCTION

The case study company is a main contractor whose scope of works encompasses the design management, construction and refurbishment of building across the UK. The business was founded in 1890 and became renowned as a family building business in the North East of England. Through a number of acquisitions in the 1970s the business developed regional presence across the UK, and by the 1990s was delivering major construction projects. Today, the business employs approximately 400 people and has an annual turnover of ~£250m which is split across three operating divisions that are run from regional offices in the South, West and East of England. In addition to the three operating divisions, the business also has a number of support functions, for example estimating, human resources, health and safety, marketing, supply chain management, ICT and business improvement, that provide expertise and support to each of the individual project teams. The Company delivers projects that include schools and colleges, student accommodation, hospitals and laboratories. These projects are won through competitive tendering and framework agreements. The average project value is £21m, with over 85% of the cost of each project being outsourced to sub-contractors who are chosen and vetted as part of the Company's supply chain.

The Company is currently implementing a change programme based on embedding lean principles such that it can continually improve and meet business targets. This change programme is central to the Company's strategy.

A recent stage of this change programme was to develop and implement a number of tools/ways of working that could be standardised across the business to ensure that critical tasks are carried out consistently to the correct standard, thereby ensuring risks are mitigated and projects are delivered as planned, achieving the planned profit target.

Recent work within the lean community has described how lean tools and techniques have been adapted to suit a particular company (Court, et al., 2008; Carneiro, et al., 2009). Rather than describing the completed production system however, this paper explains the rationale and detailed step by step approach behind how a set of tools, adapted from the concept of standardised work, were developed in a bid to engage people from across the business in the improvement process. Whilst the outcome of the strategy, i.e. the completed standardised work, is important, it is the process by which it was achieved that is described and analysed in this paper. Management support, time given to improvement activities, employee engagement and motivation, and identifying and communicating the need for improvement, set in the context of organisational performance, all identified by Mitropoulos and Howell (2011) in their model of performance improvement process, are discussed in terms of what the case study company actually did in order to try to ensure all these aspects were embedded into their improvement process.

Having described the process developed by the business to create its standardised work, the paper then goes on to explain what happened when the process was put into practice; it explains how people in the business responded, what aspects of the process were adhered to, and how the process had to be continually adapted throughout in order to achieve the end goal of the completed tools. What actually happened is discussed in the context of what this means for the business in terms of being able to make future changes, and also in terms of other recent lean construction literature. For example, the ability of people to engage with improvement strategies is highlighted in terms of knowledge and capabilities, and the influence of the company culture on ability to change and learn is identified (Hirota & Formoso, 2001; Morrey, et al, 2010).

Finally, the conclusions of the paper are set in the context of defining lean. The experience of the case study company is used to suggest that lean cannot be defined in isolation of context,

and is therefore neither a set of prescriptive tools and techniques on one hand or an ambiguous “complex cocktail of ideas” on the other (Green, 2000, p.2.) but something that needs to be adapted to suit the needs of the business and its culture and objectives.

THE COMPANY BUSINESS CASE

At any one time, the case study company will have approximately 20 on-going projects being delivered by project teams across its three operating divisions. Whilst some projects were able to deliver results in terms of on time delivery, cost and quality, other projects failed to do this and were considered to be “bad jobs,” i.e. completed late and made a loss. This level of inconsistency in delivery of projects on time, within budget and to the required quality has lead not only to individual project losses, but sometimes to an overall business loss. In this sense, the business had established a sense of urgency to change, the first of the eight stages in Kotter’s process for creating major change (Kotter, 1996).

During this time the business was delivering an in-house developed and delivered project management training programme to its senior managers (project leaders, contracts managers) and front line managers (deputy build managers, gang supervisors). The development of the training material for these courses highlighted a lack of documented, defined ways of working; ways of working had to be hastily written in order for the training course material to be completed, rather than the training course material being based around existing company standards and processes. In addition, delivery of the training courses highlighted the fact that different divisions of the business, and even different project teams within divisions, were developing their own ways of working, in some cases creating new processes and templates at the start of each project.

In response to the inconsistent performance and the learning from the training programmes, the business carried out an analysis of post project review findings. Rather than poor project

performance being found to be due to complex situations, it was a lack of application of the basics of project management that were found to be the causes, for example:

- Poor handover of information from the tender team to project team
- Inadequate design management

Variation in ways of working was clearly leading to inconsistency in project performance, with different project teams defining and re-defining how they worked; a business waste in itself. These findings prompted two main requirements; the need to reinforce these basics across the business, and the need to clearly define a benchmark of what “good” looked like so it could then be communicated and embedded across the business.

The business therefore decided to develop a number of “tools” that would become the standard way project teams would carry out certain critical project management tasks.

Developing these standard, internal working practices would provide a consistent framework for project teams, despite any project specificities. The prime objective was to ensure that these critical tasks could be carried out to the same standard, every time, by every team, mitigating the risk of finishing late and over budget.

This objective became one of the strategic functional imperatives outlined in the Company strategy document, and as such could be considered to have buy in at Board level.

Table 1 below shows the tools that the business decided should be developed and standardised. This list of tools was determined following an analysis of post project reviews and based on the areas highlighted as being inconsistent during the delivery of the learning programmes. As an aside, post project reviews are reviews held at the end of projects to understand what went well and what did not go well.

Table 1 List of tools developed and description of purpose

Tool name	Description of purpose
Tender launch meeting agenda & checklist	Ensure all the tender team review all the project information and agree the tender strategy
Final price meeting agenda	Ensure all tender information is presented appropriately for approval before submittal to client
Sub-contractor appraisals	Method for assessing and communicating sub-contractor performance
Forward load for sub-contractors	Method for giving sub-contractor companies a forward view of workload
Tender handover agenda and checklist	Ensure all information and assumptions made by the tender team is communicated to the project delivery team
Project launch meeting agenda	Agenda to ensure the project team review all project information, agree objectives and team set up at the start of the project
Construction director mid-month review	Check list for construction directors which details all the activities and tools they should be checking their project teams are carrying out
Project team checklist	Checklist for the project manager which details the critical tasks and tools he should be checking his team is implementing and maintaining
Package management	Set of 7 tools which allows creation and purchase of a sub-contractor package such that it meets the clients requirements

Quality essentials plan	Means to identify key quality control risks and actions to mitigate them
Handover sheet	Sheet to be signed off by preceding trade on site signifying the next trade can commence work
Stop day check sheet	Checklist of items to be checked and signed off before the next stage of works can commence.
QA checklist	List of quality control instructions, relating to a particular type of work e.g. bricklaying, to adhered to
BREEAM issues summary sheet	Sheet listed all actions required to achieve the BREEAM rating
Project commercial review and KPIs	Checklist for commercial managers to use to assess whether the project team are undertaking the required commercial tasks
Verification of client funding check	Checks to be made by finance team to ensure that the client has the funding for the project
Risk health check	Executive Board checks to ensure that the project team are properly resourced and managing risk appropriately
Countdown to completion	Set of 6 tools that ensure account is taken of all the items required to complete the project and handover the relevant information to the client team

A STRATEGY TO ENACT LEAN – DEVELOP STANDARDISED WORK

The decision to develop a set of tools, and the way these tools were developed, became the strategy by which the business could enact lean principles in practice. The business called

this stage of the lean implementation plan the “stabilisation” stage in recognition of that fact that “it is only when the process is stable that you can begin the creative progression of continuous improvement” (Liker & Meier, 2006, p.111).

Both the tools themselves, and the process by which the tools were developed, were to become vehicles for embedding lean principles and techniques, i.e. strategies to enact lean in practice.

The completed tools can be considered to be a version of standardised work, one of the core lean tools. The important thing to note however is that this is a *version* of standardised work which has been developed to suit the needs of this business. Adapting existing methods to suit the individual business’ need has similarities to another case in the lean construction literature. A Brazilian construction company developed their own production model, called the PS-37, based on Goldratt’s Theory of Constraints (Goldratt, 1990) and 5S, the five senses of organisation (Carneiro et al., 2009). The PS-37 case study paper (Carneiro et al., 2009) describes the steps of the production process that was developed by adapting existing lean methods; this paper in contrast does not explain what the completed tools are, but describes how the tools/standardised work were developed, how the approach taken differed in reality from the planned approach, and what this means for the business as it continues to try and implement change based on lean principles.

Standardised work documents the current, best practice for carrying out a particular activity/process. The result is that activities can be carried out consistently, ensuring that the desired results of quality, cost, delivery and health & safety will be achieved every time (Liker, 2004; Liker & Meier, 2006).

From a Company perspective, this elimination of variation in project performance is a reduction in waste. In addition, creating the standardised work in itself forces wastes in the work methods to be identified and eliminated by those who are carrying out the work.

Once defined, the standardised work, which represents current best practice, would then become the Company's Management System, and therefore be the baseline for training and continuous improvement. In addition, the content of the Company Management System is that which is audited as part of the Company's accreditation to the ISO9001 quality management system standard, which is based on the Plan Do Check Act approach. (Deming, 1986; British Standards Institution, 2008).

THE PROCESS TO DEVELOP THE STANDARDISED WORK

Previous research has identified that little attention has been paid to the ways companies develop their production models/processes; "very little attention has been given to the methods top competitors use to make content decisions that originate their production systems" (Carneiro et al. 2009, p.384). The next section of this paper therefore explains in detail the process that the case study company undertook to develop the standardised work, which would become the content of their Company Management System, i.e. their production system.

The process developed to produce the standardised work had two main objectives:

- Produce the right tools
- Engender employee involvement and empowerment

Concerning the first objective, the "right" tool was defined as:

- A way of working that would enable the correct output(s) to be achieved each time. This would be specific to each individual tool.
- One that was lean, i.e. allowed the task to be carried out efficiently (process waste eliminated).

