

A practical Continuous Improvement implementation framework for UK
manufacturing companies

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Submitted for the degree of Doctor of Philosophy

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August 2018

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Abstract

Continuous Improvement initiatives continue to report high failure rates. This research initially aims to explore the reasons for implementation failure and then address the identified themes through the development of a new framework. The research is focussed on a specific sector and region in order to provide findings tailored to that audience.

Several stages of research have been completed. Initially, a Systematic Literature Review identified eight main themes that most contribute to the failure of Continuous Improvement initiatives in manufacturing organisations. These eight themes were subsequently validated and ranked by influence towards initiative failure.

The next phase centred around the creation of a new implementation framework. This involved firstly the evaluation of current implementation guides through a Critical Literature Review to understand both the strengths and weaknesses of each. This identified that there is not currently an implementation framework or model that fully satisfies the objectives of this research. This is the main research gap. A new conceptual framework for implementing Continuous Improvement in UK manufacturing companies was therefore developed by incorporating the strengths of current offerings as well as the findings of the previous research phases.

An important element of this research is the desire to bridge the gap between academic findings and real world application. This translation of theory into practice should be the objective of any operations management research. To achieve this the conceptual framework required extensive evaluation by the intended user groups. This was achieved through a two stage Delphi study. Through this approach consensus was reached on the content and structure of the updated framework. Finally, a focus group was organised to allow a separate group of individuals, not previously involved in the research, to discuss the framework. This served to further validate the framework.

Whilst being of practical use, the new framework also contributes to theory; specifically change management, motivation and organisational learning theory.

As with any research, limitations exist. These have been identified throughout and where practical have been addressed to ensure robust research methods are employed. The main limitation of the research is the absence of practical application of the final framework. This was due to the absence of opportunity to do so, as well as the extended timeframe associated. A future research direction is to complete this action research or case study research in order to provide a final validation of the framework.

Keywords

Continuous Improvement, implementation, framework, manufacturing, UK

Acknowledgements

Firstly, and probably most importantly, I would like to thank my former manager Euan Birrell. Whilst working for him I decided I wanted to pursue a PhD and he is the person that secured company support at that time to allow me to do so. Had he not, I probably would not have been able to pursue this ambition further. He has undoubtedly also been the biggest influence on my work life to date as I learned a great deal from him; not least in terms of the work ethic required to succeed in the world of work and the integrity you can retain whilst doing so.

The other companies for whom I have worked for since have also both supported my studies through the sponsoring of my tuition fees. For that I am grateful.

When I started my PhD I had no point of reference of what was involved, or how to achieve it. From a young age I have just always wanted to be 'Dr. McLean'. For this reason, the guidance provided by my supervisor, Jiju Antony, has been invaluable. Thank you especially for pushing me to publish my work. I have found that a great source of pride and a valuable method of validation during the research process.

During this process I have moved out from home, got engaged and then married (and bought a dog), and moved house again. My wife Emma has always supported my studies, as have my family. I look forward to finally getting to celebrate my achievement with them.

Finally, I particularly appreciate all those who have taken the time to contribute to my research. Without the input of academic or industry experts the output of the research would not have been possible. The process of interviewing over 20 people from industry I found hugely interesting and have applied many of the findings already to enhance my day-to-day work.

Overall, what started as an academic exercise has also enhanced my practical application of Continuous Improvement immeasurably. All contributions to that process are appreciated.

ACADEMIC REGISTRY

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Publications

Journal publications

McLean, R. and Antony, J. (2014), "Why continuous improvement initiatives fail in manufacturing environments? A systematic review of the evidence", *International Journal of Productivity and Performance Management*, Vol. 63 Issue: 3, pp. 370 - 376.

McLean, R.S., Antony, J. and Dahlgaard, J.J. (2017), "Failure of Continuous Improvement initiatives in manufacturing environments: a systematic review of the evidence", *Total Quality Management & Business Excellence*, Vol. 28 Iss 3-4, pp. 219 - 237.

McLean, R.S. and Antony, J. (2017), "A conceptual Continuous Improvement implementation framework for UK manufacturing companies", *International Journal of Quality and Reliability Management*, Vol. 34 Iss. 7, pp. 1015 - 1033.

Professional/Trade Magazines

McLean, R. and Antony, J. (2016), "Breaking the Chain", *Quality World*, Jan 2016, pp. 28 - 33.

Conference Papers

McLean, R. and Antony, J. (2016), "Towards the development of a practical and strategic framework for the implementation of Continuous Improvement in UK manufacturing companies: The EDDIE framework", 6th International Conference on Lean Six Sigma, 30th and 31st May, Heriot Watt University, Edinburgh, Scotland, UK.

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Chapter 1 Introduction

This research began due to the frustration encountered by the researcher in attempts to successfully apply Continuous Improvement theory within the work place. The theory often seems straightforward and the need for improvement clear, however implementation often failed entirely or did not deliver the results expected. The desire to address this personal frustration was the springboard to study this area further and create new knowledge to aid personal efforts as well as add to the tool kit available to other practitioners.

As a Continuous Improvement practitioner, the author has become frustrated with instances of high effort for low reward, and ultimately failure to sustain the improvements that have been implemented. There is therefore a desire to study and better understand failures and develop a practical tool to aid practitioners in the future. To date, the author's career has involved working in one company across various sites, in a consultancy role working with various Scottish Manufacturing companies, and now as Operational Excellence Manager leading a site wide improvement initiative. On a personal level the author would like to use this research to improve success with these interventions, whilst creating new academic knowledge and enhancing the toolkit available to practitioners. As a true advocate of Continuous Improvement the author would like new iterations of Continuous Improvement to move past being viewed and reported as a 'fad' and find much higher levels of sustainability.

The aim of this thesis is to investigate the implementation of Continuous Improvement initiatives in the manufacturing industry. The initial focus of the study is specifically on the failure of past initiatives and using this experience as the basis to develop an implementation framework to guide future company efforts. As the research develops the scope is narrowed to provide a framework specifically tailored for UK manufacturing companies. The framework will be validated through a Delphi study involving both the interview and survey of experts within UK manufacturing companies. Finally, the validated framework will be tested through a focus group review.

1.1 Rationale

To mirror personal experience, Continuous Improvement initiatives are regularly reported to have high failure rates. Within literature there is regular reporting of the high failure rate of change initiatives, and specifically of attempts to implement Continuous

Improvement. This demonstrates the need to identify the reasons for failure and better address these. When implementing Continuous Improvement, whether Lean, Six Sigma or TQM, failure rates of 60-70% (Angel and Pritchard 2008, Pedersen and Huniche 2011), and conversely success rates of only 10-30% (Bhasin 2012, Oakland and Tanner 2007) are consistently reported. This means that the majority of these change initiatives are considered to be unsuccessful and that significant organisational resource is therefore being wasted.

Whilst there are many of these reports, reasons for the failures are fragmented within current literature. The limited number of studies on failure that do currently exist are not focussed upon manufacturing and fail to validate the findings through robust reflection or application within companies. Although many Continuous Improvement implementation models and frameworks do exist, the research will demonstrate the current shortcomings with these and therefore the research gap the core output of this research fills. The current frameworks and models (e.g. Baidoun 2004, Bolboli and Reiche 2013, Chakraborty and Leyer 2013, Chin and Pun 2002, Dibia et al. 2014, Jeyaraman and Teo 2010, Koh and Low 2010, Kumar et al. 2011, Mishra and Sharma 2014, Mostafa et al. 2013) are found to be incomplete in content, presented poorly and not specific to a particular user group. Shortcomings in both the academic rigour applied in collating the content and the inability to present the findings in a user friendly manner are demonstrated.

Understanding why quality programmes fail and how to improve their implementation is an issue that warrants attention (Moosa and Sajid 2010). Failure, however, is an issue largely neglected by researchers (Mellahi and Sminia 2009). Albliwi et al. (2014) described the previous absence of research in to Critical Failure Factors (CFFs) specific to industries, such as manufacturing, as a ‘huge gap’ in research. Snee (2010) also identifies the lack of roadmaps to follow as a particular challenge.

These issues lead to the following research gaps which are answered by the thesis. Overall, the study has the following research objectives:

1. Evaluate why Continuous Improvement initiatives fail in the manufacturing industry.
2. Critically evaluate current models and frameworks for implementation and sustainability of Continuous Improvement initiatives in manufacturing.

3. To develop and validate a practical and strategic framework for implementation and sustainability of Continuous Improvement initiatives in UK manufacturing.

The desired output of the research is an advancement of the understanding of CI failures, and specifically the development of a framework that can be used by organisations to aid their CI efforts.

1.2 The Significance of this Study

The results of this study will:

- Provide a greater understanding of the reasons for the failure of Continuous Improvement initiatives. The findings are significant particularly in theory building related to CI initiative failure. This will be enhanced by the identification of which themes are most significant and contribute most to the failure.
- Provide a practical framework for use by companies to address these issues, and allow greater success with change efforts. This will be significant in determining an effective change management approach for UK manufacturing companies in relation to CI efforts. This will serve to extend current Continuous Improvement theory as well as Operations Management and Change Management theories.

1.3 Structure of the thesis

The thesis is structured in line with the sequence in which the research was completed, with each chapter providing an output which contributes to achieving the overall research aims. Initially, a systematic literature review and critical literature review were completed. The findings of these baseline stages of the research are detailed in Chapters 2 and 3. These were both used to establish and clearly demonstrate the research gaps.

With the research gaps established, the research methodology followed in order to address these is detailed in Chapter 4.

Chapters 5 and 6 subsequently detail the surveys and interviews completed in order to address the identified research gaps and create new knowledge.

Chapter 7 captures the reflections of a potential user group to the content, structure and value of the final framework.

Finally, Chapter 8 provides the necessary summary and reflection regarding the achievement of the research objectives and the success of the process followed. Recommendations for future research are also provided.

Chapter 2 Systematic Literature Review

2.1 Introduction

As outlined in Chapter 1, the implementation of Continuous Improvement initiatives within a manufacturing environment is difficult, and many organisations fail to realise the expected benefits from the efforts. For that reason, and to allow better focusing of the research a systematic literature review was completed in order to be able to answer the question:

Q1: Why do Continuous Improvement initiatives fail in manufacturing environments?

More specifically within this question, the author also hopes to answer:

Q1a: How to define Continuous Improvement?

Q1b: What are the individual factors that contribute to failure?

Q1c: Do these factors group into main themes that can more readily be further explored?

Through this review 211 individual variables have been identified that can contribute to the failure of Continuous Improvement initiatives in manufacturing. The main output of this stage of the research is the subsequent grouping of these variables into 8 broad themes to allow further study and development of these.

2.2 Defining Continuous Improvement

Continuous Improvement is gaining momentum in manufacturing, as well as other industries. The phrase ‘Continuous Improvement’ is used in relation to multiple organisational initiatives. Each put in place the necessary elements to allow an organisation to identify and implement improvements on an ongoing basis. Continuous Improvement initiatives aim to create a culture of ongoing improvement by including everyone involved (Bhuiyan and Baghel 2005). Continuous Improvement entails mass involvement in making relatively small changes, which are directed towards organisational goals on an ongoing basis (Bessant et al. 1994). It develops over time, from

tentative attempts and the self-conscious adoption of new ways of doing things, to the point where incremental improvement becomes embedded into the culture of the organisation (Caffyn 1999).

These improvements are typically incremental in nature, with the accumulation of individual improvements resulting in more significant results overall. These improvements are achieved through the structured application of tools and techniques targeted at the identification and removal of waste and variation in all processes.

A Continuous Improvement culture within a business will strive for sustained performance improvement of all systems and processes (Bhuiyan and Baghel 2005). Structured approaches to quality and process improvement started with Total Quality Management and the Toyota Production System (Pegels 1984), and developed with Lean Manufacturing (Bhamu and Sangwan 2014) and Six Sigma (Braunscheidel et al. 2011) respectively. More recently Lean Six Sigma has been popular, combining the two previously separate approaches (Pepper and Spedding 2010). These improvement approaches are each an evolution of the previous methodology, incorporating the effective aspects and adding new methods to further enhance the approach (Snee 2010). The application of these tools and techniques will identify and eliminate sources of variation and waste, therefore enhancing customer satisfaction (Singh and Singh 2015). Ultimately, all are focussed on improving organisational performance (Naslund 2008).

A more detailed overview of each of these individual approaches and their application within manufacturing is provided.

Total Quality Management (TQM)

There are various definitions available for TQM (Zairi and Youssef 1995). This is probably due to the various ‘gurus’ who contributed to the development of the approach. Amongst the most prominent of these are Feigenbaum, Ishikawa, Crosby, Deming and Juran (Martinez-Lorente et al. 1998).

During the 1980s TQM was a popular approach used by companies in the pursuit of improved performance (Mensah et al. 2012). Despite this, the term TQM only started to be used in the mid-1980s and didn’t become a common quality term until the late 1980s (Martínez-Lorente et al. 1998). Despite companies “aggressively adopting TQM during

the 1980s” (Schroeder et al. 2005:469) academics trailed this trend with an absence of research on the subject.

Towards the development of a definition, Dean and Bowen (1994) state that three core pillars are at the centre of TQM. These are considered to be customer satisfaction, continuous improvement, and teamwork. The pursuit of Continuous Improvement is therefore an essential element of TQM (Deming 1986). By 1990, TQM was embedded in companies using Continuous Improvement principles to enhance customer satisfaction, reduce costs and improve profits (Kanji 1990). This was achieved by altering the corporate culture to focus on reducing poor quality through the implementation of new management systems (Berry 1991). It became a means to allow an enterprise to achieve business excellence (Dahlgaard et al. 1998).

Lean

The Lean philosophy originated in Japan at the Toyota Motor Company at the end of World War 2. Its application was initially limited to large manufacturing companies, with the early Western adoption occurring within US automotive manufacturers who were in direct competition with Toyota (Pepper and Spedding 2010). Over the last 40-50 years Lean production techniques have been key to manufacturing companies in the U.S. (Shah and Ward 2007).

Browning and Heath (2009) state that available definitions of Lean vary greatly. In general, the purpose of the philosophy is to identify and eliminate waste in a process, streamlining it to only include value adding activities (Monden 1983). Seven forms of waste were originally identified, with the aim of Lean to eliminate the presence of each within a process. The seven wastes are transportation, inventory, motion, waiting, over-production, over-processing and defects (Pepper and Spedding 2010). Lean incorporates various improvement approaches, including TQM, with a key element the use of teams to drive the improvement activity (Jenner 1998).

All of these principles, previously considered separate, were later packaged together under the Lean umbrella. This led to increased levels of interest from academics and application from businesses. The purpose of Lean is to increase productivity and reduce lead times. This ultimately should result in reduced costs. By the mid-1990s Lean had “gained widespread attention” and was “a dominant strategy for organising production

systems” (Karlsson and Ahlstrom 1996:25). The application of these principles has since broadened beyond manufacturing and is utilised in all areas of a business (Karlsson and Ahlstrom 1996).

Six Sigma

“Six Sigma should be considered state-of-the-art in terms of quality management, in that it borrows from previous programs, especially Deming’s management philosophies and TQM’s focus on the customer, and adds new features such as a comprehensive training structure and a broad definition of value from a customer’s perspective” (Arnheiter and Maleyeff 2005:12).

Six Sigma has its roots in industry, first being developed by Motorola and subsequently implemented to great effect in companies such General Electric and Honeywell (Pande et al. 2000). From the initial focus purely on quality improvement, Six Sigma has been developed to be used as an organisation wide culture change program involving aspects such as change management and leadership as well as problem solving teams (Goodman and Theuerkauf 2005).

Whilst Six Sigma is labelled as providing nothing new in terms of a Quality Management approach (Clifford 2001), a unique element of the philosophy is the hierarchical role structure upon which it is based. Differing levels of training are provided to individuals within a company in order to create a team of Black Belts, Green Belts, and Yellow Belts who tackle improvement activity (Henderson and Evans 2000).

Whilst Lean is focused on the elimination of waste within a process, Six Sigma instead predominantly targets the reduction of variation. With a foundation of statistical analysis, Six Sigma provides a robust approach to achieving improvement. Six Sigma is defined as a defect rate of 3.4 defects per million opportunities (Brady and Allen 2006). Through its application defects will reduce, process capability will improve and process throughput will increase (Nave 2002). Central to the Six Sigma tool kit is the use of statistical approaches in order to examine processes and isolate root cause (Pojasek 2003).

Lean Six Sigma

“Both Six Sigma and Lean management have evolved into comprehensive management systems” (Arnheiter and Maleyeff 2005:5). Applied in isolation both have provided great benefit to a wide range of industries and served as a basis for achieving sustained cultural change. Improvements achieved through utilising Lean or Six Sigma in isolation however will tend to tail off over time (Figure 2.1). This is because each philosophy has a focus on specific elements of improvement, meaning other opportunities within the business will be missed after the immediate benefits are realised in the area of focus (Arnheiter and Maleyeff 2005).