Aside from the objectives stated above, the business did not explicitly set measurable targets that were to be achieved as a result of implementing the completed tools, for example, x% projects complete on time, or y% reduction in defects. The fundamental principle that consistent, current best methods would lead to improvements in quality, cost and delivery was accepted as a given, and as such that focus for the development of the tools was concentrated on involving people with the right experience to identify what currently worked well and develop it into a standard format/tool. The process to develop the tools was therefore much more process focused than results focused (Mitropoulos & Howell, 2011), emphasising the need to get the process and method right in order to reap the required results.

Regarding the objectives of the strategy, there was a conscious effort not just to follow the mentality of trying to implement a particular lean tool, i.e. standardised work, but to set that in the context of the wider aim of becoming a lean organisation where people were involved in the improvement process and had an understanding of what lean was and what it was trying to achieve in wider terms.

The senior management team had identified the areas for improvement and the 18 tools that should be developed based on the findings from the analysis of post project reviews (see table 1 previously). Rather than the process improvement team develop these tools by themselves, the Process Improvement Manager (the researcher) set about developing a process by which people from across the business would be involved in the improvement process. The table below shows the 12 working groups of people who were convened, each lead by a Process Improvement Facilitator, to develop the tools.

Table 2 Working group members and the tools they developed

	Team 1	Team 2	Team 3	Team 4	Team 5	Team 6	Team 7	Team 8	Team 9
Sponsoring director	Peter Bates	Richard Alport	Peter Millett	Phil Greer	Phil Greer	Peter Bates	Sean Smylie	Peter Bates	Phil Greer
Process improvement facilitator	Craig Fletcher	Mark Wheatley	Mark Wheatley	Nicola Morrey	Craig Fletcher	Martin Elms	Mark Wheatley	Nicola Morrey	Craig Fletcher
Process leader	Colin Sargeant (construction director)	Neil Clarke (construction manager)	David Crampton (construction director)	Chris Smith (construction director)	Paul Waller (construction manager)	Mike Armstrong (construction manager)	Stephen Price (commercial director)	Steve Crampton (commercial director)	Mike Trigg (construction director)
Working group members	Andy Haylock (estimator)	Antony Gaukroger (supply chain)	Neil Darnton (estimator)	Paul Steele (project manager)	Trevor Lawrance (subcontract buyer)	Phil Curran (design director)	Gary Walton (commercial manager)	Paul Marsland (commercial manager)	Paul Surtees (planner)
	Shaun Baker (estimator)	David Perrin (subcontract buyer)	David Murray (training manager)	Mick Bodecott (project manager)	Paul Flynn (QS)	Stuart Jessop (quality manager)	Simon Woolcock (commercial director)	John Dixon (business development)	Graham Hope (project manager)
	Guy Tristram (site manager)	Tim Goddard (commercial manager)	Jon Howland (estimator)	Neil Matthias (site manager)	Selina Manton (subcontract buyer)	Mark Owen (H&S manager)	Paul Marsland (commercial manager)	Marcus Kidd (finance manager)	John Lavin (project manager)
	Gary Walton (commercial manager)	Paul Eastwood (supply chain)	Andrew Constantine (commercial manager)		Rob Rushworth (planner)	Mark Richardson (site manager)	Farooq Lakada (finance manager)	Nick Summerfield (construction manager)	East managing QS
	Andy Beale (planner)	Mark Kenyon (QS)	Nigel Moore (project manager)		Danny Baker (estimator)			Derek Urquhart (construction manager)	
Tools to be developed by the team	Tender launch meeting agenda and checklist	Sub-contractor appraisals	Project launch checklist and agenda	Construction director mid month review	Package management	Quality essentials plan	Commercial manager measures	Risk health check	Countdown to completion
	Final price meeting agenda	Forward load for sub-contractors	Handover agenda & checklist	Project team checklist		Stop day checks	Verification of client funding		
						QA checklists			
						Handover sheets			
						BREEAM issues summary sheet			

Since a number of people would be involved in developing the tools, the Process Improvement Manager felt it was important to have a defined, documented process for developing the tools in order to make sure that the correct tools would be developed and that managers could review and check the work being produced. A set process would also allow the Process Improvement team to facilitate the groups of people in the same way, to the same standard.

Each group, guided by the Process Improvement Facilitator, would undertake the process defined by the Process Improvement Manager, with the end outcome being the completed tools that could then be implemented by all project teams across the business.

The Process Improvement Manager started by defining the top-level improvement process, which is shown in figure 1 below.

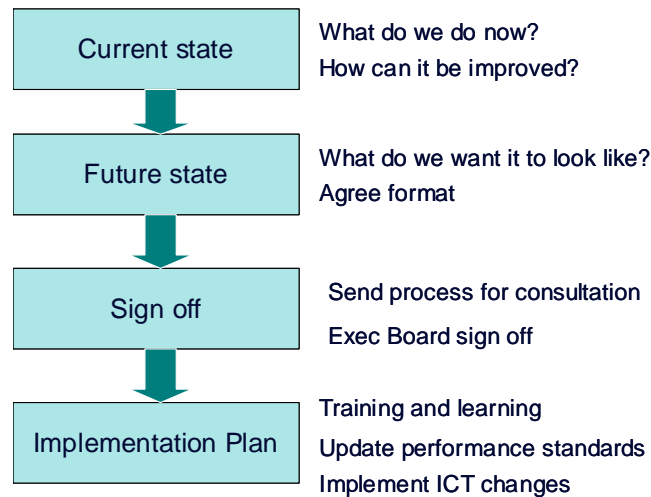


Figure 1: Process Improvement process

The first step of the process is concerned with understand current conditions. This meant that in the first instance each group was to understand what currently happened in this area of project management, whether any existing forms or templates were already in use, and whether these achieved the desired results.

Having understood what was currently happening, each group then had to determine what should happen in the future. The group has to develop the tool, whether it was an agenda, a checklist, a form to be filled out that would enable that critical aspect of project delivery to be carried out to the required standard every time. The team had to develop the content of the tool and its format, i.e. would it be in Word, Excel, landscape, portrait, etc.

Once the group had completed their tools they had to be reviewed and signed off by senior management. Following sign off, the approved tools would then be implemented across the business. Implementation would include ensuring the tools would be embedded into the Company Management System, that training would be identified and delivered to ensure that all the people who needed to know how to use the tool would be able to do so to the correct standard. In addition to training, performance standards (job profiles) would also be updated to reflect the changes required of the roles that had to use the tools. Similarly, any changes to

the Company ICT system that would need to be made to accommodate changes to process would also be identified and implemented.

This top level improvement process is something the Process Improvement Manager had been taught as part of being trained by SMMT (Society of Motor Manufacturers and Traders) Industry Forum engineers, who had been trained by the Japanese engineers at Nissan and Toyota.

Having set the top-level process, based in principle on having groups of people develop the tools, a detailed process was drawn up for each of the groups to follow. The overall process for developing the tools consisted of 23 steps. The process was drawn up into a process map using Visio process mapping software. In addition to the process, some of the process steps had defined tools that the Process Improvement Facilitators should use to help them carry out that step of the process. These tools included standard presentations and meeting agendas.

Figure 2 shows part of the detailed process map for developing the tools.

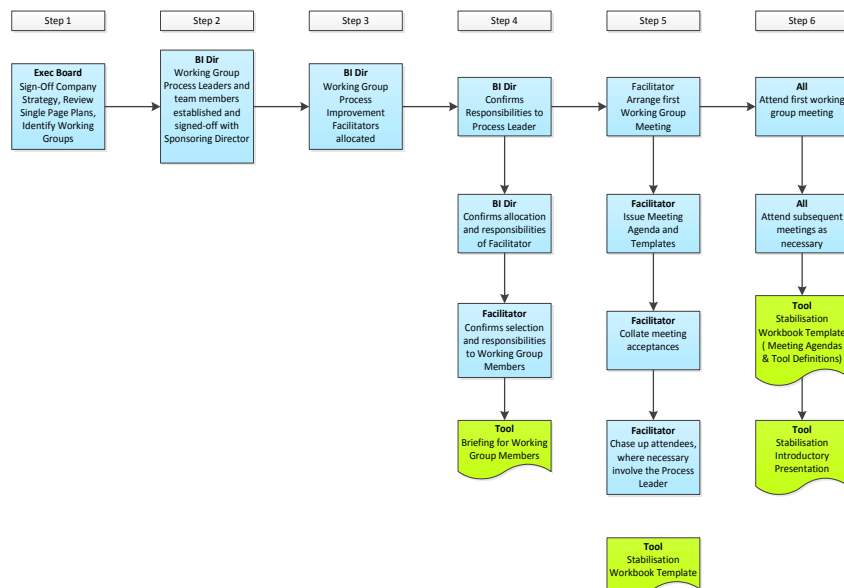


Figure 2: Extract of the strategy for developing the stabilisation tools

The square boxes define each step of the process, while the document boxes refer to the tools that the Process Improvement team used for carrying out that step of the process.

The following sections discuss the key elements of this 23-step process and why the Process Improvement Manager developed the process in this way and how this process was designed to embed a culture of lean thinking and give the people involved experience in process improvement and problem solving.

Employee Involvement and Empowerment

A common discussion surrounding standardised work is that of whether standardisation actually disengages people and makes their working lives too rigid, stifling creativity. Toyota's view of standardised work is that "rather than reinforcing rigid standards that can make jobs routine and degrading, standardised work is the basis for empowering workers and innovation in the workplace." (Liker, 2004, p.142). Adler (1999) talked about democratic Taylorism in the sense that Toyota was encouraging workers to become the problem solvers and develop their own standardised work, rather than having it imposed on them by someone else. Toyota believes that the key to achieving balance between rigid procedures and freedom to innovate "lies in the way people write standards as well as who contributes to them." (Liker, 2004, p.147). Further to this, the way processes are developed, tested, evaluated and documented and communicated appear to be important factors in being able to effectively transfer knowledge and allow new processes to be learned so that a business can overcome dependencies and change (Teece, et al., 1997; Zollo and Winter, 2002).

To this end, the 12 working groups were set up to develop the tools. These groups consisted of people from a range of relevant disciplines and from across each area of the business. The groups were lead through the process of developing the tools by the Process Improvement team facilitators. Involving the process experts from across the business would ensure that current, best working practices would be revealed, debated and agreed in the final form of the tool. A second aim was that taking people through a structured process and involving them in

the development of the tools would introduce them to a problem solving/improvement mindset that they would be able to take back with them into their day job, hopefully more empowered to effect change. In other words, begin to teach and coach people the improvement process, referred to as the improvement kata and coaching kata. (Rother, 2010; Liker & Rother, 2011).

Communication of Purpose

The process included ensuring that the working group members understood the reasons the business was developing the tools and what the next steps would be. The first working group session was focused on explaining the approach to developing the tools and why they were needed in the context of the wider business. The aim of this was to try to engender in people the need for change, and to ensure people would be working for the benefit of the whole organisation, and not just focusing on their immediate project or area of work.

For example, step 5 of the process was “Attend first working group meeting.” This meeting had an agenda that the process improvement facilitators were to use, and a presentation whose content included explaining the purpose of the tools and why they were needed by the business.

Defined Roles and Responsibilities

The roles and responsibilities of the working group members, process leaders and sponsoring directors were defined, documented and communicated to the individuals as part of the process. The aim was to ensure people were clear of what was expected of them.

Table 3 below outlines the roles and responsibilities written for working group members. Similar roles and responsibilities were defined for process leaders and sponsoring directors.

Table 3 Working Group Roles and Responsibilities

Roles and responsibilities of working group members:

- Challenge current processes, tools and checks through attendance at the improvement workshops facilitated by the business improvement champion
- Propose improvements to the process, tools and checks
- Share ideas and feedback to colleagues during the improvement process; feed comments back into the working group
- Be involved in developing the implementation plan for introducing the new proposals
- Own and complete actions on the implementation plan
- Be a champion of the new processes and tools on your projects/in your departments and with your peer group

Senior Manager Involvement

Senior managers at all levels of the business were involved in the process of developing the tools. Executive Board directors were allocated as “sponsoring directors” for particular working groups. The aim was to ensure that the groups had a figurehead for their work, and to ensure that the directors themselves would engage with the improvement process. Middle managers, such as construction directors, were assigned as “process leaders” of the working groups. It was felt essential to involve these managers, as they would ultimately have to ensure their teams’ compliance in using the completed tools.

Additionally, the support and understanding of management was also required so that they could support the people from their teams who had been chosen to take part in the working groups; ensuring people would be released and encouraged by their managers to participate would be important. Management support is recognised in Mitropoulos and Howell’s (2011)

model of performance improvement process as being a contributory factor to making operational improvement.

A steering group was also set up to oversee the progress of the development of the tools, ensure that the agreed process was being adhered to, and to provide leadership and support through emphasising the importance of the work at every opportunity. The steering group were supposed to be the guiding coalition (Kotter, 1996) who could oversee progress and make decisions and provide leadership for the benefit of the whole business, not just viewing things from a single perspective.

Check Points

Regular checkpoints were built into the process to ensure the working groups were progressing as planned, and that the tools being developed would be fit for purpose. Check points included reviews of progress with the sponsoring director, progress reviews with the steering group and formal sign off of the tools by the Executive Board before they were released as the standard to the whole Company.

IT Support

In order to allow the working groups to share information and work on the same documents a new IT filing structure was set up that would allow the groups access to each other's work, retain version control and eliminate the need for e-mailing documents to each other. The aim was to use IT as a mechanism for improved collaboration and sharing, creating a different environment and way of working that would in itself reduce duplication and waste, but also promote a team ethos and sense of shared purpose.

WHAT HAPPENED IN PRACTICE?

Much effort was put into developing a strategy that would not only produce the right set of tools, but also perhaps more importantly begin to educate and engage people from across the business in the improvement process and lean philosophy. However, implementing the process in practice and attaining the intended outcomes proved to be much more difficult in practice than on paper.

In the main, the Process Improvement team were able to follow the top-level strategy of working with the groups to understand the current tools in use within the business and develop the future state tools with the teams. However, scheduling the sessions with working group members was a constant challenge due to lack of availability, with most sessions taking place without the full group in attendance. This meant that the Process Improvement team had to do follow-ups with individuals to ensure they were kept apprised and involved, rather than the team being able to work collaboratively.

The strategy employed to develop the tools was aimed at engaging and involving employees, and clear roles and responsibilities for those involved were set out. Individuals within the working groups did engage with the strategy at the facilitated working group sessions and became enthused with developing the tools they had been assigned to work on. Some groups felt particularly empowered by the strategy, and felt barriers between company departments and teams were being broken down as they gained a shared understanding of each other's roles. However, outside of these sessions, individuals seemed to go back to their day jobs, which did not include spreading the message of what they had learned. In the main, the majority of the individuals did not carry out their working group roles as defined, in many instances leaving the Process Improvement facilitators to carry out most of the actions.

Arguably one result of this was that the intended ownership of the tools was taken away, with the only resulting gain being completion of the tools within the required timescale.

In particular the checkpoints that were to be undertaken by the Executive Board directors and steering group were not adhered to. Due to a lack of availability, which could ultimately be said to be a lack of priority, progress reviews with Board directors were rarely undertaken. In order to maintain progress, these checks were effectively abandoned, with the result being that the tools required more re-working when they were finally reviewed at the end of their development. In addition, the whole Board did not sign off all the tools; the strategy was again amended and final sign off fell to one Board director. This was despite the strategy of developing the tools being part of the Company business plan, bringing into question how that plan had been developed and the level of top management buy in. It is possible that senior managers were being asked to engage in a strategy that they felt threatened by due to it being new and outside of their experience and knowledge. Whilst needing skills to cope with and lead change is not limited to change based on lean principles, this highlights the need to consider the difference between management and leadership, and the skills needed for both, in a lean organisation (Bodek, 2008).

Outside of those in the working groups, a commonly held view was that standard tools would turn people into robots, with little scope for creativity or innovation. This is a view that is evidenced in a case study of a Japanese automotive transplant to the UK where reality was reported to be reduced worker autonomy rather than empowerment (Garrahan & Stewart, 1992). These concerns are counter to the intended strategy that was aimed at involving people in developing their ways of working, providing a mechanism for continuous improvement, but fundamentally to create tools that would allow the creativity to be in the way they used the tools, rather than the tool itself.

WHAT DID WE LEARN?

The previous section discussed what actually happened when the strategy developed was put into practice. These experiences are now discussed in the context of the challenges to the business in terms of future process improvement activities, and how these experiences relate to existing lean construction literature.

The lack of engagement in the strategy by some individuals has led the researcher to consider whether individuals had the capabilities to engage fully with the strategy and carry out the working group roles as defined. Whilst project teams overcome problems on a daily basis, getting to the root cause of problems and preventing their reoccurrence is not a common way of thinking, i.e. the process improvement process was unfamiliar. Previous work has pointed to construction managers being influenced by their tacit knowledge, and that this knowledge is in turn influenced by organisational culture and beliefs (Hirota & Formoso, 2001; Carneiro et al., 2009). Using the Myers-Briggs Type Indicator (Briggs Myers et al., 2003), which uses a forced answer questionnaire to identify an individual's preferences, analysis shows that approximately 70% of senior construction managers in the case study company base their learning around what they think they already know, indicating that asking them to do something different is asking them to go against their tacit knowledge.

Other research being carried out within the case study Company proposed that path dependencies existing within the business were influencing the way it, and its people respond, to change (Morrey, et al, 2010). Path dependency refers to the idea that events from the past continue to influence current decisions and ways of working. Historically within the case study company ways of working were prescribed by functional heads, and individuals were not involved in the development of their tools/processes. This path dependency has meant the majority of people in the business have not had to develop process improvement skills as a

natural part of their day-to-day life. It is suggested that within Toyota the problem solving cycle has become tacit as a result of an organisational learning process, and that it is this, rather than the cultural factors that makes the difference to how they operate (Spear & Bowen, 1999; Hirota & Formoso, 2001). The strategy of engaging individuals in developing their own processes, by setting up the working groups, was aimed at overcoming this path dependency by introducing people to the problem solving/improvement process. However it is evident that it will take more than one exposure to the improvement cycle to overcome the path dependencies and embed the improvement and coaching katas such that they become custom and practice, and ultimately tacit knowledge that everyone in the business possesses. Overall, it could be said that individuals at all levels did not engage as envisaged with the strategy. Although this was identified and highlighted at the time, the designated leadership did not intervene in the intended ways, leaving the Process Improvement team to drive the strategy without the backup of the guiding coalition or Executive Board. When the working groups and roles were set up, the vision was that all parties would be engaged and enthused by the lean agenda, however this assumed that those individuals wanted to be involved and also that they shared the same goals for the organisation. The developer of the strategy, who had learned from lean texts such as the Toyota Way (Liker, 2006), Lean Thinking (Womack & Jones, 2003) had assumed a unitary perspective of the organisation (Fox, 1974; Burrell & Morgan, 1979) i.e. that all parties would want to strive for the common goal and that the strategy was in everyone's interests. In reality, all those asked to engage with the strategy had their own interests, and without clear leadership from senior management as to the importance of this strategy, their day jobs took precedence. The pluralist perspective of the organisation, where individuals and groups have their own interests with only fleeting interest in the goals of the organisation (Morgan, 1997) is one that was evidenced here, and which Green and May argue has been largely ignored in the lean construction debate (Green & May, 2005).