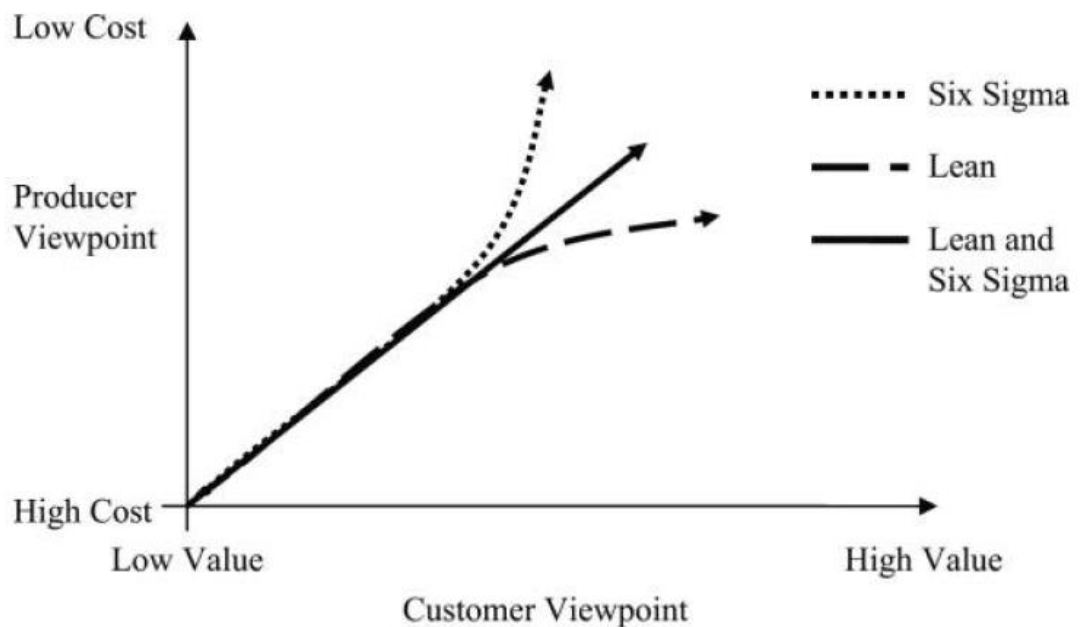


Figure 2.1 - The nature of competitive advantage (from Arnheiter and Maleyeff 2005)

Both philosophies can be implemented in conjunction with one another in order to achieve enhanced improvement results (Pepper and Spedding 2010). “Lean Six Sigma is the latest generation of improvement approaches” (Snee 2010:9), with these philosophies being commonly implemented in an integrated manner since the early 2000s. This combination of Lean and Six Sigma produces better results because it integrates the human aspects of Lean with the process aspects of Six Sigma, producing significant savings for organisations of all sizes (Snee 2010).

Continuous Improvement has been adopted across the globe. In the USA, Australia, Africa, Asia and Europe research has been completed outlining the need for Continuous Improvement, as well as the benefits and challenges associated. “The increasing pace of globalization and technological change” (Chapman and Hyland 1997:176) has meant that improvements in quality and productivity are required in manufacturing organisations in order to remain competitive. This global competition means manufacturers must pursue Continuous Improvement (Un 2010). This changing external environment means there is a strategic need to increase the involvement of staff within the organisation. This increased participation of staff can provide significant benefit to an organisation (de Jager et al. 2004).

Many Australian manufacturers have embraced a range of improvement programmes (Chapman and Hyland 1997). In Korea and Japan there is a preference towards the use of Quality Circles, whilst the most popular approach to Continuous Improvement in US manufacturing companies is Kaizen events (Jin and Doolen 2014). No one Continuous Improvement approach is superior to another however, with each providing both technical and social improvements within an organisation (Jin and Doolen 2014).

In Malaysian manufacturing companies Continuous Improvement practices are very common, with both Lean and Six Sigma very popular. Sustainability of Continuous Improvement efforts however remains the biggest challenge (Ali et al. 2013). Dale (1996) researched what is required in order to sustain a process of continuous improvement. This concluded that three main features are required, and that all are influenced by the culture and management style within an organisation. Firstly, as an implementation process matures the importance of the individual elements involved, such as coordination, communication and visible leadership, will alter in their level of criticality. Also, throughout the implementation there should be an ongoing method of self-assessment in order to evaluate progress and define the next steps. Finally, when improvements are made the gains must be sustained in order to maintain momentum. An important element of a Continuous Improvement program is to ensure that the Continuous Improvement efforts are aligned with the overall organisation strategy. A key challenge highlighted is having the senior managers not only sponsor the initiative but being directly involved (Chapman and Hyland 2000).

Whilst the implementation and challenges of Continuous Improvement are well documented in the developed world, research by Parris (2013) has also examined its

applicability in the developing economy of East Africa. This found that Lean Six Sigma applied in this context can also bring considerable benefit with cycle time and cost reductions achieved.

Reports however that most of these organizational change efforts fail or do not meet targets (Stanleigh 2008, Axelrod et al. 2006) demonstrate the need to identify and address the issues associated with organizational change. Specifically, in relation to Continuous Improvement implementation, Angel and Pritchard (2008) state that 60% of Six Sigma initiatives fail to achieve the desired results. Moosa and Sajid (2010) also state a large proportion of organisations fail with their Six Sigma efforts. Through a review of existing literature Bhasin (2012) indicates that less than 10% of UK organisations are in fact successful in their Lean implementation efforts, whilst the rate of failure of TQM implementations is similar to other strategies (Candido and Santos 2011), with success levels reported to be between 10-30 per cent in Europe (Oakland and Tanner 2007). Despite the benefits these can bring, Continuous Improvement efforts are consistently reported to have a high failure rate. This has long been an issue, with failure rates of TQM reported to be as high as 70% (Anonymous 1995). More recent evolutions of Continuous Improvement have reports of similar high failure rates. 70% of Lean implementations have failed (Pedersen and Huniche 2011) with 60% of Six Sigma initiatives failing to achieve the desired results (Angel and Pritchard 2008). In relation to change efforts, Klein and Sorra (1996) state it is a failure in implementation approach, not the subject matter itself, that leads to companies not achieving the expected benefits of the innovation they implement. The failure of improvement initiatives is typically due to poor deployment, with a particular challenge in the lack of roadmaps to follow (Snee 2010).

This rate of quality initiative failure is of considerable concern and it is imperative to understand how to improve the level of successful implementation (Moosa and Sajid 2010). With the majority of Continuous Improvement initiatives reported to end in failure or abandonment, it is clear a substantial amount of money and resource are being squandered globally every year in the unsuccessful pursuit of organisational change. The aim of this research is to address this negative business impact in order for improved implementation success and more effective use of valuable business resources.

The manufacturing industry has experienced significant change in recent years; technology, customer expectations and level of global competition have all increased. This places significant demand on manufacturing organisations. The implementation and

application of Continuous Improvement principles within manufacturing organisations is an important element of continuing to meet these increasing demands. This should ensure the business is flexible and responsive, therefore having the ability to change quickly in line with its environment and achieve a competitive advantage (Singh and Singh 2012).

2.3 Literature Review Approaches

A literature review is a common approach used in order to investigate and summarise the existing research in an area of interest. This typically serves to identify a research topic or a research gap, therefore aiding the development of new knowledge. It is an important stage within the research process (Bruce 1994).

There are four main types of literature review that can be carried out in order to summarise the existing literature. All have unique characteristics which will determine selection based on the research purpose.

All types of review, whether narrative or systematic, are retrospective in nature and subject to both systematic and random error. Therefore, the quality of a review depends on the level of scientific approach taken to combat this error and bias. Distinguishing features between a traditional narrative review and a systematic review are detailed in Table 2.1 (Cook et al. 1997).

A traditional or narrative literature review is conducted to provide a general summary of the literature and therefore a defined method is not necessarily required to achieve this. It is the most common type of review completed and is used to summarise existing information published on a topic. This style of review however is criticised for its potential bias and lack of rigour. For this reason, systematic reviews are becoming more common (Kowalczyk and Truluck 2013). A systematic literature review is used to answer specific research questions. The process followed is more robust and should be detailed to ensure repeatability (Jesson et al. 2011)

As well as these two approaches, a literature review can also be either a meta-analysis or a meta-synthesis. A meta-analysis will use statistical methods in order to analyse the findings whereas a meta-synthesis will use non-statistical approaches (Coughlan et al. 2007).

Grant and Booth (2009) provide a summary of various review methods, detailing the perceived strengths and weaknesses of each. A traditional or narrative literature review

involves the identification of material for inclusion, the summary of these in textual, tabular or graphical form, and an analysis of this. The benefit of a traditional literature review is that seeks to identify previously completed work, allowing this to be summarised to identify current research gaps. A weakness of the traditional approach is the opportunity for bias to exist in the data collection or analysis as the opportunity to omit information of seek evidence to support a pre-conceived view exists.

A critical review however goes beyond this regurgitation of existing literature and instead attempts to analyse the existing theory in order to provide “conceptual innovation” (Grant and Booth 2009:93). Typically, the output of a critical review will be a new hypothesis or a model; not a definitive answer. The model produced may be the amalgamation of the existing models examined or be based on interpreting the data studied. The strength of a critical review is the evaluation of the existing theory, identifying the value of each and seeking to add to it through the development and testing of new concepts. A drawback of this approach however is that it is not as systematic in nature, and does not necessarily seek to identify all available literature on the research topic. There is however no strict requirement to do so as the approach aims to interpret the literature and provide an output for further evaluation (Grant and Booth 2009).

A systematic review aims to address the limitations of the other approaches through a robust and repeatable process for the identification, evaluation, and reporting of the existing material available. The method followed is fully detailed, with the decision making criteria explained at each stage in order to minimise the bias that exists in the output. The timescale associated with implementing this level of rigour can however conflict with the need to inform decision making in a timely manner (Grant and Booth 2009).

Feature	Narrative Review	Systematic Review
<i>Question</i>	Broad scope	Focused question
<i>Sources and search</i>	Not specified, potential bias	Comprehensive sources
<i>Selection</i>	Not specified, potential bias	Criterion-based
<i>Appraisal</i>	Variable	Rigorous
<i>Synthesis</i>	Qualitative	Quantitative
<i>Inferences</i>	Sometimes evidence based	Usually evidence based

Table 2.1 - Differences between narrative and systematic reviews (from Cook et al. 1997)

A systematic literature review is a logical written summary which demonstrates a thorough grasp of current knowledge about a chosen topic (Machi and McEvoy 2009). It is a process of “gathering research, getting rid of rubbish and summarizing the best of what remains” (Grant and Booth 2009:92). The systematic literature review has its roots in healthcare, where there was an acknowledgement of the need for review articles to accurately detail the existing knowledge in an area of study. Medical articles were previously unsystematic and lacked the required level of rigour in approach. This led to inaccuracy and bias in the research findings.

Clinicians now increasingly rely on health care literature to base decision making with robust reviews of existing literature used in conjunction with primary studies to allow informed decision making (Grant and Booth 2009). Several authors have since published systematic literature reviews on the topic of healthcare.

Systematic Reviews “differ from traditional narrative reviews by adopting a replicable, scientific and transparent process, in other words a detailed technology, that aims to minimize bias through exhaustive literature searches of published and unpublished studies and by providing an audit trail of the reviewers’ decisions, procedures and conclusions.” (Tranfield et al. 2003:209). The approach is “systematic and replicable, giving confidence to the users it informs regarding the status of present knowledge on a given question” (Rousseau et al. 2008:38).

2.4 Systematic Literature Review

This section describes how the systematic review was conducted based on the methodology promoted by Tranfield et al. (2003) that has since been adopted by a variety of authors in management research (Thorpe et al. 2005, Keupp et al. 2012, de Menezes and Kelliher 2011). The initial search using the criteria outlined returned 782 search results. Of these, 72 papers were reviewed fully and included in the research findings.

Systematic reviews were originally developed to combat a perceived need for more robust evidence-based research amongst the UK medical profession. Since its development, use of the approach has increased, and is now more common within management science. This systematic literature review has been carried out in a structured and repeatable manner as advocated by Tranfield et al. (2003). The approach has been followed to combat the potential effect of researcher bias, and to ensure a traceable path has been

followed. It is felt this outweighs the known limitations of a systematic review; specifically, that practice journals will typically have a low star rating and be missed.

Systematic Review Strategy and Process

The systematic review followed the three broad stages as outlined by Tranfield et al. (2003):

1. Planning the review
2. Conducting the review
3. Reporting and dissemination (Results).

These three stages were then expanded upon through reference to the work of Bakker (2010) and Rashman et al. (2009). This led to the development of the review procedure as outlined in Figure 2.2. This review procedure is felt to be robust, with a clear logic and a sequence that can be traced.

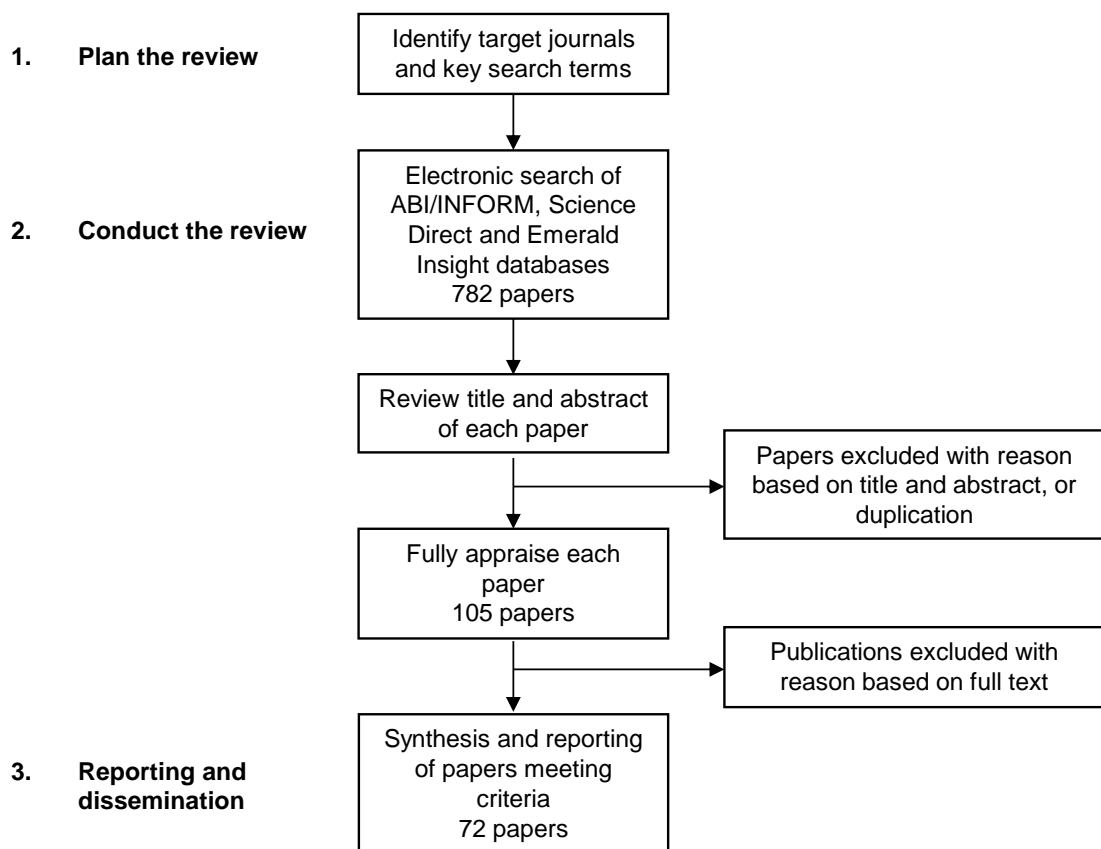


Figure 2.2 - Flow diagram of systematic review process

1. Planning the review

The review was limited to journal articles published since 1995. These dates were chosen to ensure findings were up to date and relevant. All searches were initially conducted using the ABI/INFORM database advanced search function. Across various disciplines ABI/INFORM is amongst the databases regularly used for conducting a systematic review (e.g. Tari 2011, Gimenez and Tachizawa 2012, Frank et al. 2011), and was chosen as it was found by the authors to be most proficient for building the detailed search criteria outlined. Although more difficult to use when detailing the desired search parameters, Emerald Insight and Science Direct were also used to ensure all relevant literature has been included. The authors are confident that the findings from these databases are representative of the literature available within the search parameters detailed.

Predominantly, only high quality journals were searched. High quality journals were identified through the ABS star rating scheme (www.the-abs.org.uk). Only journals deemed relevant to the research topic were searched. Carefully selected 3 and 4 star journals from within categories related to Operations Management and General Management were searched based on their appropriateness and relevance to the research. Through this the following journals were identified for investigation:

Academy of Management Review, International Journal of Management, Harvard Business Review, Sloan Management Review, Leadership Quarterly, Strategic Management Journal, Decision Sciences, Management Science, Administrative Science Quarterly, Journal of Operations Management, Production and Operations Management, OMEGA: IJOMS, and Academy of Management Journal.

The research was largely limited to journal articles; with books, book chapters and other non-refereed publications being excluded.

In addition to the above identified journals however, *The International Journal of Lean Six Sigma (IJLSS), TQM and Business Excellence and the ASQ Six Sigma Forum Magazine* were also included. Although not 3 and 4 star journals, these are well respected specialist sources related directly to the research area. Without diluting the quality of the findings, these were included due to the known relevance of articles. The three journals cover well the areas previously discussed under the definition of Continuous Improvement, and therefore serve to provide additional insight. The first stage of the research was to search all issues of these journals and specialist sources from 1995 to the last issue that were available on-line on 20th December 2014 for key phrases.

2. Conducting the review

The search strings were developed according to the criteria for the study. All journals were searched for the terms ‘TQM failure’, ‘Lean failure’, and ‘Six Sigma failure’ appearing within the articles.

The searches were constructed in the following manner with the publication, search term and search period detailed: pub.Exact("Total Quality Management & Business Excellence") AND (tqm failure) AND pd(>19941231).

The terms were chosen as they were felt to cover failure within the most prevalent continuous improvement methodologies used, whilst also covering both past and present methods. Reference to these key terms is intended toward the method being used as a vehicle for broader organizational change rather than the discrete use of individual tools and techniques. This grouping of terms is ratified through research conducted by Candido and Santos (2011) that found the factors leading to TQM implementation failure are identical to those which would impede any other business change implementation. This process returned a total of 782 search results.

Secondly, each remaining paper was then subjected to a more thorough evaluation of the title, and abstract where necessary. Relevance was based on the identification of key terms. Papers purely based on services or the public sector were excluded. At the end of this stage, there were 105 relevant studies remaining to be fully reviewed.