Another point of contention was sign offs and checkpoints that had been built into the strategy to ensure progress was being made but also to ensure the tools being developed were fit for purpose. Some individuals complained that in the end their opinions would not matter as management would eventually over-rule what they wanted. Arguably the planned strategy developed by the case study company was controlling the level of empowerment and participation. Stuart Green (1999, 2000) suggests that this reinforces the hard human resource management approach that is typical of construction and allows managers to use lean rhetoric as a disguise for further command and control. However, in a pluralist organisation, where individuals only have a passing interest in the goals of the whole organisation, at some point there needs to be some decision making by management. In a pluralist organisation conflict is an accepted characteristic of the organisation and interest groups play for power, with the task of management being to “shape the debate and convince competing parties to follow their chosen course of action.” (Green & May, 2005, p.501). So rather than the unitary approach of managers being able to implement lean irrespective of the actions of others, the pluralist approach sees management as being responsible for shaping the debate and convincing competing interest groups. Certainly in this case it fell to the Process Improvement team to carry out the convincing in order to ensure the strategy, in its continually adapting form, was completed. The challenge seems to be finding the balance between employee empowerment and involvement and a need to take decisions to steer the business in the right direction.

CONCLUSIONS

In direct response to the business need to eliminate variation in performance the case study company decided to develop a set of tools that can be considered to be a form of standardised work, which is a lean improvement technique. But more than just picking a lean technique from the toolbox and applying it in isolation to achieve a specific business result, the

organisation was aiming to enact lean at a philosophical level also, encouraging a change in mind-set through the way it went about developing the standardised work. In other words, the strategy to develop the tools was aimed at developing improvement skills and encouraging employee involvement and empowerment. So to what extent can the strategy of developing a set of tools to enable the enactment of lean be considered to have been successful?

A set of tools was produced and a full implementation plan to embed them across the business was completed. There is tangible evidence of improved project performance and a level of consistency and control of projects has been attained. An Executive Board member has given feedback that the improvement in projects completing on time can be attributed to this aspect of the lean strategy. In this sense, the result of the strategy, i.e. implementing the lean technique of standardised work, has proved successful.

While there is the tangible output of the completed tools and their impact, to what extent has this strategy been successful in engendering a lean thinking mind-set? Some of those individuals involved feel this strategy has given them the first opportunity to take ownership of their ways of working, and they continue to propose further improvements. However in general, people have returned to their day jobs. Until the improvement process becomes a recognised part of everyone's role, and they are given the skills and coaching to do it, only pockets of a change in mind-set will exist.

Perhaps most interesting though is how enactment of the strategy played out in practice compared with what was planned. As discussed in the previous section, precise adherence to the process to develop the tools was not achieved. At all stages throughout the development of the tools the process was amended and re-developed to make it achievable in practice. So what does this tell us about lean and how its enactment needs to be approached?

Firstly, the day-to-day needs, politics, and pressures of the business mean practice does not conform to theory, and therefore any strategy to enact lean needs to continually respond and

evolve to overcome barriers. It is not a case of setting out on a clear path and sticking to it rigidly, but rather accepting that what will happen in practice will be different, with the challenge being to keep reinventing the approach until it works within that organisation. Not only do the current internal and external environments impact on the strategy, but path dependencies also play a part. Whilst the approach of developing standardised work always remained, the way the business went about developing it evolved from the planned process as events unfolded, and people in the business reacted in certain ways. The end goal was achieved, albeit not exactly as planned.

Secondly, the business did not attempt to become lean by implementing a set of prescriptive tools and techniques. Instead the business took the theory of standardised work and developed a version of it to suit its purpose. This is similar to other cases described in the literature; the PS-37 case study (Carneiro et al., 2009) describes how Goldratt's theory of constraints were developed to suit the internal and external circumstances of the business, recognising that there is no one right way to make decisions but that myriad factors will play a part. Similarly, Ko et al. (2011) apply the 4Ps of the Toyota Way (Liker, 2004) to develop an improvement strategy for formwork engineering. The experience of this Company reinforces that there is not a one size fits all solution to lean implementation. Contrast this case study company's approach with that of another which designed a lean and agile construction system for a large mechanical and electrical project (Court, et al., 2008). In this case one of the objectives of the system was to meet a company objective of being incident and injury free. This determined the way that system was developed and communicated across the project team. In all of these examples, the companies can be said to have implemented lean, and yet the company business cases, approaches and practices by which that had happened are different.

So what does concluding, “one size does not fit all,” mean for those trying to define lean and how it can be implemented? The experiences here support the adaptation theory of the diffusion of lean where local factors and path dependencies play a part in how lean is played out in practice, rather than a diffusion model which suggests elements of lean are universally applicable and can be copied from one place to another regardless of context. (Scarborough & Terry, 1998; Green & May, 2005). This also highlights the need to discuss lean diffusion in context; doing so in abstraction of context becomes meaningless since context defines everything in terms of what lean becomes.

In this case, the business has not tried to implement a set of lean tools and techniques, and nor has it tried to directly emulate the approach of another. The case study company has made lean fit for its own purpose, responding to its own needs, capabilities and external environment. It has taken a “lean as a philosophy” approach and developed its own strategy for implementation, which it has learned it must continuously adapt in order to meet the ever-changing context in which it is being enacted.

So is lean without definition? On the one hand it is seen as an ambiguous “complex cocktail of ideas including continuous improvement, flattened organisation structures, teamwork, the elimination of waste, efficient use of resources and co-operative supply chain” (Green, 2000, p.2.), and on the other a prescriptive set of universally applicable tools and techniques. Can each company define what lean is, in which case it becomes “good management?” Or is there a set of fundamental guiding principles that can be appropriated and re-shaped in a contingent way? If, as evidenced here, lean implementation needs to be based on adaptation theory, founded on a set a fundamental principles, then lean can only begin to be defined within an organisational context, meaning local factors and path dependencies need to firstly be defined. Lean cannot be defined in abstraction of these conditions.

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APPENDIX M THE IMPACT OF PATH DEPENDENCIES ON LEAN IMPLEMENTATION WITHIN A CONSTRUCTION COMPANY (PAPER 3)

Full Reference

Morrey, N., Pasquire, C., & Dainty, A.R.J., (2010). The impact of path dependencies on lean implementation within a construction company. *Lean Construction Journal*, 2010 Issue, 86-96.

Abstract

Hypotheses: The hypothesis under consideration is that path dependencies can influence the implementation of lean and enactment of that strategy in practice.

Purpose: The effect path dependency has on a lean implementation is being investigated using a major UK construction company as a case study. This paper describes the nature of the issues arising from path dependency and presents the preliminary findings.

Research Design/Method: A literature review on path dependency has been carried out, with emphasis on finding literature concerned with path dependencies in the context of implementing change.

Findings: The paper finds that many elements that are required to implement and embed a lean culture are path dependent.

Limitations: The findings from the literature review are not limited to a particular company or industry, and so the findings concerning elements that can influence change being path dependent have a wide relevance.

Implications: The implication for industry is that history matters, and that it is necessary to understand the past and the path dependencies in existence within a business in order to change the future.

Value for practitioners: A study of path dependencies could be considered to be a form of root cause analysis of barriers and/or enablers for change within the business. It is suggested that other practitioners could carry out a study of the path dependencies that exist within their business in order that any lean implementation/change programme can be tailored to either overcome or capitalise upon these dependencies and to ensure that the change programme will be fully realised and sustainable.

Key words – Path dependency, lean, standardised work, construction, lean implementation

Paper type – Journal

INTRODUCTION

The case study Company is a UK main contractor with an annual turnover of ~£300m, whose projects include schools and colleges, student accommodation, clinics and residential, mainly won through competitive tendering and some PFI. The average project value is £21m, and over 70% of the cost of each project is within the supply chain, with the Company having a small direct labour force.

The Company is currently implementing a change programme based on embedding lean principles such that it can continuously improve and meet business targets. This change programme is central to the Company's strategy. A recent stage of this implementation plan was to develop and implement a number of tools (ways of working) that could be standardised across the business to ensure that critical tasks are carried out consistently to the correct standard, thereby ensuring risks are mitigated and projects are delivered as planned, achieving the planned profit target.

The tools are the equivalent of standardised work, one of the core lean tools. If a method of working ensures delivery on time, to the correct quality and cost and safely, why not work that way every time? Documenting the set standard way of working ensures there is a standard to train people against. The set standard also provides the baseline for continuous improvement; if there is no baseline, then any improvement cannot be quantified or realised across the whole business, and any improvement will be not be sustained. The tools are also aimed at eliminating waste, such as bad quality (reworking of tasks) and process waste, from the way these tasks are carried out. These tools will be fully embedded when every project team is using all the tools to the correct standard.

The development and implementation of the tools has so far taken nearly 12 months, and still all the tools have not yet become custom and practice on all projects. Prompted by the length

of time taken to embed the tools, and feedback from those within the business regarding the way the tools have been developed and taught, it was decided to consider whether the business is locked into path dependencies that are constraining its ability to change.

Path dependency refers to the idea that events and decisions that have taken place in the past continue to influence current decisions and future ways of working. In other words, past decisions have locked the organisation into pathways that constrain future choices and ability to respond to change.

Since implementation of lean requires a change in thinking and practices, it will be of value to understand these path dependencies so that future lean implementation plans can either capitalise upon, or overcome these dependencies by enabling new paths to be generated.

Therefore the hypothesis under consideration is that path dependencies can influence the implementation of lean and the enactment of that strategy in practice. In the context of the case study Company, the hypothesis has been considered from the perspective that had a path dependency study been carried out prior to the start of their lean implementation strategy, the implementation plans could have accounted for and/or capitalised upon the existing path dependencies. It might therefore have been possible to generate new paths that would have realised the full extent of the lean strategy in practice and within the planned durations.

This paper discusses some potential path dependencies that have been identified from initial feedback received during the implementation of the tools across the business, and outlines some further work to be carried out that will aim to confirm these dependencies and propose how they might be addressed so that the strategy of lean implementation can be enacted fully in practice.

OVERVIEW OF LEAN IMPLEMENTATION TO DATE

In the last three years, the business has begun to adopt lean construction techniques, such as collaborative planning, to make improvements in terms of cost, quality and time. Recently two main events have served to drive the implementation of lean, and make it central to the Company strategy.

A recent poor result prompted a review by an Executive Board director of causes of project failure. A review of post project review documentation revealed that the causes of loss making projects were due to lack of “basic” construction management activities, for example package management, design management.

At the same time, the business was also embarking on delivering two major learning programmes. These in house training programmes, aimed at first line managers (people putting tradesmen to work) and advanced managers, (senior managers of at least one project team) were to be delivered by Executive Board directors or directors within the organisation. The aim of the major programmes was to ensure all managers at each work level knew the activities critical to project delivery, how to carry them out, and where necessary, teach them to others. Development of the module material highlighted that there were no current, standard, best practices available within the business that could be taken and taught. In addition, delivery of the major programmes, particularly the advanced manager programme, further highlighted the lack of process and consistency when the individuals from each part of the business shared their ways of working. Not only were practices different across different operating divisions of the Company, but also across teams within these operating divisions. Coupled with the evident range of competencies and capabilities, this reinforced the need to develop and embed standard ways of working.

These two circumstances therefore directed what was called the “stabilisation stage” of the Company’s lean implementation plan. The aim of the stabilisation stage was to develop and implement, as standard across the business, 27 tools that would ensure tasks critical to successful project delivery were carried out to the correct standard on each project, every time, resulting in management of risk and therefore consistent project delivery. In this case, “tools” can be considered to be aids that define the way to carry out a task or step of a process, for example a template/proforma document such as a procurement schedule template or final price meeting agenda.

The identified tools were developed by twelve groups of approximately six people who represented the different company departments who had a stake in the tools they were developing. Each group had people of different levels of seniority, a sponsoring Executive Board director, a senior manager as a group leader and were facilitated by the improvement team. The aim of having groups made up of people from different areas of the business was to capture the current, best practices that had been found during the major programmes.

Following Executive Board sign off, implementation of the tools across all project teams and departments was carried out using a number of methods. Presentations delivered by an Executive Board director and the process improvement team were made to groups, by department or role, outlining the purpose of the tools, what they were, who should use them and why and how they had been developed. Interactive workshops sessions were facilitated by the process improvement team for groups of people by role type, supported by the company Managing Directors, to review each tool in detail and discuss how to implement it. Support was also given to each project team; the allocated process improvement champion for that project would work with the project team on site to coach and support them in the use of the tools as these activities took place. (See fig1)

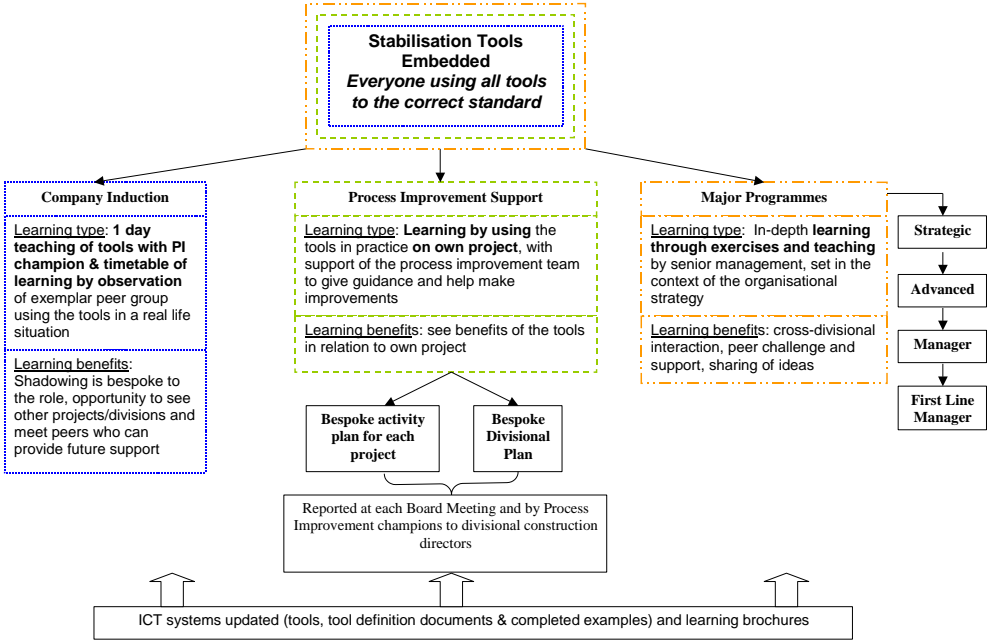


Figure 1. Embedding the tools through Learning and Support

The intent was to provide a set of standard tools that would ensure that critical activities are carried out consistently. In most cases, the completed tools were developments and amalgamations of current working practices, not totally new activities people were being expected to carry out. Four of the tools are management measures and checks. The purpose of these measures is to ensure managers are checking that their teams are using the tools to the correct standard and to identify areas for improvement and individual development. In the long term, the measures and checks will identify areas for continuous improvement in the tools themselves, the individuals and teams using them, and on the specific projects themselves. In addition, the standardisation of critical tasks should enable the teams to carry out these tasks easily and efficiently, therefore releasing potential time spent re-inventing the wheel on every project and defining ways of working with that team, meaning there is more time for innovation, improvement and delivering value.

However, a number of questions arise: to what extent is this strategic intent understood, and to what degree are the tools mutating as they are cascaded through the business and put to

use? Have our path dependencies locked us into paths that inhibit us from enacting the strategy in practice and influenced this mutation of the use of the tools?

PATH DEPENDENCIES IN THE CASE STUDY COMPANY

Feedback from presentations, workshops and on-site support has been captured, collated and reviewed by the improvement team. This feedback has been captured from verbal feedback, workshop feedback forms, and onto flipcharts in “what went well” sessions at the end of workshops and presentation sessions.

As stated by Cowan and Gunby (1996), the constraints concerning understanding path dependencies include the level of detail required to support empirical work, and how to understand which seemingly minor historical details might have had an impact in order to identify what might have been.

DEVELOPING AND DOCUMENTING PROCESSES

The assertion is that a firm’s routines are specific to that firm, and are therefore its history, as these routines have been learned and reinforced over time (Teece, et al., 1997; Coombs & Hull, 1998). Therefore, if the routines are a firm’s history, in order to understand these routines fully, you need to understand the history, the path dependencies, too. In terms of imitating a competitor therefore, you would need to have a very detailed understanding of that company’s history and paths. Toyota have shared their way of working with supply chain and competitors, with their production system being documented in many books and papers e.g. *The Toyota Way* (Liker, 2004), perhaps because they understand that an entire company history and culture is not easily replicated.

There is empirical evidence that understanding routines, and the way routines are coordinated, is critical to process improvement, change and overcoming path dependencies; “an organisation cannot improve that which it does not understand” (Teece, et al., 1997, p.525.)

Historically the case study company’s procedures and policies were controlled and managed by the Finance Director. Only those directly concerned with the policy or procedure, for example the manager of that department, updated them. Updated procedures and policies were sent out to senior managers for consultation and then circulated for implementation. It has not been common practice in the past to always involve people in the development of procedures/tools, therefore people are perhaps locked into the way they believe or perceive our tools are developed and implemented. People getting used to being involved will require new path generation, which might mean giving them the skills to follow this path.

A new document was developed to capture information and guidance for using the tools. Many people reported that they found this tool definition document too wordy, and many workshops sessions highlighted the fact that people had not taken the time to read any supporting information. Conversely though, those that took the time to read the documents did so diligently and returned with detailed comments, demonstrating the different learning styles of the people involved.

In terms of the tools themselves and their purpose, many people have commented that we are now asking to do even more than before. They see new forms and agendas and perceive something extra, rather than a structured, consistent way to many of the things they already did. This has been a particular issue for high performing individuals, who have taken some convincing that not all teams worked the way they did; many of the high performing individuals and teams took for granted the good practices that they had and had not considered that others might work differently. This highlights the project, rather than Company focussed, way of thinking. This might also help to explain the lack of sharing and

lessons learned, as every team looks inwards, rather than considering the experience that other teams and areas of the business could bring to their projects; we are locked into a project based way of thinking, where asking for help and support is seen as a weakness.

ICT SYSTEMS

The issue of our ICT systems was a common point raised. The tools are located within an existing part of the current system, which to date had not been populated or needed to be accessed readily on a daily basis by all employees who might now need to access that area due to the tools. In addition to some problems with system availability and speed on all sites, an individual's ability and willingness to use the ICT systems is a factor; this lack of willingness might be perpetuated by occasional unresponsiveness of the system. In other words, the business is locked into a path of not using ICT capability available due to previous experience and availability.

Another aspect of the concerns regarding ICT was regarding the way information was presented. Many requested the presentation of the tools be more visual and intuitive. However, what can be considered to be intuitive is open to further, individual interpretation. Never the less, the current presentation of the tools is constrained by our current systems.

LEARNING AND INNOVATION

The dynamic capabilities literature makes the link between a firm's routines and learning; "dynamic capabilities arise from learning; they constitute the firm's systematic methods for modifying operating routines" (Zollo & Winter, 2002, p.340.) Routines and learning appear to be inextricably linked, and are both shown to be path dependent (Garvin, 1988; Coombs & Hull, 1998; Cacciatoria & Jacobides, 2005.) There appears to be an interesting conflict however concerning whether operating routines can reinforce path dependencies, ultimately resulting in lock in, or whether it is possible for firms to adapt their knowledge and therefore

their routines (Coombs & Hull, 1998.) If innovation is also considered to require a change in routines in order to introduce innovations, then the ability of a firm to innovate will also be path dependent (Coombs & Hull, 1998.)

Also identified as being important, and one of the limits to how an organisation is able to learn, and therefore adapt its routines, is the way in which routines are developed, captured and disseminated (Zollo & Winter, 2002.) They believe that the act of documenting a new process is a part of gaining an understanding of that process. They propose that organisations and individuals go through a learning cycle that reinforces routines. However they believe that at present “the literature does not contain any attempt at a straightforward answer to the question of how routines...are generated and evolve” (Zollo & Winter, 2002, p.341.)