Finally, the full text of the remaining papers was reviewed. During this review the author was specifically searching for explicit reference to reasons for failure. Each of these was collated and grouped. Whilst most of the papers were not primarily written about failure, reference was contained within the body of the text, and each mention of failure was recorded. A breakdown of the number of articles found and fully reviewed is presented by publication type in Table 2.2.

Journal Type	Search Results	Removing Duplication (Number Requiring Title and Abstract Review)	Papers to Fully Review	Reference to Failure Found (Paper Referenced)
3 and 4 star journals	385	313	56	34
Specialist sources	397	215	49	38
Totals	782	528	105	72

Table 2.2 - Search results by journal type

Through the facilitation of a workshop with other academics, the variables found were initially grouped under 26 headings using an idea map. These 26 headings, and the factors contained, were then grouped into 10 more general themes with the use of an affinity diagram. Finally, this was reduced to the 8 core themes discussed in the paper as overlap was considered to exist between certain themes and the content of these are therefore discussed together. The use of an idea map and affinity diagram allowed the group to rationalize and apply experience of the subject matter. The idea map produced to collate the Management Leadership variables is shown in Figure 2.3.

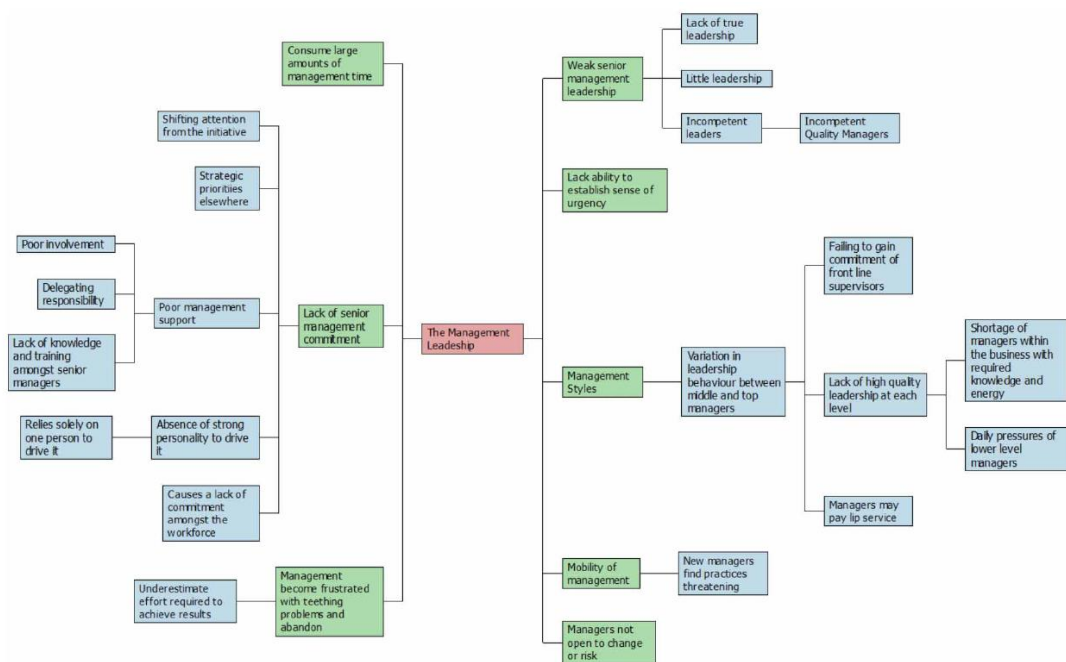


Figure 2.3 - Example idea map (Management Leadership)

2.4 Literature review findings

The research method detailed above has led to the collation of variables that lead to the failure of Continuous Improvement initiatives within the manufacturing industry. These variables have been grouped under 8 main themes as presented below in an overview of the literature. A summary of the number of references made to each theme, and the number of variables allocated within each theme is detailed in Table 2.3.

Theme	Number of papers referenced	% of total papers referenced	Number of individual variables	% of total variables found
1. Motives and Expectations	25	35%	35	17%
2. Organisational Culture and Environment	29	40%	24	11%
3. Management Leadership	26	36%	30	14%
4. Implementation Approach	20	28%	21	10%
5. Training	19	26%	20	9%
6. Project Management	20	28%	32	15%
7. Employee Involvement Levels	23	32%	21	10%
8. Feedback and Results	23	32%	28	13%

Table 2.3 - Summary of variables found by theme

2.4.1 Theme 1: Motives and Expectations

Before the implementation is even underway; it would seem that the motives for the initiative, and the expectations of the outcomes, require serious consideration and evaluation. From the research it is evident that starting an initiative for the wrong reasons could cause it to end in failure.

The compulsions for change; the reason for introducing and continuing the initiative is critical (Soltani et al. 2005). The motivation should be based on individual company needs, and not adopting an initiative because other firms have (Beer 2003). Responding to external pressures rather than the needs of the organization (Westphal et al. 1997) or being driven by inadequate quality performance rather than the customer (Angell 2001) is believed to be the wrong motive. An absence of pressure or urgency being present will be a problem (Al-Najem et al. 2013).

Organisations can therefore be guilty of “joining the bandwagon” without consideration for the likely demands of the initiative versus their available resource levels (Powell 1995), at times using legitimacy rather than technical rationality as their motive (Yeung et al. 2006).

Zbaracki (1998) identifies some organisations will hold unrealistic expectations. Setting unrealistic targets (Mariotti 2005) is likely to lead to disappointment and overall failure can result when these expectations are not met (Hendricks and Singhal 2001, Reed et al. 1996). Lituchy et al. (1998) state that some organisations will expect a quick fix, whilst Hariharan (2006) highlight organisations may be overly aggressive and guilty of wanting instant results. A lack of understanding may lead managers to see Continuous Improvement techniques as panaceas instead of using them to tackle specific issues (Anonymous 1995).

The motivation and expectation of employees is also important, as issues can arise if differing perceptions exist amongst managers and operatives (Bhasin 2013). Motivation could be provided in the form of reward or incentives, but there are conflicting views in the literature regarding this topic. Snee (2010) believes a lack of incentive to individuals can be problematic, whilst Sterman et al. (1997) state that inconsistent incentives are more likely to lead to failure. Conversely, Hackman and Wageman (1995) state rewards can in fact hamper efforts as they drive a behaviour of putting winning ahead of learning. This is echoed by Argyris (1998) who believes that recognition awards simply do not work.

There will also be those employees that approach the implementation negatively. This negativity can result for many reasons including misunderstanding (Taylor and Wright 2003), resistance from individuals not interested or capable (Moosa and Sajid 2010), a lack of understanding (Snee 2010), a lack of knowledge (Kuhnert 2014), or a feeling of uncertainty (Azis and Osada 2010). Others may feel that the approach is either too vague or too complex (Taylor and Wright 2003), taking too long, or too academic (Kubiak 2004). This perceived complexity can also lead to a feeling of intimidation (Zbaracki 1998). Cynicism may also be present (Beer 2003) as the changes are viewed as a threat (Kuhnert 2014). This can often be caused by experience of past failures which create that expectation of the new initiative (Lituchy et al. 1998), whilst other employees can become change fatigued (Abrahamson 2000). For these reasons employees' initial reaction may be to find the new initiative ideological or faddish (Powell 1995). People cynical about change can transfer this to others (Hariharan 2006). It is however important to reflect on past failures so as to learn from them and avoid reoccurrence (Abrahamson 2000). Overall, resistance to the initiative will hamper efforts (Azis and Osada 2010).

2.4.2 Theme 2: Organisational culture and environment

During an implementation there is a need to understand and address the organisational culture (Detert et al. 2000, Naveh and Erez 2004, Bhasin 2011, Bhasin 2013), as these implementations are likely to impact on the core issue of culture, as well as the strategy and structure of the business. A failure to change the organisational culture or environment (Yeung et al. 2006) can be problematic; as the existing culture of an organisation could impair performance and stifle change (Pascale et al. 1997), or make the intervention untenable (Green 2012).

Moosa and Sajid (2010) highlight that the social aspects of organisations are underestimated; and within this ‘Organisational Culture and Environment’ is specifically referred to. There is a risk that the organisational culture or processes are not ready for the intervention (Hariharan 2006). There exists the potential issue of a cultural mis-match being present between the organisational context and the innovation to be implemented (Das et al. 2000, Klein and Sorra 1996, Sousa and Voss 2001, Reed et al. 1996). For instance, a culture may exist where a lack of empowerment is evident, and employees at the lower levels are not encouraged to participate and problems solve (Pinedo-Cuenca et al. 2012). This would be in conflict with the ethos of Continuous Improvement. The implementation of certain initiatives can be viewed by some as an attempt to “import a management technique developed halfway around the world” (Abrahamson, 2000:79), where it is viewed to be successful in an extremely different culture.

Cultural elements such as a sense of acquiescence towards the implementation (Lituchy et al. 1998), too much bureaucracy within the organisation (Hackman and Wageman 1995), and organisational complexity (Azis and Osada 2010) are all identified as problematic to an implementation. Some organisations will make unrealistic assumptions about their ability to transform these beliefs and create a new culture (Powell 1995). There could also be cultural and language barriers present (Cudney and Elrod 2011, Al-Najem et al. 2013).

More quantifiable factors within the organisation such as inadequate budgets (Jung-Lang 2007), an absence of, or weak, quality system (Taylor 1997, Moosa and Sajid 2010) and poor support from other business areas (Snee 2010) can also prove important. The structure of the organisation could also influence the change efforts. Organisations could find themselves unable to put the desired changes into practice due to hierarchical management structures (Venkateswarlu and Nilakant 2005). Having too many people – particularly in management and support roles – encourages the status quo (Venkatesan et al. 1996). Frequent employee turnover (Jun et al. 2004) and insufficient interdepartmental communication (Jung-Lang 2007) is also detrimental.

The environment in which the organisation operates can also influence the implementation. Whilst the organisation may not have as much control over these factors, it is important that they are considered and planned for. Timing may not be ideal for implementation (Huy 2001), where failure can result, for instance, if a tight economic environment exists (Cudney and Elrod 2011). If the organisation operates in a volatile

environment, where the market or technology is rapidly changing, they must be wary of committing resource to improve a process that may no longer be suitable for the future environment (Anonymous 1995).

2.4.3 Theme 3: The Management Leadership

The themes of Management and Leadership were initially separate, but have been discussed together. Although separate topics, they are interrelated; specifically, in reference to the points raised within literature.

The area of management support and commitment is one regularly highlighted in the literature. An organisational change program will demand intense leadership commitment and consume large amounts of management time (Powell 1995). An implementation will suffer where there is an absence of a strong personality to drive it (Moosa and Sajid 2010) or it relies solely on the drive of one senior person (Breyfogle 2005).

A lack of senior management commitment will lead to failure (Taylor and Wright 2003, Beer 2003, Angell 2001, Lituchy et al. 1998, Snee 2010, Chiarini 2011, Soltani et al. 2005). This lack of commitment could be evident through the management shifting attention from the initiative (Sterman et al. 1997, Breyfogle 2010), having strategic priorities elsewhere (Dean and Snell 1996), providing poor management support (Das et al. 2000, Jeyaraman and Teo 2010) and poor involvement (Keim 2011) or delegating responsibility to others (Venkateswarlu and Nilakant 2005). Soltani et al. (2005) highlight a lack of knowledge and training amongst senior managers as a potential contributor to failure. This lack of commitment will in turn cause a lack of commitment amongst the workforce. Initiatives also fail when management become frustrated with teething problems and abandon as a result (Moosa & Sajid 2010). This behaviour could result from complacency and an underestimation of the effort required to achieve results (Kuhnert 2014).

Related to commitment, weak senior management leadership will also impede the implementation (Sterman et al. 1997, Chiarini 2011, Watson 2007, Jung-Lang 2007). This is echoed by Zbaracki (1998) who identifies a lack of true leadership as leading to implementation failure, whilst little leadership (Snee 2010), incompetent leaders (Lituchy et al. 1998) and incompetent Quality Managers (Moosa and Sajid 2010) are also highlighted.

Management styles (Moosa and Sajid 2010) during the intervention are important. Lituchy et al. (1998) state issues can arise if a variation exists between the leadership behaviour of middle and top managers; meaning a lack of high quality management at each level is likely to be an issue (Beer 2003). This could be due to failing to gain the commitment of frontline supervisors to the new approach (Maccoby 1997), or if there is a shortage of managers within the business with the required knowledge and energy (Womack and Jones 1996). Lower level managers can become overburdened with additional duties (Bhasin 2013), and their regular daily pressures can mean Continuous Improvement is not viewed as essential, resulting in a lack of participation (Jung-Lang 2007). Management may also pay lip service to the implementation, specifically to the use of scientific or statistical tools where applicable (Hackman and Wageman 1995).

Mobility of management is also an issue, as management changes impact the improvement efforts (Soltani et al. 2005). New leaders can find the existing practices threatening (Venkateswarlu and Nilakant 2005). Managers may also not be open to change or risk, and as a result focus their attention on easier things (Soltani et al. 2005). Leadership may also lack the ability to establish the sense of urgency required (Venkateswarlu and Nilakant 2005).

2.4.4 Theme 4: Implementation Approach

‘The implementation’ is regularly referred to by scholars as a reason for failure of a continuous improvement initiative. Poor implementation, deployment, or execution are given as holistic, over-arching reasons (Sterman et al. 1997, Das et al. 2000, Klein and Sorra 1996, Snee 2010, Jeyaraman and Teo 2010, Moosa and Sajid 2010, Green 2012, Gijo 2011). These, however, provide little guidance on the specifics of an implementation that warrant consideration.

A more focused reference is made to the level the initiative is implemented to, and the manner in which it is implemented. A partially implemented program (Klein and Sorra 1996) or ceremonial adoption (Hackman and Wageman 1995) is identified as problematic. Implementing Continuous Improvement as a ‘quick fix’ rather than to achieve culture change will impede day-to-day activities as it will not be integrated into the organisational structure and the full potential benefits of the approach will be missed (Keim 2011, Venkateswarlu and Nilakant 2005). Whilst this may be seen to promote an all-encompassing approach, a contradictory warning is made that being too ambitious

(Hackman and Wageman 1995) or attempting to change too fast (Huy 2001) can lead to failure. Abrahamson (2000) warns change can foster a feeling of initiative overload and create a sense of organisational chaos.

The mechanics of the implementation also requires consideration, as organisations have been guilty of employing related strategies in isolation (Ahire et al. 1996), potentially understanding the individual techniques involved but struggling with how these fit together. A focus on one area of the business will lead to sub-optimisation due to a lack of overall systems thinking (Breyfogle 2005). A lack of integration with current practices (Zbaracki 1998) would likely result. The efforts will suffer where a weak implementation structure in terms of roles, planning and organising exists (Moosa and Sajid 2010) or where the organisation is not planning to involve everyone (Green 2012, Al-Najem et al. 2013). This issue could in part be due to the organisations not having a roadmap to follow during the implementation process (Snee 2010). This roadmap could be provided by employing consultants, but issues regarding the programmatic nature of their interventions have been raised (Beer 2003), as well as organisations overestimating the ability of consultants to change the business (Hariharan 2006). Organisations can also be guilty of not considering the necessary Organisational Development (change process, reward structure, performance measurement) aspects (Bhasin 2013). The implementation should not be carried out by an individual or homogenous group (Angell 2001, Hariharan 2006) as this will inhibit the ability to standardise process improvements (Maccoby 1997).

2.4.5 Theme 5: Training

During the implementation of any new initiative it is almost certain some level of training will have to be delivered to the workforce. There are many elements related to training that can hamper the effort.

A lack of training and education (Jung-Lang 2007, Al-Najem et al. 2013, Bhasin 2013) is identified as a major issue. However, it would be wrong to focus on training everyone rather than achieving delivery of improvement (Snee 2010, Hariharan 2006, Breyfogle 2005).

Some organizations will provide training programmes not capable of developing the necessary skills (Moosa and Sajid 2010), not providing knowledge of techniques and their utilisation (Pinedo-Cuenca et al. 2012), have it delivered using inappropriate methods

(Cudney and Elrod 2011) or provide diluted training content (Gijo 2011, Godfrey 2005, Keim 2011, Parr 2006). The varied standard of training and certification offered by consultants (Gijo 2011) is highlighted, however conversely it is argued that internal resource delivering training removes focus from delivering improvements and risks the quality of material delivered (Breyfogle 2005). This will result with the overall standard of the training being inadequate meaning incapable people as an output from the training process (Moosa and Sajid 2010). Specifically, some will be guilty of finessing or ignoring the difficult to implement portions (Hackman and Wageman 1995), potentially catering to those trainees who are otherwise likely to find the content overwhelming (Zbaracki 1998). This could lead to rhetoric prevailing over substance (Zbaracki 1998). The content of the training is important as the training should not be completely theoretical (Zbaracki 1998). Venkatesan et al. (1996) also believe it would be wrong to provide generic training whilst making no attempt to change mind set or beliefs of the participants.

Even if the training is delivered to the required standard, the benefits will not be realised if the support received afterwards is inadequate (Sterman et al. 1997). The application of the training, typically through projects, can lead to issues. The initiative will struggle if employees use the approach less frequently, consistently or industriously than required (Klein and Sorra 1996). Frustration can also develop if there is a perceived lag between the training and results (Snee 2010).

Issues may also arise due to employee turnover, with new employees lacking necessary training (Zbaracki 1998). According to Gijo (2011) the increasing popularity of Continuous Improvement makes people trained desirable to other companies making knowledge retention difficult. The costs associated with this ongoing retraining, as well as the initial training costs, can be significant (Powell 1995).