Both the ICT comments and way the tools have been documented link closely with training, learning and communication. Various people requested different types of presentation of the tools, the ICT systems and the way learning was delivered. The success of these types of communication, and other communications used, (newsletters, e-mail, etc.) can only be judged by those receiving the information. When learning styles and preferences vary from person to person, numerous paths would appear to be required.

The section later on path generation discusses how the case study Company has attempted to overcome some of these dependencies by involving people in developing, documenting and teaching the processes.

THE ROLE OF MANAGERS

In the main, senior managers have understood the need for consistency, as the advanced manager programme probably helped to give legitimacy to the need to define standard methods of working with that group. Has this had an impact on the embedding of the tools and breaking some of the locked in behaviours and ways of working? However, they

continually question and debate the extent to which the tools need to be adhered to, and how much they can be altered and adapted depending on project size and complexity.

There has also been much feedback about the implementation of measures and checks, both in terms of the numbers of checks and the reason for them. The reaction is that measures have been implemented to “catch people out,” rather than to identify areas for improvement and learning. Teams look for ways to fiddle the measures to ensure a green result against the red, amber, green status. Equally, managers themselves have taken some convincing that checking and coaching their teams is a key part of their role as managers.

Henderson and Clark (1990) outlined an example of a lithographic company that was unable to cope with a number of minor changes that caused their co-ordination routines to require major reconfiguration. Since managers co-ordinate activities within a business, and these methods of co-ordination are learned over time, it would therefore follow that the capabilities, learning and path dependencies of the management are also important in being able to embed change.

Some of those external to the business have seen evidence of “top down” delivery of the tools, i.e. a “telling” approach rather than one of listen and implement. This raises potential tensions between the necessity of a Company strategy developed by the Board (i.e. develop the tools) and that strategy being owned and implemented by everyone. People on workshops, who have received strong “must do” messages from their managers, whose intention was to show support and drive the strategy, have also experienced this “top down telling”. We are potentially locked into the expectation that change comes from the top down, and so any change is delivered and/or received as “tell” as we are locked into this way of thinking.

The evidence is therefore that the language we use to communicate is in itself path dependent. In other words, the language being used does not properly reflect the intention because we are

locked in to communicating in a certain way. Also, people are conditioned to hear and interpret these messages in a certain way because of how they have been meant in the past. This lock in might extend to the type of people we recruit into certain roles. In other words, we recruit managers with certain management styles and skills or who have been developed in a certain way to follow a path, which their mentor also followed before them.

Over the course of the last three to five years, the business has seen at least three “initiatives” come and go. People have commented that this is the latest in a long line, and as such the locked in expectation is probably that this is the next fad, coming from the top down, and will die out just as the others did.

PATH GENERATION

Djelic and Quack (2007) presented two pairs of case studies concerning the transformation of national institutions. They use the term path generation to describe the development of new paths that overcome the path dependencies. Their case studies showed that the path transformations relied on a combination of different mechanisms, from power and policy, the ability to mobilise support from people involved, the ability of people to establish legitimacy for the change, and the establishment of institutions that would socialise the change. Further, they suggested that momentum for change is required both internally and externally to create a pincer movement, and that the change can be gradual, rather than requiring a radical change to re-direct the path (Djelic & Quack, 2007.) Each of these case studies is based on observations of real events that have been documented over time. They show how a combination of events have facilitated change in a number of environments to overcome perceived path dependencies, although as before, there is scope for interpretation of where the path dependencies are, and therefore how difficult they might be to overcome.

Despite none of the examples being specifically concerned with lean transformation within a construction company, there are many aspects of how paths have been re-directed that could be applicable to the case study Company. For example themes of stakeholder engagement, creating social networks and using external sources to help facilitate change could all be useful, especially once the specific dependencies are understood.

The case study Company has arguably tried to create new paths in the methods by which the tools have been developed and taught.

Groups of people, taking current, best practice, worked together to develop the tools with the aim being that they would have more ownership. However, not everyone was consulted. Having Executive Directors and senior managers delivering learning was an attempt to ensure they are fully conversant with the tools themselves and to show their support for the strategy. However, perhaps this self-fulfilled an existing path, reinforcing the top down approach. Many of those in the working group expressed disappointment that they had not been able to go out and teach the tools they had developed to their peer groups. In retrospect, this might have helped to overcome the lock in to top down thinking.

The approach to teaching and learning was also adapted as the implementation stage of the tools progressed, with various forms of learning being developed as it became apparent that certain methods alone had not resulted in the required level of knowledge.

Leeds University were also involved in the development and delivery of the learning programmes. Looking externally and building a network of external relationships has been shown to overcome path dependencies. For example, Coombs and Hull (1998) proposed that external professionals and groups have skills and access to academic publications, conferences, etc., that can prompt innovations and overcome path dependencies. The creation of social networks also played a part in breaking the Swedish construction industries path dependencies concerning use of concrete rather than timber; by engaging stakeholders in user

groups and developing supply chain relationships they were able to overcome stakeholder perceptions and promote innovation and learning (Mahapatra & Gustavsson, 2008.) This would seem to reinforce the importance of developing and maintaining relationships with external bodies such as LCI UK, CIRIA, etc. There is potentially further scope to develop such networks, either with external parties, or by creating internal networks, where people can create legitimacy for change.

Feedback on the tools once the teams have used them has also been received, and much of this has been incorporated back into revised versions of the tools. Capturing feedback on the use of the tools and trying to use this to make amendments may help to carve new paths in that people see evidence of their input being considered and implemented.

The way processes (routines) are developed, tested, evaluated, documented and communicated appear to be important factors in being able to effectively transfer knowledge and allow new processes to be learned so that a business can overcome dependencies and change (Teece et al., 1997; Zollo & Winter, 2002.) This is why we put working groups together to develop the processes, and why the senior managers are delivering the major learning programmes. Doing these things will create new paths and accepted ways of working.

However, perhaps these new paths are not yet clear enough given the remaining dependencies that are still pulling people another way? Similarly, had we been aware of these dependencies prior to commencing this work, could they have been overcome?

FUTURE WORK

It is normal practice when implementing improvements to carry out a diagnostic/current state analysis, using data collection or current state mapping for example, to identify root causes prior to making changes. Carrying out the path dependency study first would have been the

equivalent of such a diagnostic. The business will now undertake some future work to identify its path dependencies fully prior to the next stage of the lean implementation.

Case studies that have identified path dependencies in the context of an organisational transition (Lamberg, et al., 2008) and industry change (Cacciatoria & Jacobides, 2005; Mahapatra & Gustavsson, 2008) are extremely detailed and have obtained information from numerous sources such as interviews, published documentation such as news articles, industry data and annual reports in order to build up written history of events. However the ability to reconstruct history can be constrained by the ability of those interviewed to recall events accurately, their perception of those events and whether there are limits to obtaining access to data or individuals involved. In some cases the researchers have aimed to account for these potential limits by using numerous data sources and triangulating qualitative and quantitative data (Cacciatoria & Jacobides, 2005.)

Interviews and historic documentation will be used to construct a detailed timeline of historical events and decisions. This work can be considered to be akin to a 5 why or cause and affect analysis for the whole of the business. By understanding the root causes of decisions, and how the business has changed and performed over the years, we aim to understand where we have become locked into paths and why. Understanding this will allow new paths to be generated, or strengthened to support the business change.

CONCLUSION

A review of the path dependency literature has shown organisational processes to be firm specific and learned over time, with methods of developing, documenting and capturing these processes having an effect on how new processes are learned. Stakeholder involvement has also been shown to be critical to organisational change, with stakeholder relationships being path dependent.

Implementing change based on lean principles requires a deep change in mind-set and organizational culture. This change in mind-set can be driven by changes to process/procedure, as doing something differently can drive a change in thinking and acceptance of new ways as results are achieved.

It therefore follows that if changes to process and organizational learning are critical to lean implementation, and both of these are path dependent, then understanding path dependencies is necessary to ensure lean strategies can be implemented in practice.

The work carried out to date in the case study Company has seen path dependencies showing themselves in the language, actions and responses to change. Furthermore, these path dependencies have influenced the extent of and approach to the lean implementation.

By understanding these path dependencies, it might be possible to ensure that communication plans, sequence of change and stakeholder involvement are improved to overcome these dependencies.

The further work outlined will be carried out to gain a more in depth understanding of the path dependencies, with the aim being to identify how new paths can be generated. The question will then turn to whether we will lock ourselves detrimentally into other paths, or whether we can identify paths that will provide advantages to enacting change too? This work will help the case study Company clarify what it knows about its business and ability to change, as opposed to what it thinks it knows about its business.

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APPENDIX N PATH DEPENDENCY TO PATH CREATION: ENABLING STRATEGIC LEAN IMPLEMENTATION (PAPER 4)

Full Reference

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Abstract

The ability to change is a necessary capability for a business, irrespective of whether those changes are driven by external forces such as market conditions or client demands, or are instigated by the business itself. However, path dependencies exist within businesses that entrench ways of working which can influence their ability to respond to change.

Path dependency refers to the idea that events and decisions that have taken place in the past continue to influence current decisions and ways of working. This paper proposes that path dependencies inhibit lean change and that only when they are identified and understood can they be overcome, enabling new paths to be created and organisational lean strategies to be implemented effectively in practice.

Building on Morrey et al (2010), the paper describes action research carried out in a case study company which evidences that path dependencies have inhibited the implementation of their lean strategy. These path dependencies are identified therefore as either enablers or barriers to lean change.

It therefore follows that lean strategies cannot be implemented effectively unless these path dependencies are understood and accounted for, and that taking account of path dependencies needs to be foregrounded in the lean debate. Had these path dependencies been understood at

the time of the implementing the lean strategies, rather than retrospectively in order to understand why they had not played out in practice as planned, the lean strategies could have accounted for these entrenched ways of working and been more effective.