2.4.6 Theme 6: Project Management

Although kept as separate themes, training and projects are often inextricably linked. Projects are typically the mechanism employed to achieve results within a Continuous Improvement initiative. Poor selection (Gijo 2011, Keim 2011) and insufficient resourcing (Snee 2010) of projects can contribute to failure of the initiative. Specifically, an issue exists when project selection is not aligned to strategy (Parr 2006, Ramu 2007, Kornfeld and Kara 2013). The ability to manage the soft change management elements of a project can also be lacking, meaning poor stakeholder management (Parr 2006).

In terms of selection, there are many areas where the organisation can fail. Projects may have the wrong focus (Cudney and Elrod 2011); which could mean they are not tied to business goals (Snee 2010), not focussed where the business will benefit most (Breyfogle 2005 & 2010), or focused on cost reduction rather than the customer (Nilakantasrinivasan and Nair 2005). Projects may also be too large in scope (Hariharan 2006) or selected using inappropriate methods (Kornfeld and Kara 2013). It is also wrong to target a number of project completions as a measure of success, as this leads to incomplete or abandoned ones from selecting insignificant projects (Hariharan 2006).

Mistakes can also be made with the management of projects. A project will struggle if it is poorly defined (Snee 2010, de Koning et al. 2010), lasts more than six months, has infrequent team meetings, or has little technical support from the Continuous Improvement experts within the business (Snee 2010). The implementation will also suffer where the project teams take too long (Zbaracki 1998), have a slow rate of learning or stop functioning (Moosa and Sajid 2010). Poor selection and application of methods or tools is also highlighted (Gijo 2011, Keim 2011, Nilakantasrinivasan and Nair 2005, Al-Najem et al. 2013).

In terms of resource, project failure can stem from assigning the wrong people to the project, not getting enough time to work on the project (Keim 2011), or conversely having too large a project team (Snee 2010). Team members can struggle to prioritise the project actions and activities due to daily duties and commitments (Pinedo-Cuenca et al. 2012). The project will therefore suffer from the absence of involvement from key individuals, and be negatively affected if there is not a champion or sponsor who wants it to progress and succeed (Hariharan 2006), or a process owner providing the urgency for project start and completion (Breyfogle 2005). Improvement efforts will stall if no full time resource is committed to lead it, the best people in the business are not released to participate, or people are moved back to their core role during the project due to operational pressures (Hariharan 2006).

Within the projects, teams can be guilty of failing to understand and analyse connected processes as one, instead viewing them as unrelated commodities that do not interact. Projects will fail where a departmental 'silo' approach is taken to solve complex problems affecting different areas of the business, rather than employing cross-functional teamwork (Pinedo-Cuenca et al. 2012). Teams can also be too focused on the business processes themselves, and fail to address the management processes necessary to sustain the change

(Anonymous 1995). Absence of good data in projects (Hahn et al. 2005, Godfrey 2008) can be problematic, as can staff turnover which disrupts the team processes, impacting the team dynamic (Venkateswarlu and Nilakant 2005).

Projects will also suffer when the team is too quick to move onto the next project rather than ensuring the improvements achieved in the current one are embedded and consolidated long term (Pinedo-Cuenca et al. 2012).

2.4.7 Theme 7: Employee Involvement Levels

As already established the leadership demonstrated by the management teams play a vital role in any implementation, but consideration must also be given to the other employees within the business. Issues such as time allocation, role conflict and participation levels are identified with achieving the desired involvement of employees in the change efforts.

Sterman et al. (1997) identify improvement efforts take too much time away from the primary responsibilities of employees. This can result in a feeling of role conflict, with tension between work demands and the problem solving methods (Zbaracki 1998, Taylor and Wright 2003, Schroeder et al. 2005). For these reasons, the initiative can be viewed as placing unrealistic demands on employees regarding their commitment levels (Powell 1995), with a lack of recognition for the sacrifices required to participate (Hopen and Rooney 2013). Employee resistance to change will derail the efforts (Jun et al. 2004).

Continuous improvement activity will typically ask for increased levels of employee involvement, and often attempt to empower employees. The team members however may not have time, or make time, to contribute to improvement efforts (Hariharan 2006). These employees may also have limitations in relation to their ability to process change; potentially uncomfortable with the number of changes or rate of change experienced (Kuhnert 2014).

Porter (1996) warns that newly empowered employees can lack a vision of the whole process or business and therefore the required perspective to recognise trade-offs. This absence of the system view, or appreciation of the big picture, will mean the opportunity to optimise a problem is missed and issues can in fact be created at subsequent processes. Soltani et al. (2010) refers to issues with management bias towards maintaining control. In general, it is difficult to find balance between a requirement for process control whilst

allowing employees the empowerment and participation they need. A potential contradiction exists in achieving both.

The necessary resource must be allocated to the initiative, as a lack of, or limited, resource (Angell 2001, Das et al. 2000, Azis and Osada 2010) will lead to failure. Allowing non participation (Chiarini 2011) and therefore a lack of employee involvement (Cudney and Elrod 2011) is identified as a possible cause for failure. On the other hand, forcing people to be involved or lead efforts is also detrimental (Hariharan 2006).

Specifically, the human resource element is highlighted. Failure to invest in human resource (Das et al. 2000) or not using top talent for the initiative (Snee 2010) will enhance the chance of failure. In addition, a lack of resource for training and development could also cause issues (Dean and Snell 1996). Those leading the Continuous Improvement efforts can also become frustrated by the absence of a clear career path resulting from their involvement (Parr 2006).

The difficulty in resource may be a result of firm size (Taylor and Wright 2003, Madu and Kuei 1995, Taylor 1997, Das et al. 2000, Powell 1995). Whilst having greater resource, Pascale et al. (1997) state large organisations can struggle due to their inability to change, whilst Womack and Jones (1996) state it is hard to implement comprehensive change in mature organisations.

2.4.8 Theme 8: Feedback and Results

Failure of the mechanisms to review projects and the wider initiative as a whole are identified. These failures will lead the business to have a false impression of the results achieved through the implementation. Inaccuracies, poor review, and poor communication can all contribute to this. Issues will arise if the feedback is distorted (Zbaracki 1998) or the metrics being used are misleading (Sterman et al. 1997). Specifically, an absence of the courage to report failures will create a false picture of the implementation, and can lead to a gap between the rhetoric and reality of the implementation (Zbaracki 1998).

Closed vertical communication will be detrimental to the implementation (Beer 2003), as will poor communication and assessment (Jeyaraman and Teo 2010). Bhasin (2013) points to a failure to communicate the outcomes of the efforts as problematic. The

effectiveness of assessment will be impacted if there are poor or infrequent reviews (Snee 2010, Hariharan 2006) or there is no follow up on projects (Jeyaraman and Teo 2010).

There is also reference made to the perceived negative impact a new initiative can have in the short term. After implementation, performance may in fact decline (Dean and Snell 1996) as disruption to production is likely to be experienced (Li and Rajagopalan 2008). During the initial period of implementation issues such as excess capacity, financial stress, and pressure for layoffs can result and lead to significant costs being incurred in the short term (Stermann et al. 1997). Initiatives in fact rarely produce short-term results (Powell 1995), as the costs are immediate and the benefits achieved in the longer term (Hahn and Doganaksoy 2011). Implementations will therefore suffer where the business only focus on hard savings (Breyfogle 2005).

In relation to longer term results, the implementation may suffer from a lack of financial returns (Sharma and Chetiya 2010), with managers frustrated by a lack of measureable results (Reed et al. 1996). This can be due to organisations placing an emphasis on process over achieving results (Powell 1995). An inability to spread project results across the site (Lapre et al. 2000) will also lead to the demise of the initiative.

Organisations can also fail to put in place the necessary mechanisms to monitor processes long term and ensure benefits are achieved (Gijo 2011, Lareau 2011, Keim 2011, Nilakantasrinivasan and Nair 2005, Pinedo-Cuenca et al. 2012). As a result, savings and benefits are calculated based on short term observation meaning estimates of annual savings are inaccurate (Gijo 2011). This can lead to premature declarations of victory without documented evidence of success (Kuhnert 2014) and makes the demonstration of genuine results difficult (Hahn and Doganaksoy 2011). Moosa and Sajid (2010) also state the issue of accountability and management interest dropping after the first few phases of projects are complete. There is the risk of less focus, effort and priority resulting in the longer term.

Hariharan (2006) warns about the expense incurred through reward and recognition systems. A failure, however, to tie management compensation to achieving goals (Jun et al. 2004) is problematic, as is a performance system (appraisal) that does not give Continuous Improvement significant weight (Hariharan 2006).

2.5 Conclusions

From the review of the literature it is clear that a multitude of variables can contribute to the downfall of a Continuous Improvement initiative. As detailed, these individual variables have been broadly grouped under eight main themes. Further development of these themes is felt necessary. The research of Continuous Improvement initiative failure was previously limited and fragmented. This literature review has identified and collated the variables that contribute to a Continuous Improvement initiative failure within a manufacturing environment. The grouping of these into themes allows better understanding of the main issues, and also provides a basis for further investigation and development of the themes.

The next steps of the research will be to validate the themes identified as well as developing these into an implementation framework. Initially, a review of existing models and frameworks will be completed to verify that a research gap exists. This review will involve comparison of the existing frameworks with both the research objectives and the eight themes identified (Chapter 3).

2.6 Summary

As stated, the initial objective of the research was to evaluate why Continuous Improvement initiatives fail in the manufacturing industry. This has been achieved through the completion of a Systematic Literature Review.

Taken together, the literature provides consistent and related groups of variables, with little conflict found. This allowed the identification of eight broad themes that these individual variables belong within: Motives & Expectations, Culture & Environment, Management Leadership, Implementation Approach, Training, Project Management, Employee Involvement Levels, and Feedback & Results.

In terms of theoretical contribution, the Systematic Literature Review findings are relevant to motivation theory and change management theory. Employee motivation toward Continuous Improvement, and the role of reward and recognition in achieving this, will be specifically explored with recommendations in approach captured and compared to existing theory.

Chapter 3 Critical Literature Review

3.1 Introduction

In order to build on the findings of the Systematic Literature Review (Chapter 2) and progress toward an output of practical relevance a Critical Literature Review of existing Continuous Improvement implementation models and frameworks is presented.

As discussed in Section 2.3, a Critical Literature Review is utilised when the objective is to examine the current literature and use this to generate a new hypothesis or model for subsequent evaluation and testing. The methodology used does not require to be as robust as a Systematic Review as the Critical Review is not attempting to provide a final answer but instead feed subsequent phases of the research. A broad selection of existing implementation frameworks has therefore been reviewed, but the potential exists for relevant examples to have been missed.

The Critical Literature Review is necessary in order to critically evaluate the current implementation frameworks in existence, clearly demonstrating the research gap that exists. The research gap of a suitable Continuous Improvement implementation guide specific to UK manufacturing is identified. The findings of the initial Systematic Literature Review are coupled with this to develop a new conceptual framework for the implementation of a Continuous Improvement initiative in UK manufacturing companies.

There is currently an absence of industry and region specific Continuous Improvement implementation frameworks and models. Manufacturing companies lack the knowledge required of how to implement an improvement initiative. These organisations in particular need a guide to successful implementation specific to their sector. This is particularly needed where the implementation is being started from scratch (Albliwi et al. 2014). One of the top five limitations for Lean Six Sigma in the manufacturing industry is the absence of a roadmap for these companies to follow. This area is therefore a rich source of future research (Albliwi et al. 2015). Pepper and Spedding (2010) identify the need for a Lean Six Sigma framework, stating that the combination of Lean and Six Sigma has the potential for meaningful and lasting culture change and process improvement within organisations. It is also stated within the paper that, “Going one stage further...is to develop an industry-specific framework...A fully integrated framework targeting specific

industries will take away any such ambiguity over which techniques to apply where and in what situations” (Pepper and Spedding 2010:149).

In order to address these identified gaps, the next stage of the research is to develop the eight themes previously identified from the literature into an implementation framework tailored specifically for UK manufacturing companies. This will be achieved through a thorough review of existing models and frameworks in order to examine the current style and content whilst also evaluating the need for an improved offering that specifically meets the objectives of the research.

3.2 Methodology

In order to achieve the aims of the research, a critical literature review has been completed. All searches were initially conducted using the ABI/INFORM database advanced search function. Across various disciplines, ABI/INFORM is amongst the databases regularly used for conducting a literature review (Frank et al. 2011, Gimenez and Tachizawa 2012, Tari 2011). In addition, Emerald Insight was also used to ensure that all relevant literature has been included. The authors are confident that the findings from these databases are representative of the literature available within the search parameters detailed.

The search was conducted using a combination of the search terms “TQM”, “Lean manufacturing” or “Six Sigma” and “model” or “framework”. These terms were chosen as they were felt to comprehensively cover available improvement methodologies and popular terms used to describe implementation guides. In total this provided six separate combinations of search term, generating 23 unique papers for full review after initial review of title and abstract. Each paper identified was reviewed in full and has been included within the results. No parameters were set to limit the journal titles searched or the date of publication.

One of the common aims of a model or framework is to understand and/or explain what influences implementation outcomes, although a clear distinction between the terms exists (Nilsen 2015). The value of a model lies in the deliberate simplification of the phenomenon which it represents. It is therefore not intended to accurately represent reality. A framework however provides a structure, outline or plan consisting of various categories intended to achieve the desired outcome.

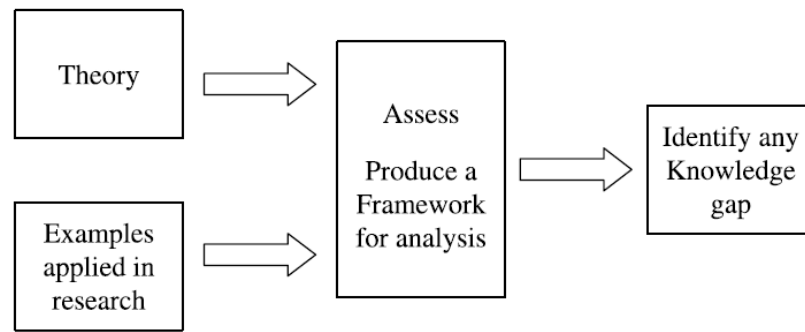


Figure 3.1 - The analytical process (Jesson and Lacey, 2006)

A critical literature review should be more than descriptive; it should provide a unique perspective through the analysis conducted. It is important that the selection of sources used for the review are selected fairly, and that these are critically compared in order to demonstrate contrast in current ideas and evidence presented. Through this analysis existing knowledge gaps can be identified which the research can then address (Jesson and Lacey 2006). Figure 3.1 shows the typical critical review analysis approach, upon which this phase of the research was based. The initial review then goes a step beyond this by proposing a solution, in the form of a new framework, to the research gap identified.

3.3 Evaluation of current models and frameworks

Each existing model or framework found in the literature was reviewed in order to identify positives and areas for improvement (Appendix A). Each positive element identified was deemed worthy of note and considered for inclusion in the new conceptual framework. The areas for improvement serve to demonstrate that none of the current models or frameworks exactly fulfil the needs of this research. When reviewing each existing model or framework the criteria against which it was evaluated was:

- Does it cover the eight themes identified from literature?
- Is it specific to manufacturing?
- Is it designing for a site or companywide implementation?
- Does it provide guidance on ‘how to’; the actions required, and not just what areas to consider?
- Is it specific to the UK?

As these are the criteria for the new framework it is important to demonstrate that none of the existing models or frameworks completely cover all of these areas.

Through the analysis it is clear that none of the existing models or frameworks fulfil the research objectives or provide effective guidance on the implementation of a Continuous Improvement initiative within a manufacturing company. This is the identified research gap.

Of the models and frameworks reviewed, only those developed by Mostafa et al. (2013), Nordin et al. (2012), Ng and Ghobakhloo (2018) and Thomas et al. (2008) are specifically tailored for manufacturing companies. The majority are more general in nature, or are specifically focused on the public or service sector.

Several models and frameworks are presented in a phased manner (Baidoun 2004, Bolboli and Reiche 2013, Chakraborty and Leyer 2013, Chin and Pun 2002, Dibia et al. 2014, Jeyaraman and Teo 2010, Koh and Low 2010, Kumar et al. 2011, Mishra and Sharma 2014, Mostafa et al. 2013). This would seem to be a popular and logical approach as companies will want to prepare the implementation in some form before launching into it. A common emphasis is also placed on a latter phase of review or measurement in order to monitor and sustain the efforts.

Although the titles of the papers reviewed would suggest otherwise, some of the models and frameworks are not designed to be guides for a company or site wide implementation. Instead some are either designed to purely be a guide to running an effective project (Cheng and Chang 2012, Furterer and Elshennawy 2005, Jones et al. 2010).

Of those that are pitched at the desired level; company or site implementation, several still suffer from an absence of the 'how to' element. These models and frameworks instead only provide the areas to consider and not the actions required to achieve success in them.

Finally, and critically, several papers fail to cover all of the eight themes previously derived from literature that can lead to initiative implementation failure. As these have been identified through a robust systematic review it is deemed crucial that each is addressed within the framework to provide the best opportunity to avoid failure.

A summary of the criteria each model or framework fails to cover is presented in Table 3.1. From this it is clear that none of the existing offerings reviewed fulfil all of the research criteria. In relation to the need for a region and industry specific framework; in

this case for UK manufacturing, none of the existing offerings are tailored to the UK and only three are specific to the needs of manufacturing.

Additionally, only two are felt to comprehensively cover the eight failure themes derived from the literature. Of the existing models and frameworks, that by Baidoun (2004) best fulfils the criteria, but this suffers from the absence of tailoring to the UK manufacturing industry, instead being designed specifically for Palestinian organisations. As well as this, it is also difficult to use as it requires constant reference back to the full article for the implementation framework to make sense. The framework itself cannot be used in isolation. The desired user friendly element is missing.