Further to this, the paper suggests that it is only when path dependencies are understood that path dependencies can be overcome/capitalised upon, or new paths can be created. Proposals to overcome and capitalise upon the path dependencies uncovered in the case study company are discussed, with acknowledgement that these new paths could become the path dependencies of the future!

Key words – Standardisation, process improvement, path dependency, change management, lean, strategy, implementation barriers, root cause analysis

Paper type – Conference

Introduction

The majority of lean construction literature focuses on project based production performance improvement, using lean tools and techniques adapted to suit the needs and circumstances of the organisations where they are being implemented (e.g. Court et al. 2008, Carneiro et al. 2009.) In many cases these works recognise some of the barriers to lean construction, such as management commitment, people capability, commercial engagement, cultural issues etc. and often propose actions for further improvement and areas of research (e.g. Alarcon & Diethelm 2001, Johansen et al. 2004.) There is less work however in understanding the root causes of these barriers to change at an organisational level, such that lean philosophy can be embedded strategically in all aspects of the company culture and business strategy.

So how can lean be done better from a strategic point of view? Stage 3 leanness (Kinnie, 1996), where lean focus is on the attributes required by the organisation to respond to change, suggests that management responses are path dependent and adapted to suit the organisational circumstances (Kinnie et al. 1996, Green & May 2005.) The adaptation model of lean diffusion also states that local factors and path dependencies play a part in how lean is played out in practice (Scarborough & Terry, 1998, Green & May 2005.) Further Green et al. (2008 p.76) also state that “the issue of path dependency is not especially prominent within the construction specific literature and arguably deserves much stronger emphasis.”

Path dependence refers to processes that are “unable to shake free from their history” (David 2001 p.19.) In other words, people become locked into ways of working that prevent them from being able to change. This paper proposes that path dependencies inhibit lean change and that only when they are identified and understood can they be overcome, enabling new paths to be created and organisational lean strategies to be implemented effectively in practice.

Following an overview of path dependency, this paper describes the research methodology employed to uncover the path dependencies within a case study company. The path dependencies found are then discussed in terms of their impact on lean strategies implemented to date, and proposals for how the business can capitalise on and overcome these path dependencies are then discussed and conclusions drawn.

Path Dependency

There are three broad categories of work in the lean construction literature, namely strategic, operational and tactical (Garnett et al. 1998) following on from Koskela's (1992) new construction philosophy that identified three distinct levels; tools and technologies, manufacturing methods and general management philosophy. There is a wealth of literature concerning project based production performance improvement, applying the lean philosophy and Transformation Value Flow (TVF) theory (e.g. Howell & Ballard 1998, Koskela, 2000) and using lean tools, such as Last Planner (e.g. Johansen & Porter 2003) and 5S (e.g. Carneiro et al. 2009.) The implementation of these tools and techniques has, in many cases, followed the adaptation model of lean diffusion; rather than assuming that these tools are universally applicable and can be copied and implemented in the same way in every instance, the adaptation theory takes into account local factors and path dependencies, which play a role in how lean is played out in practice (Scarborough & Terry 1998, Green & May 2005.) Feedback on how these cases of lean implementation have played out in practice touch on the barriers to implementing lean, outline organisational elements that are critical for lean implementation, and propose areas for future action and research (e.g. Johansen et al. 2004.) However, the root causes of these barriers to lean implementation are rarely investigated, either at project level or specifically at organisational level. Path dependency analysis, as a technique, can therefore provide insights into initial conditions, and can be considered to be root cause analysis of barriers to change.

At stage 3 leanness it is stated that management responses will be highly path dependent and lean production philosophy and techniques will be adapted to suit the individual circumstances of the organisation at that point in time (Kinnie et al. 1996, Green & May 2005.) This paper therefore proposes that path dependencies inhibit lean change and that identifying an organisation's path dependencies is key to enabling effective, strategic lean change. It is suggested that only when the path dependencies, i.e. barriers/enablers to change, are known can they be overcome such that new paths can be created and lean strategies be realised in practice as planned.

Path dependency refers to the idea that events and decisions that have taken place in the past continue to influence current decisions and ways of working such that people become locked in paths that they cannot break free of (David 2001.) Examples such as the prevalence of the Qwerty keyboard (David 1985) and the VHS video recorder (Liebowitz & Margolis 1995) are used to evidence that a single decision/event can lead to the lock in of a product, even if that product years later becomes the less efficient or economical choice. Causes of path dependency include the durability of capital equipment and technical interrelatedness of technology (David 1985, Liebowitz & Margolis 1995); having made a capital investment, other technologies must align with this investment, and economies of scale need to be achieved to make the investment pay off. Whilst this makes economic sense it can lead to lock in to a solution that over time prohibits change. Following from the economics literature, path dependency is then considered in the context of dynamic capabilities, in other words the ability of a business to respond to internally or externally driven change. The competitive advantage of a firm is seen as being a combination of its managerial and organisational processes (routines), its asset position (its technology, customer base, relationships, etc.) and the paths that are available to it, which in turn are dependent on the paths already taken (Teece, et al. 1997.) If a firm's routines are its history, to understand

them fully, it follows that you need to understand the history, the path dependencies, too (e.g. Teece et al. 1997.) A link is also made between a firm's routines and learning (e.g. Garvin 1988.) Therefore, with respect to lean transformations, where new ways of working need to be developed, embedded and learned, it follows that path dependencies can influence the ability of a business to make such changes. In other words, past decisions can lock the organisation into pathways that constrain future choices and ability to respond to change.

Path dependencies undoubtedly exist within organisations, as evidenced through the literature review. Their impact on implementation of lean strategies has not been assessed however, despite adaptation models of lean diffusion and stage 3 leanness acknowledging that path dependencies influence how people respond. This paper therefore provides empirical evidence that path dependencies inhibit lean change, and proposes that lean strategies must be cognisant of the future path dependencies they might create.

Research Methodology

The research has been carried out within a single case study company that has been implementing change based on lean principles since 2006. The case study company is a main contractor whose scope of works encompasses the design management, construction and refurbishment of buildings across the UK. The business employs approximately 400 people and has an annual turnover of ~£250m which is generated by three operating divisions run from offices in the South, West and East of England. In addition the business also has a number of support functions - estimating, human resources, health and safety, marketing, supply chain management, information communication technology (ICT) and business improvement, which provide expertise and support to each of the individual project teams. The company engages sub-contractors, chosen as part of the supply chain, to deliver projects such as schools, student accommodation, hospitals and laboratories which are won through competitive tendering and framework agreements.

The research methodology follows an action research framework. This methodology suits the case study company since the researcher is responsible for process improvement activities, and is therefore a part of the changes being implemented, and action research designs also involve the people who are affected by the research that is taking place.

The research design uses the feedback from two cases of lean improvement, that have been implemented within the business over a period of two years, to identify the historical events that have proven to be path dependent and to show how they have influenced the lean strategy. The lean strategy employed was that of developing and implementing standardised ways of working across the business in the areas of work winning and project delivery. The completed processes and tools can be considered to be a version of standardised work, one of the core lean tools. Standardised work documents the current, best practice for carrying out a particular activity/process. The result is that activities can be carried out consistently, and without variation (waste), ensuring that the desired results of quality, cost, delivery and health & safety will be achieved every time (Liker & Meier 2006.) A full description of this strategy and how it was developed and enacted in practice is discussed in Morrey et al. 2011. This strategy did not play out exactly as expected however, therefore post implementation, ten semi-structured interviews were undertaken within a two month period with participants to gain their feedback and understand the path dependencies, i.e. the barriers, to change. Interview questions included whether they thought there was a need for change, whether they thought the strategy employed was correct, what they thought about how the processes had been implemented and what barriers to change exist in the organisation.

A history of the company was obtained from historical documents and semi-structured interviews and presented as a series of timelines in order that feedback from the cases of organisational change could be referenced back to past events/decisions, thereby identifying the path dependencies. Seven historical timelines were created under the following

categories; general company history, industry, Company performance, process and learning, ICT, organisational structure and people, innovation, marketing and communication.

The Path Dependencies Identified and Their Impact on Ability to Change

Based on the feedback from the cases of organisational change and the company history the following section discusses the path dependencies identified, and how these historical events/decisions continue to show themselves today through the feedback on the cases of the lean strategies implemented.

Family Business Since 1890 - Starting out as a family business has set the business on its original path, and 112 years on it is still a factor in how people see the business and approach their work. Throughout the years, family members have been directly involved in running various companies within the Group, ensuring the business remained on this path. This initial beginning has therefore created a path dependency that is evidenced today in feedback that refers to “family values” and being “insular” and “parochial”. The family origin should in some senses be a strength to capitalise upon. Some people noted that employees feel like a part of the family, but that with new people coming into the business it was beginning to feel less like that. However, the downsides of the family heritage would appear to be a lack of challenge, reluctance to engage with parties external to the organisation and lack of accountability.

“Builder” Culture Prevails - The family business heritage is closely linked to the second path dependency identified, that of the case study company still considering itself to be a “builder” rather than a main contractor. Nearly all of the interviewees, when asked what the business does, included the word “builder” in their response, despite the company having no direct labour and engaging a supply chain to carry out its works. This path dependency of being a builder, whilst having positive connotations with respect to reliability and quality, can

be considered to be restrictive with respect to the strategic intent to become a “solutions provider.”

Lack of Standardised Processes due to Loss of Functional Heads – The “builder” path dependency has undoubtedly been reinforced by a disconnect between what people actually do and the Company’s strategic intent; with no standard ways of working, aligned to strategy, people had developed their own methods. In the late 1980s, functional heads, who were middle management, defined ways of working that were implemented across the business; interviewees recall being given a manual which clearly defined their role and the management reporting they needed to adhere to. The loss of these functional leads in 1988 meant Company standards were no longer documented and implemented across the business, and that operating divisions began to define their own ways of working. It is the removal of these functional heads, the process owners and experts, that has led the business to become accustomed to lack of standardisation, and people becoming unaccustomed to being involved in defining processes for their functional area. This lack of process has impacted the level to which strategy has been enacted in practice. This is evidenced by the short-lived nature of Company initiatives which only endured for short periods of time.