	8 themes	Manufacturing	Site wide	How to	UK
Aziz et al (2018)	X	X		X	X
Baidoun (2004)		X			X
Bolboli and Reiche (2013)	X	X		X	X
Chakraborty and Leyer (2013)	X	X		X	X
Cheng and Chang (2012)	X	X	X	X	X
Chin and Pun (2002)	X	X			X
Dibia et al (2014)	X	X		X	X
Furterer and Elshennawy (2005)	X	X	X	X	X
Jeyaraman and Teo (2010)		X		X	X
Jones et al. (2010)	X	X	X	X	X
Koh and Low (2010)	X	X		X	X
Kumar et al. (2011)	X	X			X
Michael et al (1997)	X	X		X	X
Mishra and Sharma (2014)	X	X	X	X	X
Mostafa et al. (2013)	X			X	X
Ng and Ghobakhloo (2018)	X			X	X
Nordin et al. (2012)	X			X	X
Psychogios and Tsironis (2012)	X	X		X	X
Thomas et al (2008)	X		X	X	X
Turnell and Washbourne (1991)	X	X		X	X
Wang et al. (2011)	X	X	X	X	X
Yadav (2015)	X	X		X	X
Yusof and Aspinwall (2000)	X	X		X	X
<i>Total number of papers</i>	21	19	6	20	23

Table 3.1 - Criteria not covered by each existing model or framework

3.4 Description of new conceptual framework

The new conceptual framework presented has been developed by incorporating the eight failure themes derived from literature, along with the positive aspects identified from the other models or frameworks reviewed (Figure 3.2). As it explains what influences the implementation outcomes and details a structure and plan for achieving these the implementation guide detailed is categorised as a framework rather than a model. It can be more specifically defined as a determinant framework. The framework contains several barriers or enablers (determinants) which influence the overall outcome of the implementation. As has been the case with this research, determinant frameworks are typically developed by collating results from previous studies of barriers and enablers, through the review of existing frameworks or through the originators own experience (Nilsen 2015). The new conceptual framework has utilised all of these approaches.

It also fulfils the criteria set out at the beginning of the paper by being specifically tailored to the needs of manufacturing companies. This has been achieved as the original systematic literature review was conducted purely on manufacturing. This specific tailoring will be further strengthened when the conceptual framework is subsequently tested with UK manufacturing companies. Additionally, an attempt has been made to go beyond ‘what to do’ and provide guidance to the user of the framework on ‘how to do it’ by detailing the actions to be completed.

Similar to several of the frameworks and models reviewed, the new framework is presented in phases. The four phases are Extended Diagnostic, Design, Implementation and Evaluation (EDDIE). The model serves to provide guidance on the activities required at each phase as well as providing awareness of the implementation overall. No time lines have been provided in the framework as it is felt this is likely to vary considerably between businesses.

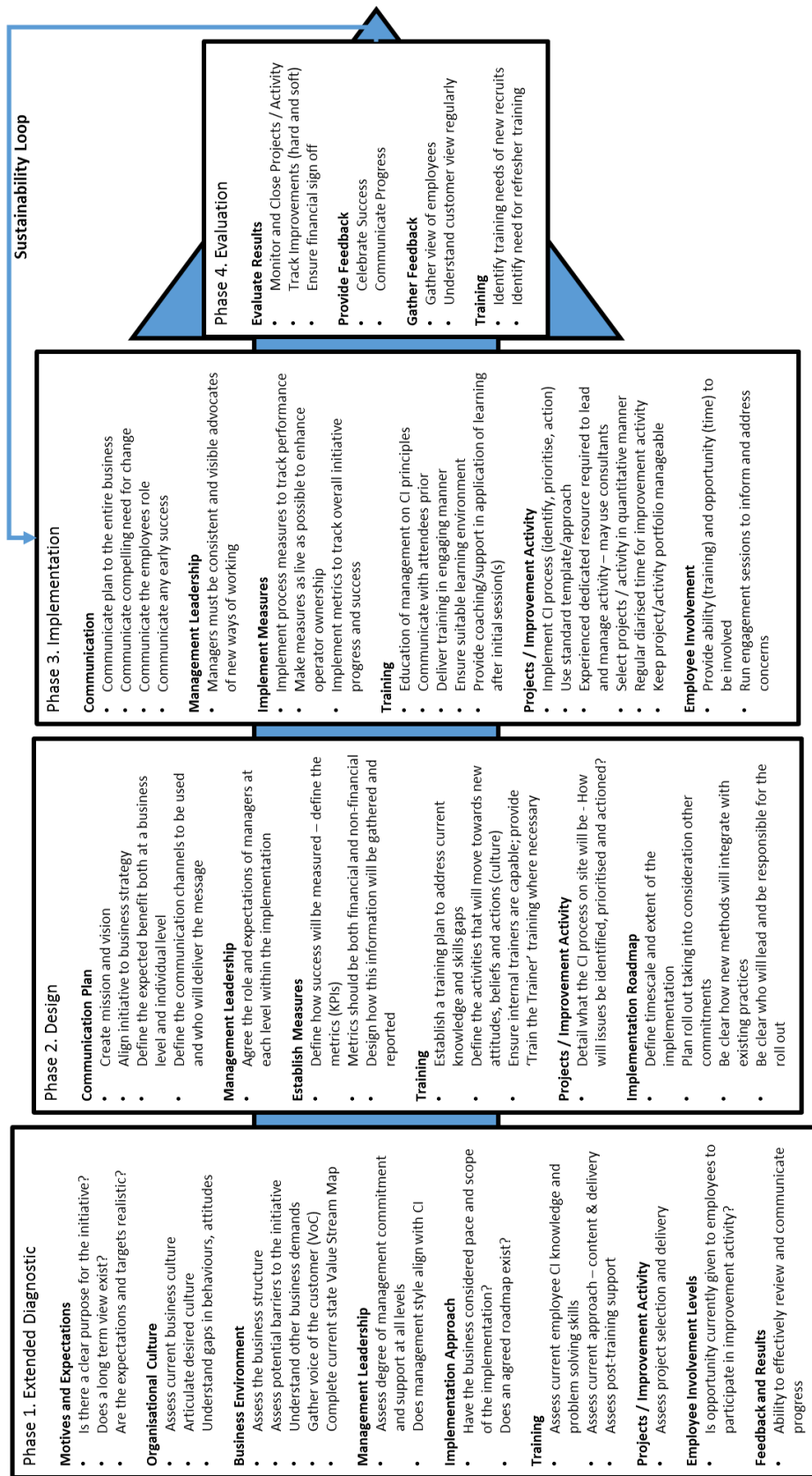


Figure 3.2 - New conceptual framework: The EDDIE framework

Although the framework is split by phase, the areas and activities within each are not strictly sequenced. This allows a business to use the framework in a flexible manner to suit its approach, whilst ensuring the critical steps within each phase are addressed before moving to the next.

Similar to Dibia et al. (2014) and Nordin et al. (2012), the framework presented has an emphasis on effective communication throughout the entire process.

Phase 1: Extended Diagnostic (ED)

The main aim of the Extended Diagnostic phase is to understand the current state within the business. This appraisal of the business, which would include assessment of the current culture as promoted by Turnell and Washbourne (1991), would be tackled by understanding areas such as the motivation for the initiative and current levels of management commitment. All levels of management therefore must provide commitment to and support of the initiative. It is unlikely that all staff will be on board but it is useful to have a gauge of the biggest advocates and resisters at the outset.

This Extended Diagnostic phase would involve several activities designed to gain a strong grasp of various aspects of the business and its environment. The term Extended Diagnostic is used as this phase would be an assessment across all levels and areas of the business. This would require assessment of different people and different business areas at various points in time before the assessment could be considered complete. This would be achieved through activities such as interview, focus group, and observation. As advocated by Yusof and Aspinwall (2000) this would allow the completion of a 'gap analysis' and serve to mould the thoughts on how to approach the implementation. Depending on the level of experience within the organisation it is felt this could be completed internally or through the use of a consultant.

Either way, the framework provides guidance on the areas that should be considered. This phase of the framework is split further under nine headings. Within each heading are questions or statements designed to act as prompts and cover the areas felt critical to understand before moving to the second phase of the initiative. Each of these sub headings should create an awareness for the business that either;

- They can provide a positive response to the question, and are confident they are strong in this area or have addressed this area

- They can provide a negative response to the question, and therefore need to address this before proceeding or,
- Cannot respond yet, and need to complete discussion or action before proceeding to the next phase.

As well as the internal business environment the framework also states the need to collect Voice of the Customer information. This upfront customer focus is specifically promoted by Baidoun (2004) and Michael et al. (1997). This ethos is well aligned to any continuous improvement approach. Lean has understanding the customer as one of the core principles and Six Sigma has the customer as one of its core pillars.

The output of this phase would be a clear identification of where the organisation currently sits in relation to the areas highlighted, and this will input into the next phase; Design.

Phase 2: Design (D)

Building on the awareness created in the Extended Diagnostic phase, the Design phase is used to create the action plan for the implementation, ensuring that the gaps identified during the Extended Diagnostic phase will be addressed. This distinct planning phase prior to execution is promoted by several other authors (Chin and Pun 2002, Mishra and Sharma 2014, Mostafa et al. 2013).

If, for instance, training is identified as a gap during the Extended Diagnostic phase (maybe no one has currently received Continuous Improvement training) the Design phase would be used to agree what training people will receive and when. As well as the formal education of staff, any training delivered should also attempt to influence the attitudes and behaviours of staff in order to aid the movement towards the desired culture. These plans would feed into the creation of an overall company implementation roadmap. The different elements highlighted in this phase of the framework will all combine to create the essential main output of an implementation roadmap. This should be tailored to the company needs and resource levels. This roadmap will allow a shared vision to be created, whilst providing guidance and a point of reference as the initiative progresses.

This phase will also ensure essential conversations regarding the need for the initiative to be aligned to the strategy (Chakraborty and Leyer 2013) occur. In their preparation phase Chin and Pun (2012) emphasise the need to create the vision and strategy and the

subsequent communication of this. Bolboli and Reiche (2013) also advocate the establishment of measures in their Planning and Design phase, and this has also been incorporated in the new framework to ensure measures of success are agreed.

Another essential element of the Design phase is deciding what the Continuous Improvement process on site will be. The Continuous Improvement process is the manner in which improvement opportunities are identified, assigned and actioned. It is important to understand what information or data will feed into this process, the forum in which it will be reviewed and the format improvement activity will take (Figure 3.3). Finally, there must also be an ongoing review of improvement activity (usually projects), progress and results. This process would be the mechanism for management of discrete improvement activity and sit within the overall Continuous Improvement implementation framework.

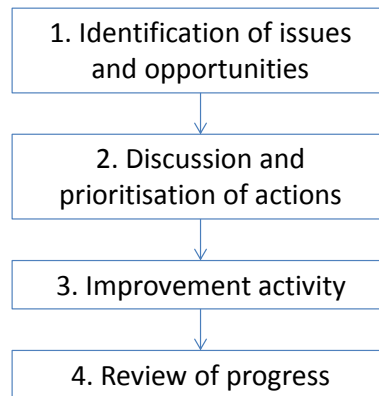


Figure 3.3 - Proposed phases of a site Continuous Improvement process

Unknown at this stage of the research is what level of previous experience, if any, is necessary to be able to navigate through this phase of the initiative. It felt essential that time is allocated to take a step back and properly plan the implementation in order to give it best chance of success. The implementation should be a well-considered and well-coordinated effort. Careful consideration is required during the pre-implementation phase (Kumar et al. 2011). Again, a formal communication plan is advised which details the messaging that will surround the implementation.

Phase 3: Implementation (I)

Once the bespoke roadmap is complete as an output from the Design phase, the company can move onto the Implementation phase of the initiative. This is where the plans are executed and the desired change starts to be realised. Again, communication is an essential component of this phase. The agreed communication plan should be rolled out, and if there are any early successes these should be communicated in order to create momentum (Kumar et al. 2011).

Mostafa et al. (2013) believe that an experienced team is required to deploy the initiative. A company may have this capability internally or require to obtain it through the use of external consultants. If not at the overall initiative level, consultants may at a minimum be required for their experience of delivering training and running improvement activity or projects.

Specifically, in relation to improvement projects, Chakraborty and Leyer (2013) stress the importance of selecting these in a quantitative manner. This, as well as the need to put in place an overall Continuous Improvement process, is included.

Another essential element of the roll out will be the education of employees at all levels. Turnell and Washbourne (1991) believe the first step should be to educate upper management. Yusof and Aspinwall (2000) also believe the senior team must be educated on improvement principles. This training should ensure management have the necessary knowledge of improvement principles and are therefore able to effectively sponsor the initiative. The training that is provided to employees should provide them with the knowledge to effectively input to the site Continuous Improvement process.

The subsequent improvement activity will require regular time allocated to it to ensure employees also have the opportunity to input to improvement activity.

Phase 4: Evaluation (E)

The final phase of the framework is the Evaluation phase. This stage is included to ensure that any improvements achieved are sustained long term and that mechanisms exist to monitor the progress of the implementation overall. It is important to have a monitoring system in place (Bolboli and Reiche 2013).

The hard and soft metrics agreed and implemented during the Design and Implementation phases now require formal evaluation. Especially in the early stages it will be important to have soft measures of success also, as it was identified in the Systematic Literature Review that the hard benefits are unlikely to be achieved immediately. The company still needs measures to indicate if the implementation is going as planned. This will allow the success, or otherwise, of the implementation to be understood. Whether positive or not, the results should aid decisions about the necessary course of action moving forward. This will feed back into the Implementation phase again.

It is believed that the implementation roadmap that was devised in the Design phase and executed in the Implementation phase should be fairly fluid, with the company making considered adjustments along the way when so indicated by feedback data. A subsequent phase of this research (individual interviews) will be used to understand the forums used in successful companies to monitor their implementation.

In addition to the formal review of metrics, Chin and Pun (2002) promote having several other review mechanisms; employee and customer feedback in place as well as performance data and benchmarking. In the Extended Diagnostic phase, it was recommended to gather the Voice of the Customer. Having been through the Implementation phase it would also be beneficial to repeat this exercise, and to have the gathering of customer feedback as an ongoing activity. In addition, efforts should be made to understand the view of the employees throughout the implementation as a core objective of the efforts is likely to be increased employee involvement levels and culture change.

Finally, within the Evaluation phase training will require ongoing consideration. This will be the case for new recruits and existing employees. As the efforts mature employees may require more sophisticated tools, or may just require refresher training. These identified training needs are again fed back into the Implementation phase to be actioned.

3.5 SWOT Analysis

A SWOT analysis is a common tool used for evaluation. A SWOT analysis has therefore been completed on the new conceptual framework prior to its review and finalisation (Table 3.2). Through this it is clear that whilst the framework contains several strengths; the main weakness and threat that exist is that it has received no real world validation at

this stage of the research process. This subsequent review also serves as the main opportunity to separate this framework from others.

<p>Strengths</p> <ul style="list-style-type: none"> • Based on an extensive review of relevant literature • Incorporates strengths of several other models or frameworks • Details what areas to address and what to tackle or consider within each • Presented in a clear manner with an emphasis on specific phases of implementation • Focused on manufacturing 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Has not been tested • Has not been used in a practical setting • Does not cater for other industries or regions
<p>Opportunities</p> <ul style="list-style-type: none"> • Review with practitioners and business leaders • Update in line with interview feedback • Ensure the terminology and format is user friendly (readily understood) 	<p>Threats</p> <ul style="list-style-type: none"> • Many other frameworks already exist • Becomes an academic exercise with no practical application

Table 3.2 - SWOT Analysis of conceptual framework

3.6 Conclusions

Having identified the need for industry and region specific implementation frameworks, an extensive evaluation of existing frameworks was undertaken through a critical literature review. This was completed in order to initially confirm the absence of a Continuous Improvement implementation framework for UK manufacturing companies, and secondly to understand the strengths and format of current offerings. Through this it

is clear that a gap not only exists with the specific focus (industry and region) of the existing frameworks but also with the content and format of many.

There are many benefits of the conceptual framework presented. It provides a clear and concise view of the high level process through a summary of the phases and activities necessary in a Continuous Improvement implementation. As it is specific to manufacturing companies it is also better tailored to their needs. The EDDIE framework, like many of the others reviewed, is presented in a phased manner, with distinct pre-evaluation (Extended Diagnostic) and preparation (Design) phases included.

The new conceptual framework has, where applicable, included positive elements from each of the other frameworks reviewed whilst also ensuring each of the eight failure themes previously derived from literature have been addressed. The EDDIE framework will now be finalised through further research with UK manufacturing companies. This will draw on the experience of UK manufacturing companies, allowing this to be incorporated, whilst also evaluating the merits of the framework with companies wishing to embark on a new Continuous Improvement journey.

3.7 Summary

With the reasons for Continuous Improvement failure identified through the Systematic Literature Review, the next objective of the research was to critically evaluate current models and frameworks for implementation and sustainability of Continuous Improvement initiatives in manufacturing. This has been completed through a Critical Literature Review, identifying both the strengths and weaknesses of existing frameworks and models against the criteria set out. This has identified that no existing framework fully achieves the objectives of this research and therefore a research gap exists.

The findings of the Critical Literature Review have also been used to begin to tackle the final objective of this research by being captured in the form of a conceptual framework. This framework will serve as the input to the remaining phases of the research with the aim of finalising the development and validation of a practical and strategic framework for implementation and sustainability of Continuous Improvement initiatives in UK manufacturing.

Chapter 4 Research Methodology

4.1 Introduction

This chapter will provide an overview of various research approaches that can be used in pursuit of the defined research objectives. Through outlining the variety of research paradigms, approaches and strategies available, the chosen research design will be detailed and justified. The chapter will broadly be based on the research onion as described by Saunders et al. (2009).

This section will therefore define where the overall research lies on the Basic to Applied continuum before detailing the research paradigm upon which the research is based. It is important to consider and detail these areas as the beliefs and feelings of the researcher have the potential to impact the study. Finally, the mix of research approaches and strategies that will be used will be defined and presented in a research model.

The purpose of research is to follow a methodical process in order to make informed decisions. According to Kumar (2010) this process, which involves the collecting, analysing and interpreting of data, should have six main characteristics. It should be controlled, rigorous, systematic, valid, verifiable, empirical and critical.

The researcher must not only have an appreciation for research methods and techniques, but also for the research methodology (Kothari 1990). A research methodology is philosophical view that will influence the research style adopted (Sapsford and Jupp 2006). A research methodology is required as it provides a systematic approach to problem solving. It defines the research methods used by a researcher in the pursuit of explaining or predicting phenomena. It is important within research for this methodology to be outlined. The methodology utilised should be designed specifically to best address the problem at hand (Rajasekar 2013).

Research methods are the individual procedures that can be used in order to collect data and find a solution (Rajasekar 2013). Research methods can be grouped into three types. The first type are the methods used to collect data. These are utilised when the existing data does not allow for a solution to be found. The other types are the statistical methods used for establishing relationships within the data as well as those methods applied in order to quantify the accuracy of the results (Kothari 1990).

The research methodology is far more wide ranging than just the research methods used. It also encompasses the logic behind the selection of those methods based upon the context in which they are applied. This awareness of the available options with justification for the chosen methods applied is an important element of research (Kothari 1990).

The objective of research, particularly applied research, is to identify a solution for a specific problem (Kothari 1990). Important to the researcher is that the research, and the resulting outputs, are of practical use and are not purely academic in nature. This is an important feature and objective of management research, as it should serve to inform and develop practical theory (Tranfield and Starkey 1998). Management research should be more like medical research with a focus on converting new findings into practice by providing managers information on what works, when and why.

Knowledge creation can be considered to sit on a continuum based on its purpose and context (Saunders et al. 2009). At the 'Basic' end of the continuum, research is carried out for the sole purpose to understand management processes and therefore will have a purely academic audience and agenda. At the opposite 'Applied' end of the continuum the research is of direct relevance to business and addresses issues important to them. It is also essential that the manner of presenting the outputs is simplistic and useable.

The research detailed in this thesis is therefore considered to be towards the 'Applied' end of the continuum. This is the case as the researcher is a full time Continuous Improvement practitioner and is therefore attempting to create new knowledge relevant to his role, and that will aid businesses in their activities.

The research can also be considered to be mode 2 knowledge generation. Gibbons et al. (1994) define 5 criteria that highlight the difference between mode 1 and mode 2. Mode 1 is a more traditional approach to research that is theory led, having theory as its starting point. Mode 1 will typically be carried out in a structured manner, by academic teams. The problem definition will therefore be in a purely academic context. This means that little consideration will be given to the sharing of the knowledge created with potential applicants.

Mode 2 however, differs through the following five points:

1. The aim of knowledge creation in mode 2 is with a focus on the application of that knowledge. It must therefore address a real problem for a firm or industry

that is preventing them achieving their desired state. The research aims to have a practical use.

2. Although it may not be clear at the start, it is likely that the practical problem which forms the basis for the research will most effectively be addressed by drawing on expertise from a combination of disciplines. The ability to identify and include these as the research develops is important.
3. There is the on-going need to reflect on the research through the use of multi-disciplinary teams in order to shape the future direction and ensure the problem solving is effective.
4. The research team, or those involved in the research, will not be made up of individuals from purely an academic background. The people involved in the research should be from various organisations.
5. Due to the cross-disciplinary nature and the involvement of various organisations, the knowledge creating must satisfy a greater audience as it will be judged by both academics and industry.

The study is being sponsored by the employer, and their expectation is also of a practically useful output to advance their offering. In attempting to generate this however, adequate consideration will have to be given to the academic rigour required for the successful completion of this level of study. For this reason, the study is not considered purely 'Applied' in nature, but towards that end of the continuum.

Saunders et al. (2009) detail the concept of a research onion, in which both the research methodology and research methods are considered in order to develop the final research design. The layers and associated options available to the researcher within each are shown in Table 4.1.

Layer of Onion	Options available
Philosophies	Positivism, Realism, Interpretivism, Pragmatism
Approaches	Deductive, Inductive
Strategies	Experiment, Survey, Case Study, Action Research, Grounded Theory, Ethnography, Archival Research
Method	Mono-method, Mixed Method, Multi-method
Time Horizon	Cross-sectional, Longitudinal
Techniques and Procedures	Data collection and analysis

Table 4.1 - Layers of the research onion (Saunders et al. 2009)

The remainder of this chapter will be structured in this manner, with clarity given of the chosen options at each layer.

A summary of the options adopted within this research at each layer of the onion, with the associated reasoning, is provided in section 4.8 of this chapter.

4.2 Research Paradigm

At the outset of a research project it is important to state the epistemological or philosophical position held; the research paradigm. The research paradigm is argued to be more important than the research methods employed (Guba and Lincoln 1994). This is because the research paradigm is considered to define the basic beliefs and view of the world that the researcher possesses. These are considered to have a large bearing on the manner in which the research will be carried out. It is therefore essential to be able to reflect upon and understand the philosophical stance the researcher holds (Johnson and Clark 2006). The stance, or perspective, that the researcher approaches the task with has the potential to influence or bias the findings. It is therefore essential to be aware of this in order to be able to effectively defend the research findings (O’Gorman and MacIntosh 2014).

The available paradigms are positivism, realism, and interpretivism. Each will be examined in the section below. Firstly, however, important to consider when examining research philosophy is ontology and epistemology.

Ontology is concerned with how a researcher views reality and therefore the beliefs held about the manner in which the world operates. There are two types of ontology; objectivism and subjectivism (Bryman 2001).

Objectivism relates to a physical sciences approach, where the reality is considered to be fact and would be the same regardless of who the researcher is. The aim would be to discover what is factually there. The opposite view is that of subjectivism. This views that the world is constantly shifting and that reality is dependent on who is viewing it. The aim is therefore to gather and understand the different views of people (Meredith et al. 1989).

Despite having an engineering and mathematical background, and therefore desiring rigid rules to guide understanding, in terms of management theory the researcher is strongly of the belief that the individual personalities and the interactions between people have a significant impact on the outcome achieved. A subjective ontology is therefore held in relation to the research.

Epistemology relates to the research philosophy held, and what is considered suitable knowledge within an area of study (Saunders et al. 2009). This set of beliefs will guide how the researcher will approach the task of inquiry (Easterby-Smith et al. 2004). Three core epistemologies will be discussed; positivism, interpretivism, and realism.

Positivism, and the associated positivistic approach, generally relates to a quantitative research method. This is underpinned by a fundamental belief that the subject of investigation can be accurately measured rather than being described subjectively (Remenyi et al. 1998). This philosophy would seem to be closely tied to an objective ontology. The aim of this form of research is to be removed from the subject of study, and to generate findings that can be universally applied. Due to this approach, the method used and the findings achieved should be highly repeatable (Gill and Johnson 1997).

The opposing philosophy to this, and therefore closely related to the subjective ontology, is that of interpretivism. This relates to attempts to understand a subject from the point of view of individuals and their interpretation of that reality. It is based on the fundamental belief that this is necessary in order to capture the complexity of social situations (Saunders et al. 2009). This approach is particularly suitable when conducting business and management research as business situations are both complex and unique (Saunders et al. 2009), and the focus should be to analyse the meaning of that experience (Easterby-Smith et al. 1991).

Another philosophical position is realism, and this has two types; direct realism and critical realism. Realism in general is concerned with to what extent our senses truly portray reality. Direct realism promotes the concept that our senses accurately portray reality, whereas advocates of critical realism believe that you receive feedback or senses from your position or point of view in that reality and not necessarily the complete reality itself (Saunders et al. 2009). The philosophy of critical realism is aligned to business and management research where the objective is to understand the reason for an occurrence before making recommendations for the future (Saunders et al. 2009).

Aligned with the previous statement of holding a subjective ontology, the researcher is more towards the philosophical position of interpretivism and critical realism. This paradigm is held as the researcher believes it is likely the research will ultimately be dealing with subjective people-related elements that are going to require interpretation rather than solely quantitative measurement. For this reason, a bias toward interpretivism and critical realism is held. It is acknowledged however that in a mixed methods approach the quantitative and repeatable philosophies of positivism may be well suited to certain stages.

4.3 Research Approach

There are two fundamentally different research approaches; the deductive approach and the inductive approach. This is related to the level of clarity that exists at the outset of the research in regards to the theory or hypothesis.

The deductive approach is used when a theory or hypothesis exist at the outset of the research, and the focus is therefore to test that.

According to Robson (2002) there are five phases involved in the deductive approach:

1. Deduce the hypothesis
2. Express the hypothesis in operational terms
3. Test the hypothesis
4. Examine the outcomes
5. Modify the hypothesis (if necessary).

A criticism of the deductive approach is the rigid nature of it, failing to explore alternative reasoning for the outcomes (Easterby-Smith et al. 2002).

The inductive approach, however, is used when the researcher intends to develop the theory through the collection, and subsequent analysis, of data (Saunders et al. 2009).

An inductive approach was initially required for this research as no specific theory or framework existed at the beginning; purely a desire to examine “Why Continuous Improvement Initiatives Fail in Manufacturing Environments”.

The approach therefore was to conduct a systematic literature review in order to develop an initial model or framework that was subsequently tested, refined and developed through a deductive approach.

Saunders et al. (2009) promotes this combination of the two approaches within the same piece of research. As Continuous Improvement is a subject on which much has been written, the approach of defining an initial framework from the literature is well suited (Creswell 2002).

4.4 Research Purpose

The purpose of research can be considered to be exploratory, descriptive or explanatory (Saunders et al. 2009). As with many of the other areas discussed within this chapter however, the research can fulfil more than one category, and can change categorisation as the research unfolds (Robson 2002).

Exploratory research is focussed on better understanding a topic or issue. Although focussed on a particular topic, this enquiry typically starts at a fairly broad level in order for the direction of later research to be determined (Adams and Schvaneveldt 1991). The first stage of this research was to undertake a broad reading of Continuous Improvement literature. This was largely unfocussed, with the exploratory nature of the activity allowing the future focus of the study to be determined as a result. This initial activity allowed identification of the multiple references in literature to the high failure rates of CI initiatives.

Descriptive research aims to define the current state (Robson 2002). It is concerned with creating knowledge around ‘What’ is currently happening (Phillips and Pugh 2005). Through the initial literature review conducted at the outset of this research this descriptive piece was achieved, through the identification of the multiple references made to the high failure rate of Continuous Improvement initiatives. This provided the basis of ‘What’ area required researched further.

The final purpose is explanatory research. The desire when conducting this type of research is to articulate ‘Why’ particular scenarios occur and develop explanations in the form of causal relationships or theories (Phillips and Pugh 2005, de Vaus 2001). Answering this ‘Why’ will be the core focus of the research, with the final output a tool to combat this occurrence. The primary purpose is therefore explanatory as the final aim of the research is to develop a new framework detailing what themes and variables need addressed, and how these combine, in order to achieve a successful Continuous Improvement implementation.

4.5 Research Strategies

In this section an overview of available research strategies, of which there are many, is given. The chosen combination of research strategies detailed will allow the central research question to be answered, and the desired final output to be generated.

4.5.1 Literature Review

A literature review is the mechanism used to establish the previous research in an area of interest, identify the trends and the current knowledge gaps. This exercise will aid either the identification of a research topic or the advancement of the current research. This is an important element of the thesis and provides justification for the research direction (Bruce 1994).

There are four main types of literature review that are usually carried out; traditional or narrative, systematic, meta-analysis and meta-synthesis.

Traditional reviews are mainly conducted to summarise the current literature. A traditional literature review is conducted in order to summarise existing literature; although no structured approach in terms of a defined method, style or analysis is necessarily used. Ensuring rigour, however, is key to undertaking a systematic literature review especially as this method is commonly used to answer specific research questions and not just to provide a general summary (O’Gorman and MacIntosh 2014, Jesson et al. 2011).

When evaluating the findings of a literature review statistical or non-statistical methods can be employed. A meta-analysis involves analysing findings by statistical procedures (Coughlan et al. 2007), whereas meta-synthesis is a non-statistical approach instead used to analyse findings from qualitative studies (O’Gorman and MacIntosh 2014).

Mallett et al. (2012) highlight several challenges associated with conducting literature reviews. Most notable amongst these are the time consuming nature of the activity, the potential difficulty accessing all available literature and being able to avoid bias in the literature selection process.

4.5.2 Experiment

The experimental method has its foundations in educational psychology. It is used to study the effect of environmental changes. It therefore requires experimental designs which hold all other conditions constant whilst altering the desired variable. This allows comparison of a control group to the experimental group in order to establish the impact of the chosen variable. The challenge in this approach is ensuring validity of the approach so that confident statements can be made comparing the two groups (Ross and Morrison 1996).

Ross and Morrison (1996) outline four of the main experimental designs available:

1. True experiments

Key to the true experiment is the ability to randomly assign participants to the different treatments to be studied. This ensures that systematic error is avoided. The participant groups are exposed to the different treatments whilst the external environment they each experience is kept constant.

2. Repeated measures

The repeated measures approach is different to the true experiment design as each subject receives each treatment and therefore serves as its own control within the experiment.

3. Quasi-experimental designs

This approach is used when it is not possible to randomly assign subjects to the treatments. This is typically a challenge when conducting school based research and classes are pre-established. In this scenario, a quasi-experiment would instead attempt to compare similar groups by exposing each to a different education strategy. Essential to this approach being successful is to complete pretesting in order to confirm similarity between the groups under study and avoid systematic bias.

4. Time series design

The time series design is a variant of the quasi experimental design. This approach involves repeat measurement of the same group, with application of the treatment

completed after the first measure is taken. The drawback of this approach is not being able to state conclusively that any change observed is due entirely to the treatment applied. In the intervening period a range of other variables could also influence the results.

Experiments are utilised widely in social science in order to study causal links. It is generally considered to be both a reliable and efficient manner of research when attempting to confirm or disprove theories (O’Gorman and MacIntosh 2014). An experimental approach is most commonly associated with scientific research, as it tends to be completed in a laboratory. This laboratory setting provides increased control over conditions and events (O’Gorman and MacIntosh 2014). The focus of an experiment is to manipulate chosen variables in order to study the impact this has on other variables or on the overall system (Hakim 2000). Experiments can also be used in management research, being best suited to the likes of psychology where the study can be conducted in an artificial environment.

4.5.3 Survey

According to Malhotra and Grover (1998:409) “a survey involves the collection of information from a large group of people or a population”. This type of research has three characteristics:

1. Information is gathered through a structured format. This can be through either mail questionnaire, telephone interview, or face-to-face interview.
2. Information is typically gathered in a standardised quantitative manner in order to understand a variable or relationship between variables.
3. A sample of the overall population under study is used in order to make generalised statements about that population.

The purpose of a survey is to be able to ask the same questions, in the same manner and same order to various different respondents. An advantage of surveys, especially when kept short and non-time-consuming, is the higher response rate that can be achieved and therefore the large quantity of new information that can be collected using the method (O’Gorman and MacIntosh 2014).

Surveys can be designed to be either exploratory or explanatory (Oppenheim 2000). An exploratory survey is used to be able to measure and understand a topic in order to become more familiar with it. This then allows the identification of subsequent routes of investigations. Exploratory surveys can also be ‘descriptive’ in nature, with the focus to

“develop the units that comprise theories” (Malhotra and Grover 1998:409). Explanatory survey research on the other hand aims to develop theory through the identification of causal relationships between variables (Malhotra and Grover 1998).

A survey can be completed in various forms; through questionnaire, interview or focus group (Beech 2005). The purpose of a survey is to gather information in a systematic fashion from one or more people on a chosen topic. A particular strength of a survey is the economy of time and cost versus the large volume of data that can be collected (Saunders et al. 2009).

Many survey methods can be used to collect research data depending on the topic under study, the goal of the research and the budget that exists. Most popular are face-to-face, telephone or internet based surveys. Szolnokin and Hoffmann (2013) completed a literature review which included the identification of the advantages and disadvantages associated with each method. These are summarised in Table 4.2.

Survey Method	Advantages	Disadvantages
Face-to-face	<ul style="list-style-type: none"> • Clearly structured • Flexible • Can be controlled within the survey environment • Respondents can be observed 	<ul style="list-style-type: none"> • Interviewer bias • High cost per respondent • Geographical limitations • Time pressure on respondents
Telephone	<ul style="list-style-type: none"> • Can utilise random dialling • Good geographical coverage • Personal interaction • Low cost 	<ul style="list-style-type: none"> • Interviewer bias • Low response rate • Cannot use visual help
Online	<ul style="list-style-type: none"> • Low cost • High speed • Interviewer does not require to be present • Busy people more likely to participate 	<ul style="list-style-type: none"> • Requires initiative from respondents • Can result in selective samples (nonresponse bias) • Representative of population sub groups only

Table 4.2 - Advantages and disadvantages of survey methods (Szolnokin and Hoffman 2013)

Based on these advantages and disadvantages the decision was made to incorporate both online survey and face-to-face survey into the final research design. Online survey is well suited to the review of the initial themes identified in literature as the aim was to quickly sense check the initial findings with as many relevant people as possible. Online survey allows access to people of diverse location and a consistent question and response format. This matched well with the objective of this stage of the research.

The initial review and development of the conceptual framework, however, was felt to require detailed face-to-face discussion. As it was the central activity in the research the detailed response achieved from each interview was felt to out-weigh the time commitment required from the researcher to complete the activity.

Regardless of the chosen survey form, there are five phases involved in conducting a survey (Edwards and Thomas 1993):

1. Identify the purpose of the assessment – is a survey the most effective method?
2. Develop the survey
3. Survey administration – identify the desired respondents and distribute the survey
4. Data collected and analysed
5. Communicate the results.