The recent lean strategies were designed to create the new standard approach, and feedback shows that people are beginning to see the benefits of standardisation, with someone commenting that the “tools provide a platform for implementation of Company procedures that prior to the development of the tools was outdated and inadequate.” The comment that “people used to work in isolation and in the way they have always have done it” was in the context of acknowledging the benefits of the improved ways of working, as well as accepting that previously there was a lack of definition. Despite the perceived benefits however, it was also recognised that “people will embrace good tools and ignore bad tools” and “everyone has taken on board the tools which aid their particular job.” This evidences that partial

compliance still exists and that the path dependency has not been fully overcome as people find ways to get around changes they don't buy into.

Divisional and Departmental Silos - Regional businesses were first created in the 1970s when various businesses were acquired. These acquisitions have created a path dependency as these divisional businesses have become silos that other parts of the business feel excluded from/in competition with. The creation of the divisions need not have led to the dependencies that are starting to be overcome today, however the organisational structure and approach to processes that went alongside the creation of the divisions meant that variation became prevalent and each part of the business created their own ways of working. One way or another, all of the work winning case study interviewees mentioned the operating divisions in the sense of them having divided the Company. This discord between departments has made implementation of change more difficult. An example of this is the work winning process, where estimators are reluctant to stop doing activities that are now allocated to work winning managers since they feel it diminishes their role and importance within the business.

In-house Developed System - The final path dependency identified concerns the Company's ICT systems, specifically the creation of the in-house developed database system launched in 2003. All of the people giving feedback referred to the way the developed processes and tools are accessed through the system, with comments ranging from referring to lack of user friendliness, to people simply asking for "paper!" copies of the documents. Although the ICT team, in their feedback, feel that the business has begun to "pull" on their services, and people are arguably becoming more ICT aware through use of personal mobile phones and laptops, the current system does pose a barrier to the way recent changes have been received. Whilst in some respects an in-house developed system gives the business flexibility, and means it is not reliant on external third parties providing bespoke products, there is undoubtedly

evidence, in the form of the feedback, that the decision to develop its own in house system has locked the business into a path that it now needs to review.

Summary - Feedback from the recent change strategies has helped to identify the path dependencies that exist within the case study company. Therefore, it follows that all of these path dependencies have had an impact on how the recent change strategies have been received by the business. The family builder heritage is apparent in the way people view the business and retain a level of insularity and lack of challenge, meaning introducing change strategies and different ways of working create fear in the sense that it moves people out of their comfort zones. Creation of operating divisions, coupled with the loss of functional heads who took ownership for processes, helped lead to silo mentality and variations in ways of working across the divisions being accepted; only since the benefits of the recent process improvements have been seen in practice is the downside of the variation being appreciated. Finally, ICT has proven a barrier to new ways of working being accepted, regardless of whether this is a true barrier, due to the limitations of the systems, or an easy excuse for people to resist change. The previous narrative also outlined how each of these path dependencies are interlinked, and how later events have served to reinforce earlier decisions and ways of working. For example, had functional heads not been removed, the impact of having operating divisions might not have been so divisive.

The path dependencies uncovered here fit with the work of Mahoney (2000) and Ebbinhaus (2005) who discuss path dependency in the context of sequences and of events. Events that take place in the early stages of a historical sequence, in this example the setting up of a family building business, are the contingent occurrences that can't be explained based on any prior events and are decisively important to the final outcome. After these "contingent historical events take place, path dependent sequences are marked by relatively causal patterns or what can be thought of as "inertia."" (Mahoney 2000 p.511.) In other words, once

processes are set in motion, they tend to stay in motion, with the inertia created ensuring these processes and patterns are repeated over time, or meaning that subsequent decisions lead on from each other as an apparently naturally occurring sequence of events.

Paths to the Future

The path dependencies uncovered and discussed in the previous section show how events and decisions from the past are continuing to influence and present themselves in the present and indeed pose barriers to change. However, despite these path dependencies, there is still evidence of change occurring within the business. Feedback from the interviews evidenced people are beginning to see the value of consistency and standardisation and its impact on performance; “alignment of the processes across the business was necessary” and I “believe they are a very important part of our business *now*”, evidencing that they weren’t before but that opinion has been changed. Similarly, the support for involving people in change, e.g. it was “right to draw on the skill base across the business” and comments that asked for further people involvement, such as “I believe the people who have produced the tools would have welcomed rolling out their tools,” show that path dependencies are being overcome and that this opportunity should be capitalised upon further. New people to the business would also seem to be creating new paths through their openness in involving external organisations in bringing their ideas into the business.

Ebbinghaus (2005) discusses three possible scenarios for institutional transformation. Path stabilisation involves the “marginal adaptation to changing environmental conditions” (Ebbinghaus 2005 p.17) and is most likely when an institution is strongly entrenched in its ways of working, is remaining true to its core principles and is locked into its original paths. Path departure is likely when there are more significant changes in the environment and when earlier decisions have not narrowed the future path such that they determine fully the next step. Path departure could be achieved through “gradual adaptation through partial renewal of

institutional arrangements and limited redirection of core principles.” (Ebbinghaus 2005 p.17.) Path departure could therefore be achieved through long term gradual changes that over time add up to a larger re-orientation (Pierson, 2000b), a situation where the business changes the purpose from which it was initially intended (Thelen 2003), or the addition of a new orientation to the business that requires its own separate arrangements and ways of working (Thelen 2003.) Finally, path cessation or switching is a radical transformation that ceases the self-reinforcing ways of the business and gives way to a new institution in its place. The case study company could therefore be considered to be undergoing path stabilisation; it remains entrenched in its core principles of being a family owned building business, and the lean strategies to date have served to adapt its ways of working. This change could be continued, and the path dependencies in existence marginally overcome through the following recommendations.

It is recommended that the business develop strategic relationships with third parties, for example universities, clients and consultants who are able to access industry best practices, latest research and provide bespoke services that are outside of the immediate skill sets within the business. Doing this would help tackle the parochial and internally focussed behaviours that evidence the family building business path dependency. This approach is already being taken in some areas of the business, for example in work winning where external parties have been engaged to provide expertise in the areas of publishing and document presentation. Strategic relationships, rather than one off interactions, would allow consideration of future strategic targets, not only in terms of work winning, but also with respect to technical advances, industry developments and management/social sciences.

Continuing to engage people in developing and improving their processes, and driving the implementation of lean principles in this way, would continue to overcome the loss of functional heads, would help break down divisional silos (as working parties should be made

up of people from across the business) and should also help develop capabilities in the areas of process improvement. Developing process improvement skills could also enable people to break free from the “builder” mentality and begin to challenge what they do and how they do it. Best practice sessions could also reap similar benefits if they were facilitated to encourage people to problem solve and think in a different way. A series of best practice sharing sessions would also give people a means of sharing ideas and promote a more outwardly looking approach, helping to overcome the divisional path dependency. Management’s role in driving and supporting these efforts is critical, and it is recommended that the manager role needs to be redefined and communicated so that managers realise the role they should play in learning, problem solving and coaching.

The business also needs to find a way in which to involve people in future ICT strategies and technology choices. Employee engagement in the process improvement activities to date has been shown to give increased buy in and credibility to the change. This needs to be achieved with ICT improvements, so that ICT solutions facilitate, rather than become a barrier, to change.

The above proposals would continue the change that has been started by the lean strategy employed to date within the business and would focus effort specifically on overcoming and breaking the self-reinforcing cycles in evidence due to the path dependencies. However, to meet the business’s future strategic aspirations to become a “solutions provider”, it would seem that path departure, rather than the marginal adaptation of stabilisation, is required. To this end, the business would need to create a clear vision and set of principles that could be cascaded and implemented through renewal of processes, systems and capabilities that would be aligned with that strategy. There is perhaps also the potential to create a new layer (Thelen 2003) to the business that could focus on new work streams and therefore have its own ways

of working and separate set of core principles and values, with new people and/or people with the capability to relinquish the old principles and history.

Conclusions

The research carried out and reported in this paper provides evidence that path dependencies inhibit the implementation of lean strategies and as such, lean implementation strategies need to understand and account for these path dependencies if they are to be fully realised and effective in practice. It therefore follows that the issue of path dependency needs to be foregrounded in lean debates if the topic of strategic lean implementation is to be advanced.

It is suggested that without an understanding of the path dependencies and the company's unique path through history, participants in change programmes will find ways around change and revert to continuing as they always have done. Only an acknowledgement and understanding of the barriers to change will allow them to be consciously overcome. In other words, understanding the path dependencies will allow lean strategies to be targeted to overcome the reinforcing mechanisms and inertia created by the path dependencies, enabling new paths to be created. Path dependency analysis is therefore a tool for understanding the root causes of barriers to organisational change, which in turn will allow appropriate change mechanisms to be determined.

Alternatively, there is the option of ceasing existing paths, or enabling path departure, by making more significant changes to organisational principles and processes. For example, in this case it is unlikely that the business can fully escape being locked in by its family heritage, however new strategic routes to market could be created on new paths, following new processes with different types of people, rather than attempting to adapt existing aspects of the organisation.

Finally, the creation of path dependencies, especially those due to contingent events, is by nature unavoidable; the case study company did not set out to create those that exist, and

decisions made now have the potential to become the path dependencies of the future. Therefore, since future interventions have the potential to create new path dependencies, it is important to ensure that those you create (intentionally or not) are compatible with the intended strategy. In other words, if lean philosophy is core to the business strategy, then all aspects of people, process, culture and ICT need to attend to that strategy, otherwise new paths created will lock the organization into ways of working that are at odds with the strategy and prevent it from being enacted in practice.

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