In his paper, Kirk-Smith (1998) outlines some of the strengths and challenges associated with questionnaire based research. Whilst the paper is targeted towards marketing questionnaires, it does state questionnaires are a useful method of gathering data, and also allow the responses to be subjected to statistical analysis. The approach however does rely on self-report data, and this is acknowledged to include bias and unreliability.

When designing a questionnaire, it is critical to ensure the structure is suitable, the questions are clear and the questionnaire is easily read. The questions used can either be structured or unstructured (O’Gorman and MacIntosh 2014).

Another technique that can be used is interview, which involves the researcher navigating a conversation with the respondent in order to gain valuable responses around the subject matter. Interviews are used to collect primary data in response to a specific research question. The approach taken to the interview can range from structured to unstructured, with the option to use semi-structured as a hybrid of both. The main difference between each approach is the amount of influence the interviewer has over the proceedings. This is maximised in a structured interview, with a strict set of questions asked in a specific

order. The response categories are typically limited also to ensure consistency between each interview conducted. A structured interview can be appropriate when the interviewer is knowledgeable about the research topic and is able to create specific questions. Less strict in approach, a semi-structured interview will only follow the outlined topics to be discussed with the respondent's feedback to each question steering the future direction of the interview. In order to maximise the effectiveness of the approach, the researcher will often complete pre-work in order to ensure a strong understanding of the topic. This allows meaningful questions to be posed regardless of the direction the interview takes. Semi-structured interviews provide a balance between the preparation of questions by the interviewer and the opportunity for the respondent to openly express their views. Finally, the unstructured interview is used when there is not much known about the topic being studied. In this case the researcher will begin with a general question on the topic and encourage the interviewee to freely respond. This allows information to be collected that could not otherwise have been predicted. Analysis of the interviews is however difficult as the interviews can gather wide ranging responses (Stuckey 2013).

The more unstructured the approach that is used the more time consuming the activity becomes and the more difficult it is to find generalizable findings. The unstructured approach provides the opportunity to gain more insight during the interview, and therefore to gather more rich data as the flexibility exists to explore points that are of interest. This flexibility does however carry the risk that the interviewer can bias the path of the interview and the overall findings, whilst significant amounts of irrelevant data can also result. Consideration must also be given to the method in which the interview will be conducted. The option exists to either complete the interview by video call, telephone, or face to face. The decision of which method is most suitable should be made based on the resources available and the context required in order to gather the best data possible (O'Gorman and MacIntosh 2014).

The final survey approach available to use is the focus group. This approach is utilised when the researcher wishes to interview multiple people at the one time (Brymen and Bell 2003). This is done in order for the participants to be able to share and discuss opinions and experiences (O'Gorman and MacIntosh 2014). During the focus group interview the role of the facilitator is critical. The facilitator role is to encourage conversation without attempting to lead the opinion of the group (Saunders et al. 2009).

Three types of focus group can be completed; exploratory, clinical or experiential (Fern 2001). These three types of focus group are distinguished based on the research purpose they are being used for, the type of information that is generated as an output, and the methodology used. In terms of research purpose an exploratory focus group is different to both a clinical or experiential focus group. The purpose of an exploratory approach is to identify, discover and explain feelings and behaviours in order to create new ideas, identify needs or issues or to explain outputs from other research. The information generated from exploratory focus groups tends to be unique as it explores the participants' unique experiences. Exploratory focus groups can be used to generate models and theory or to explore casual relationships. The purpose of a clinical focus group is more toward the uncovering of human feeling and attitude. It is therefore used in an attempt to explain these beliefs and identify the reasons for these. Finally, an experiential focus group is more focused toward evaluation and confirmation rather than the unearthing of new knowledge. The approach also gathers the attitudes and experience of the participants but uses these to confirm a model or theory that has previously been developed (Fern 2001).

A focus group will be used in two separate stages within this research, with both experiential in nature. The initial focus group, which will be completed as part of the Delphi study, will be completed to review the conceptual framework derived from literature. It will aim to draw on the experience of the group in order to further develop the framework. The focus group therefore requires that the participants share similar levels of relevant knowledge and experience (Fern 2001).

Similarly, a focus group will also be used to review the final framework resulting from the Delphi study. Having been derived through an expert panel, it will be valuable to also review the final framework with less experienced Continuous Improvement practitioners to understand its applicability to that target user group.

As focus groups are qualitative in nature, it can be beneficial to use it in conjunction with other approaches, undertaking it to validate findings gained from the earlier application of other methods or to gain further insight (O'Gorman and MacIntosh 2014). In order for the focus group to provide robust findings the stages of planning and recruiting are critical. The planning stage will require careful consideration to be given to purpose of the focus group as well as the location in which it is to be conducted. The researcher must also be clear how the findings from the focus group will be recorded. In terms of recruitment, the focus group will only be valuable if suitable people participate with the

knowledge and experience required. Consideration must be given to the selection criteria, group size and method of invitation. Once underway the focus group should take a standard structure; introduction; ice breaker; initial questions; important questions; closing questions. Through these stages a comfortable environment is created and participants are introduced before advancing the core purpose of the session. The topic and purpose of the focus group should be clearly introduced in order to establish a shared understanding. The main discussion then proceeds before the facilitator closes the session with final questions and remarks. The final stage also allows for further clarity to be sought in relation to any prior points discussed. Limitations of focus groups include the difficulty in organising, the challenges faced with transcribing the discussions, the large volume of information generated, and the difficulty in controlling the group (O’Gorman and MacIntosh 2014).

4.5.4 Delphi Study

A Delphi study provides an approach to ask and gather views on a topic through the use of a series of questionnaires. The opinions gathered in each round is summarised and shared along with the next questionnaire (Delbecq et al. 1975).

The first application of the Delphi method occurred in the 1950s when the military used it to understand the impact of atomic bombing. Since then, the approach has been applied in various other areas including forecasting, planning, and supply chain as well as operations and production management (MacCarthy and Atthirawong 2003).

The Delphi approach is used to gain group consensus on a complex issue through the use of group communication. This communication is facilitated by a coordinator who designs the questionnaires and analyses the results. The Delphi approach is regularly applied, although the specific methodology adopted within this approach often varies (Hinckeldeyn et al. 2015, Eriksson et al. 2016, Harland et al. 2005). This is because several options exist at each stage of a Delphi depending on the objective of the study and preference of the researcher.

Key to the approach is the ‘remote focus group’ which is created; the participants do not meet in person or communicate directly with each other. It is important not to know the identity of the other focus group members (Inaki et al. 2006). Each panel member (usually an expert in the area being investigated) provides their response independently of the other participants. Input from each expert is therefore not influenced by the personalities or experience of other members of the group. This should ensure more honest and open

input to the process. One of the main characteristics of a Delphi study is that a statistical response is obtained from the group to allow final analysis of the group opinion (Campos-Climent 2012). This means that a survey tool requires to be developed to allow a numerical response to be gathered from respondents. This numerical response will ascertain the level of agreement that exists within the panel and allows this to be reported in a quantifiable manner. This aids the translation of subjective interview response into a quantifiable and objective final output.

MacCarthy and Atthrawong (2003) state that the selection of participants is not typically random as the expert panel will be comprised of people who have experience and/or knowledge of the subject being researched. When conducting the Delphi study, it is important to include as broad a range of expertise as possible in the panel (Wakefield and Watson 2014).

Wakefield and Watson (2014) outline five clear criteria for the selection of the expert panel. Each participant should possess a knowledge of the research area and be able to demonstrate a record of high performance in that area. Each person should also have the ability to be objective on the topic. Finally, the participants must both be available to participate and willing to make the commitment to do so for the duration of the research.

A consistent relationship between panel size and the effectiveness of decision making has not been found (Worrell et al. 2012). Delphi studies with as few as 3 participants (Nordin et al. 2012) have been completed, although a panel size of between 10 and 30 would appear to be more common (Worrell et al. 2012). Inaki et al. (2006) completed a Delphi study with a panel of 27 experts from various backgrounds, whilst MacCarthy and Atthirawong (2003) completed the initial stage of their research through a panel comprising of 20 experts.

Whilst there is not a single approach for conducting a Delphi study the minimum number of rounds is considered to be two (Wakefield and Watson 2014). Inaki et al. (2006) state that only two rounds were anticipated as being necessary in their Delphi study, but that subsequent ones would be completed if consensus was not reached by that point. In the research completed by Nordin et al. (2012) only two Delphi rounds were required for stable results to be achieved.

It is common for the initial phase to be open ended in nature, with the focus narrowing in subsequent rounds towards a quantitative result. The facilitator of the study must develop

set criteria with which to measure the feedback of the surveys (Inaki et al. 2006). This is typically done through the use of a Likert scale. Upon completion of a round the decision is made whether another is necessary based on the level of consensus gained. Despite there being a common process and features of a Delphi study, within that some options exist. One of the key alternatives is to ‘seed’ the process with relevant information gathered from theory or prior literature. The seed is used as a point of reference from which to start the discussion. The seed is typically generated through review of previous literature, frameworks or factors contained in practitioner journals (Worrell et al. 2012).

Due to the extended timeframe in which the study takes place with the need for multiple rounds, participant fatigue can be an issue. This can lead to withdrawals from the process as it progresses. To avoid this, it is important to provide participants with information on purpose, timeframe and benefits of the study (Inaki et al. 2006).

Pre-testing or piloting of a questionnaire is good practice (Inaki et al. 2006, MacCarthy and Atthirawog 2003) as it allows necessary changes to be made before the data collection commences. To prepare for the main study, a pilot study is completed as a trial run (Polit et al. 2001). This is completed in order to pre-test the research instrument and is typically carried out with a sample approximately 10% the size of the study panel (Baker 1994).

Various objectives can be fulfilled through the completion of a Delphi study including the development of alternatives options, the identification of underlying assumptions, establishing group consensus, correlating expert opinion or to educate the panel of differing views on the topic (Delbecq et al. 1975).

4.5.5 Case Study

Yin (2009) defines a case study as “an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context”. It will often begin with a problem that requires better understood, an area that requires more thorough explanation, or investigation of a topic where conflicting reports currently exist (O’Gorman and MacIntosh 2014). It is essential to be able to define the ‘Case’ to be analysed; which can be the likes of an organisation, individual, nation, or time period (Stake 1995).

Yin (2003) describes four case study strategies that can be used; single case, multiple case, holistic case, and embedded case. An important decision has to be made between single and multiple case, based on whether the findings have to be specific to one organisation or if the desire is to validate findings through multiple cases and therefore make the output

more generic. The distinction between a holistic or embedded case lies in whether a single unit or multiple units are being analysed (Yin 1994). The holistic design should be utilised when no appropriate subunits exist. An embedded approach should be used when within the overall study there are identifiable subunits which allow the phenomenon to be studied and explained in more detail. A summary of the four basic types of case study design are shown in Figure 4.1.

	single-case design	multiple-case design
holistic (single unit of analysis)	TYPE 1	TYPE 3
embedded (multiple units of analysis)	TYPE 2	TYPE 4

Figure 4.1 - Basic types of designs for case studies (from Yin, 1994)

Whether it is a single case or multiple case approach that is taken, the study can be useful in both the development and testing of theory, and is particularly powerful for answering ‘Why’, ‘How’ and ‘What’ questions (O’Gorman and MacIntosh 2014).

The single case approach focuses solely on one ‘Case’. The benefit of this is the depth of information that can be gathered, therefore providing valuable insight to a specific area of study. Multiple case approaches instead investigate several ‘Cases’. The benefit of this approach is the ability to compare and contrast findings, therefore generating an output more robust and generally applicable in nature. Care must be taken to select appropriate ‘Cases’ as the aim is to either predict similar or contradictory results for predictable reasons (O’Gorman and MacIntosh 2014). Eisenhardt (1989) states that using between four and ten cases is sufficient, but that using less than four can compromise the ability to generate robust findings. The findings can be further enhanced by incorporating several data collection techniques within the study. This will allow triangulation of the results

during the analysis phase. The main challenge in case study research is producing truly generalizable findings, as well as clearly documenting the process followed when gathering and analysing data. This control is required to ensure researcher bias has been minimised (O’Gorman and MacIntosh 2014).

Case study research involves the researcher gathering multiple sources of data in the field through several data collection techniques. This examination of a real life context provides the opportunity to gather rich data which will provide a deep understanding of the situation under investigation (Robson 2002). This approach is likely to necessitate the use of triangulation in order to analyse the data collected. Triangulation allows the researcher to sense check whether data collected in multiple ways is all providing the same results. This gives the results more robust.

Hodkinson and Hodkinson (2001) detail some of the limitations associated with case study research. A researcher can find themselves with a large volume of data to analyse, which may lead to some of this being omitted or simplified. Challenges also exist with the cost of the approach as it is highly time consuming to collect and analyse the data. The complexity of the situations being studied will make the accurate summarisation of what is observed difficult. Linked to this it is difficult to represent the findings numerically and also difficult to generalise the findings. The ability of the researcher is also central to the success of the approach as decisions will be made throughout the research period regarding the questions to ask, what to observe and what to record. The judgement of the researcher can therefore have a large impact on the reported findings.

4.5.7 Action Research

The term ‘action research’ was first used by Kurt Lewin, describing it as “a comparative research on the conditions and effects of various forms of social action and research leading to social action” (Lewin, 1946:35). Since then, the concept has continued to develop. Action research is deployed to combat the perceived gap between research and practice. The approach is built on collaboration between the researcher and industry, with the researcher actively influencing the proceedings rather than just observing them. This requires greater levels of access and trust with subjects than other approaches, and also produces an output less theoretical in nature (O’Gorman and MacIntosh 2014).

Through a review of existing literature Saunders et al. (2009) defines four key themes that define action research:

1. The research is conducted in the work environment rather than external to the work environment (Coghlan and Brannick 2005). It is conducted with the people experiencing the issue at the time of them experiencing it, allowing the researcher to experience it also.
2. The researcher works in collaboration with those experiencing the issues (Eden and Huxham (1996).
3. It is an ongoing iterative process, and unfolds depending on the happenings within the environment being studied. The researcher therefore requires to evaluate this and react accordingly.
4. The research being conducted should have clear broader implications. It must therefore be possible to transfer or generalise the findings to other environments.

When conducting action research, the iterative process involved is generally considered to involve four steps within an ongoing cycle. Coghlan and Brannick (2005) describe these steps as ‘constructing’, ‘planning action’, ‘taking action’ and ‘evaluating action’.



Figure 4.2 - The Action Research Process (based on Susman and Evered 1978)

Susman and Evered (1978) clearly outline the five stages involved in the action research cycle. These are demonstrated in Figure 4.2 and each discussed briefly below.

1. Diagnose

The researcher must first identify the core issues that are driving the need for change. The current state of the organisation must be understood so that an initial hypothesis can be developed regarding the organisation and its problem.

2. Plan Action

The researcher and the organisation must next agree the action that will be taken in order to improve the current state. The output is a plan that establishes the approach that will be taken and the target for the change.

3. Take Action

Next, the plan must be put into action. This involves continued collaboration between the researcher and the organisation to ensure changes are made.

4. Evaluate

Upon completion of each set of agreed actions the outcomes achieved must be evaluated. It is important to understand if the desired results were realised and whether the problem has been reduced. Where change has been achieved it is important to evaluate the extent to which the actions taken are responsible.

5. Specify Learning

Whilst it is formally depicted as the final step in the action research process, specifying learning should in fact be an ongoing process. As knowledge is gained it should be shared with the appropriate audience, either within the organisation or with academia.

This cycle continues regardless of the success of the intervention in order to inform future action and to allow evaluation of the theoretical frameworks. Both the organisation and the academic community should benefit from the output of the action research.

Building on the action research cycle detailed by the likes of Susman and Evered (1978), Zuber-Skerritt and Perry (2002) state that there is an additional cycle of learning which must occur in parallel to the main action research activity within the organisation. This is the 'thesis action research' cycle where the researcher is planning, acting and reflecting in relation to the pursuit of academic learning that is also underway.

An essential element of action research is to agree the duration and extent of the research at the outset. Should a company cease to co-operate during the study the efforts to that point could largely be in vain (O’Gorman and MacIntosh 2014).

Action research, like any other approach, has both its strengths and limitations. A key strength is considered to be the practical relevance of the findings in relation to the individual or organisation being researched. The research, by its nature, will have practical relevance and should provide benefit to both the researcher and the participants. It should improve the practice upon which it is focused whilst bridging the gap between theory and practice. On the other hand, this specific relevance to an individual or organisation is argued to create issues of the ability to generalise the findings to a wider audience. It can also be difficult and time consuming to carry out, requiring ongoing focus to be maintained on achieving the stated objectives of the research (Karim 2001).

Action research was not undertaken as part of this research. Although well aligned to action research, this research did not actively interfere with an organisation and monitor the outcome. It instead reflected on respondents’ experience and captured this to guide future action. The research can therefore be considered an important first step in the action research cycle but not an example of action research in its entirety. It is hoped that the output of this research will serve as the input to future action research in organisations.

A summary of the advantages and challenges associated with each research strategy is provided in Table 4.3.

Research Strategy	Advantages	Challenges Associated
Literature Review	<ul style="list-style-type: none"> • Establishes previous research in the area of interest • Identifies trends and knowledge gaps (Bruce 1994) 	<ul style="list-style-type: none"> • Requires access to a wide range of databases • Time and resource intensive • Bias can exist in the literature selection (Mallett et al. 2012)
Experiment	<ul style="list-style-type: none"> • Able to manipulate chosen variables (Hakim 2000) • Allows the study of causal links • Reliable and efficient (O’Gorman and MacIntosh 2014). 	<ul style="list-style-type: none"> • Conducted in an artificial environment • Ensuring validity of the chosen approach (Ross and Morrison 1996).
Survey - Questionnaire	<ul style="list-style-type: none"> • Can gather large quantity of information (O’Gorman and MacIntosh 2014) • Can be subjected to statistical analysis (Kirk-Smith 1998) • Economy of time and cost (Saunders et al. 2009) 	<ul style="list-style-type: none"> • Relies on self-report data • Includes bias and unreliability (Kirk-Smith 1998).
Survey – Interview	<ul style="list-style-type: none"> • Observation of respondent possible • Clearly structured • Flexible (Szolnokin and Hoffmann 2013) 	<ul style="list-style-type: none"> • Interviewer bias • High cost per respondent • Geographical limitations (Szolnokin and Hoffmann 2013)
Survey – Focus Group	<ul style="list-style-type: none"> • Can interview multiple people at the one time (Brymen and Bell 2003). • Participants share and discuss opinions and experiences (O’Gorman and MacIntosh 2014). 	<ul style="list-style-type: none"> • Only valuable if suitable people participate. • Difficulty organising session • Transcribing the large volume of information generated • Difficulty in controlling the group (O’Gorman and MacIntosh 2014).
Case Study	<ul style="list-style-type: none"> • Useful in developing and testing theory 	<ul style="list-style-type: none"> • Large volume of information to collect and analyse • High cost can be associated

	<ul style="list-style-type: none"> • Can provide valuable insight to a specific area (O’Gorman and MacIntosh 2014) • Can provide rich understanding (Robson 2002) 	<ul style="list-style-type: none"> • Accurate summarisation of complex scenarios difficult • Skill of researcher is essential to success of approach (Hodkinson and Hodkinson 2001).
Action Research	<ul style="list-style-type: none"> • Bridges the gap between theory and practice. • Practical relevance of the findings (Karim 2001). 	<ul style="list-style-type: none"> • Output less theoretical in nature • Should company cease to co-operate efforts largely in vain (O’Gorman and MacIntosh 2014) • Difficult to generalise findings as output specific to an individual or organisation (Karim 2001).

Table 4.3 - Advantages and challenges of each research strategy

4.6 Data Collection

Data collection can be defined as either primary or secondary data collection, based on the source of the data used for analysis. In primary research the data is collected by the researcher for the sole purpose of the research itself. Examples of primary data collection would be transcripts from an interview conducted, or survey responses gathered, for the purpose of the research (Bryman and Bell 2007). Primary data collection is suitable for either a qualitative or quantitative approach (O’Gorman and MacIntosh 2014).

Secondary data however, has been collected previously for another purpose and is accessed by the researcher from available sources (Saunders et al. 2009). This can be available in various formats including public reports, newspapers, magazines, websites, books or articles (Blaxter et al. 2001). Despite not being originally collected for the purpose of the research, secondary data can still be valuable and provide a resource efficient avenue to information. It is particularly useful for comparison to the findings from other primary data collected; allowing confirmation or contradictions to be identified through triangulation. Care must be taken however to ensure the quality of the secondary data and therefore its suitability for inclusion in the research (O’Gorman and MacIntosh 2014).

Bias is a form of systematic error. Whilst some studies are more prone to bias, all research is likely to suffer from it to some degree. The aim therefore must be to minimise the bias within a study in order to ensure meaningful conclusions are drawn from the results (Sica 2006). It is important to possess an understanding of bias and the detrimental effect this can have on any phase of the research. Bias can be present during the design, data collection or data analysis stage and must be minimised through appropriate planning and execution of the study (Pannucci and Wilkins 2010).

Prior to the research being conducted bias can be introduced through the study design or the selection of participants. Whilst conducting the research information bias, in many forms, can be present. This leads to error in the measurement of the outcome. Upon the completion of the research, bias can be introduced through either the data analysis conducted or during publication (Pannucci and Wilkins 2010). Smith and Noble (2014) provide more detail on each of these types of bias:

Design bias can be introduced through poor study design, with inappropriate research questions or a flawed research methodology resulting from the influence of the researcher's personal beliefs. **Participant bias** can be introduced either through the selection of participants for the study or through the inclusion criteria used. The participants selected should be representative of the overall population under study. In qualitative research it is common to include participants with a range of experiences in relation to the topic being studied.

Bias during the data collection can be introduced whether the study is qualitative or quantitative in nature. In qualitative studies bias can result from the manner of the questions used during interviews or from a participant's inability to accurately recall information from the past. In quantitative studies, measurement bias can result from the measurement tool not being assessed for its validity or reliability.

During the **analysis of the data collected** bias can be introduced if the researcher actively seeks data to confirm the hypothesis whilst not including data that conflicts with these beliefs.

Finally, **publication bias** can occur when the researcher uses specific methods in order to increase the likelihood of the work being published.

A specific bias that can also exist is **social desirability distortion**. As many studies will gather information from respondents, the risk exists that this is not reported accurately. A

reason for this mis-reporting is that “respondents sometimes slant their responses in a socially desirable direction” (Richman et al. 1999:755). In order to evaluate which data gathering method was most prone to this distortion Richman et al. (1999) conducted a meta-analysis comparing computer based questionnaires with paper-and-pencil questionnaires and face-to-face interviews. This analysis found that “distortion was small when respondents were alone, anonymous, and could backtrack” (Richman et al. 1999:754). It also concluded that computerised interviews had less distortion than face-to-face interviews, especially when collecting sensitive information.

As detailed in this chapter, much consideration has been given to the overall study design utilised in order to minimise the opportunity for bias within this research. At each stage of the research where results are established from the existing theory through a literature review these are subsequently validated by an expert panel. The participants in both the original online survey and the Delphi study were carefully selected using clear selection criteria. These criteria are detailed in Chapter 5 and Chapter 6 respectively. During the research a standard interview format was developed in order to ensure as consistent an interaction with participants as possible. A concerted effort to have a cross section of Continuous Improvement experience, job role, company location and company size within the Delphi study was also made in order to ensure the results were not biased by a particular sub group within the expert panel and were therefore applicable to the region and sector under study.

When using a measurement instrument is it important to understand the validity and reliability, two elements which are closely linked. The validity of an instrument is related to how well it measures what it is intended to and the reliability is a measure of how consistently it does this. Importantly, unless an instrument is reliable it cannot be valid. The most commonly used measure of reliability is Cronbach’s Alpha, which is now widely used in research. The popularity of this method compared to other alternatives is due to only requiring to administer the instrument once in order to establish the reliability score. The output of the test is a score for the instrument of between 0 and 1. As the alpha score is specific to the number of responses received, this test should be completed each time an instrument is used with a different group. If the instrument contains sub groups of questions and is therefore testing more than one construct, a separate alpha score should be calculated for each construct to avoid an inflated overall score. It is generally accepted that an alpha score of between 0.70 and 0.95 is desirable (Tavakol and Dennick 2011).

4.7 Ethical considerations

Within the process of data collection, both quantitative and qualitative, it is also essential to consider and address ethics. The need for the application of clear ethical principles within qualitative research is well established (Jelsma and Clow 2005). This is because qualitative research particularly relies on the relationship established between the researcher and the participant. Many ethical considerations must be made in order to ensure useful findings result from the research (Jelsma and Clow 2005). A range of ethical concerns can exist, with the need to respect privacy, ensure open and honest interactions and accurate interpretation of the data. Gaining informed consent should also be addressed, with clarity of the data that will be collected and how this will be used (Sanjari et al. 2014).

At the outset “it is essential to obtain informed consent before any participant is enrolled” (Jelsma and Clow 2005:4) and this includes “issues concerning confidentiality which need to be addressed” (Jelsma and Clow 2005:4). For the research to be successful trust has to be established to ensure the participant is open during the data gathering process (Jelsma and Clow 2005). For this research a consent form detailing the objective of the research and evidencing both individual and company consent was completed prior to involvement in the Delphi study. This also confirmed that the information provided by the individual would remain confidential and no company names would be reported. This was done to promote honest input and make participants comfortable in sharing opinion and information.

Within qualitative research the potential exists for the researcher to strongly influence the participant, the data collection and the data analysis (Jelsma and Clow 2005). In terms of the power relationship between research and participant, this was kept neutral by only interviewing people where no direct work or social relationship existed. The participants, therefore, should not have felt pressure to respond in a particular manner or continue involvement in the research when no longer wanting to do so. In terms of the data analysis completed, specifically the thematic analysis, the potential for researcher bias does exist. The accuracy of the interview transcripts was initially ensured by typing up each interview word for word from the voice recordings and sending it to the interviewee for review. The interviewee was therefore given the opportunity to correct any content or challenge if a point had been misinterpreted. Only once a positive response was received on the transcript content was it included within the subsequent thematic analysis to

identify themes and framework updates. Any researcher bias which could exist during the thematic analysis of the interview transcripts was addressed by reviewing the output during the next stage of the Delphi study using a quantitative Likert scale study. Interview quotes are also regularly detailed within the findings in order to support the findings of the thematic analysis.

4.8 Triangulation

Triangulation is used in order to make research findings more robust, reducing the potential for the researcher to influence the output and minimising the limitations associated with any single method employed (Thurmond 2001). Triangulation is the ideal approach as each method used will enhance understanding through varying data collection and analysis approaches. This combination of individual methods is expected in much research as it allows the validity of the findings to be cross-checked (Patton 1999). Triangulation is achieved through the amalgamation of multiple (at least two) perspectives, approaches, sources, researchers, or analysis methods (Thurmond 2001). This allows a researcher to encompass different viewpoints, and can be applied through both the use of multiple data sources and through the use of multiple research methods (Bryman and Bell 2007). This approach adds credibility to the research findings as it removes the potential for researcher bias (Vikstrom 2010), and provides the opportunity for both quantitative and qualitative data collection and analysis techniques to be included in a single study to best suit the stage of the research being tackled (Roberts et al. 2005). Most important is to select the most appropriate methods for the problem being addressed, as there is no one approach suitable for all situations (Patton 1999). It is important to note however that the use of triangulation does not improve the research findings where the individual strategies used are weak, and will typically increase the research timescale (Thurmond 2001).

4.9 Selected Method

Having completed a review of available research paradigms, approaches, and strategies, a summary graphical representation of the author's position on a continuum for each philosophy or approach discussed is presented in Figure 4.3. This demonstrates the author's fundamental beliefs and preferences when conducting research based on the

options outlined in the research onion. As can be seen, the complete extreme between the two available options is never selected. This is due to an acknowledgment in the validity and perceived benefits that can come from both, and that elements of each resonate.

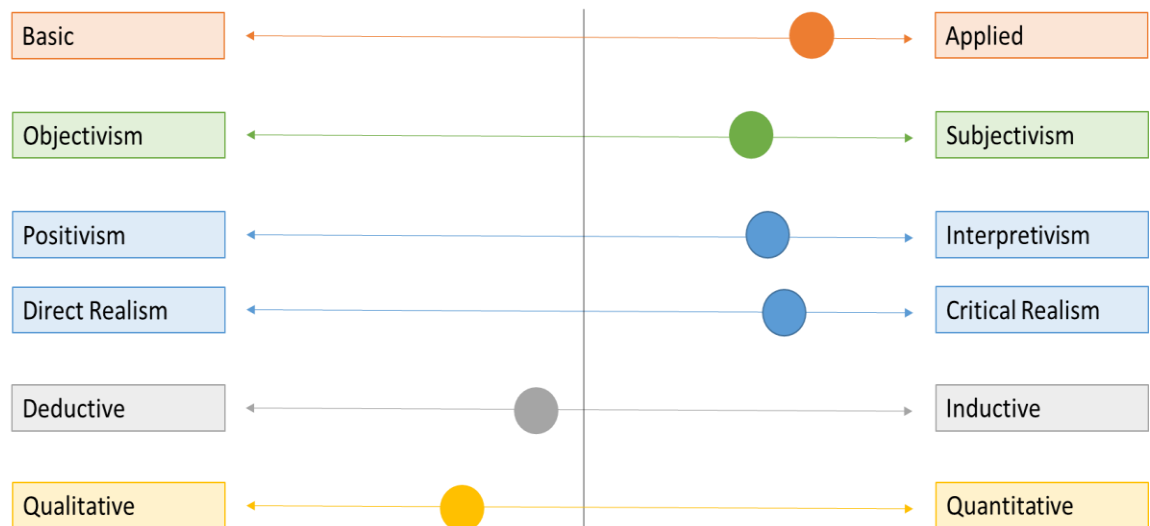


Figure 4.3 - Personal research paradigm and approach

It is however important to be aware of any bias that exists. One of the most extreme positions held is that towards the applied end of the continuum. As a practitioner completing academic research, and with the desire to produce an output to positively influence practical application of Continuous Improvement a bias definitely exists toward this. Whilst pursuing this output it will be essential to also ensure the academic rigour required of this level of study and justify at each stage the decisions made. In terms of the philosophical stance held, a bias towards subjectivism is also acknowledged to exist. As stated, the researcher believes that people play a huge role in the outcome that is achieved from management research. Not all people view things the same way, or base their point of view on the same experiences. When collecting qualitative data therefore it will be important to identify the correct respondents. Aligned closely to subjectivism, a bias towards interpretivism is also held. The success of this research will hinge on participants reflecting upon and sharing their personal experience of Continuous Improvement. The elements which can impact an implementation are multiple. It is therefore the belief of the researcher that the combination of these variables is likely to make each implementation complex and the experience of each individual involved unique. This research will aim to establish the commonality between these experiences in order to provide meaningful guidance to future initiatives. In terms of realism, and in line with the

philosophical position stated, a bias towards critical realism is held. As stated, it is believed that each individual will experience the same situation slightly differently and therefore no one true account can be captured from one individual. Each person involved will have differing agendas, be physically located in different positions and be absorbing information differently based on their previous experiences and pre-conceptions of the events unfolding. As at the outset no firm hypothesis was stated, but instead research questions posed, the approach being taken to this research initially is more inductive in nature. This lack of firm boundaries at the outset is felt to be the correct approach, allowing the findings at each stage of the research to lead the subsequent direction. To achieve the overall objective of the research however a conceptual framework will be developed and this specific theory will be evaluated through a much more deductive approach. Overall, a slight bias to the deductive approach is held as it is felt to allow the research to reach a firmer conclusion than the approach remaining open ended throughout. Finally, in terms of data collection the researcher favours qualitative data as it is felt to provide the rich input that is required to understand the complex matter of failed change initiatives. Again, however, both quantitative and qualitative methods will be adopted where deemed appropriate in the research.

4.10 Summary

With an enhanced awareness of the inherent bias that may exist, the research will pass through several phases, with a combination of research methods being used as appropriate (Figure 4.4). This allows the broad initial identification of a research gap to the funnelled down to a final research output through industry review, update and validation.

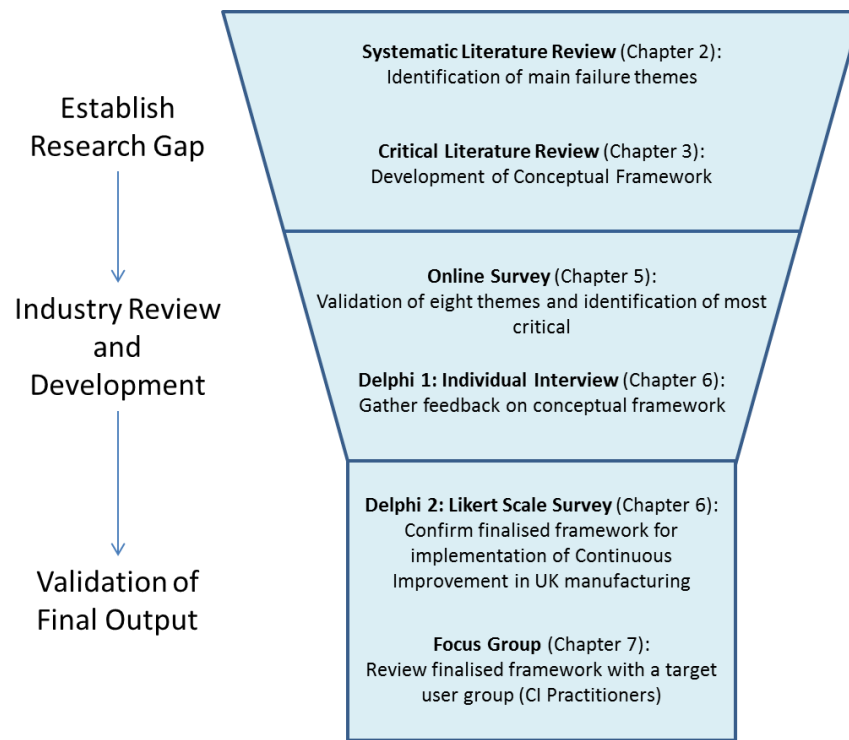


Figure 4.4 - Research stages

Triangulation of both data sources and research methods will therefore be achieved and will provide more robust findings. The intention is to have each piece of academic work (literature review) subsequently validated and developed through input from industry (survey and interview). This will ensure the final output has both academic rigour and is of practical relevance. The majority of the data collected will be primary, with the exception of the systematic and critical literature reviews. These will be used to establish current research gaps that can then be remedied through new data collection.

Within the final stage of the research a Delphi study will be completed. This will combine the use of both interview and survey with an expert panel, allowing both qualitative and quantitative responses to be gathered and analysed. This approach will narrow through each phase to provide a quantitative demonstration of consensus with the final framework presented. Further detail on the Delphi approach used is provided in Chapter 6. Finally, a focus group will be completed with a target user group. This will provide a review of the practical applicability of the finalised framework. This will also feed discussion on potential limitations of the framework as well as future research directions.

Chapter 5 Online Survey Results

5.1 Introduction

Following the identification of the eight themes from literature detailed in Chapter 2, the next stage of the research is to validate these through survey research and identify the most influential.

Research on the failure of Continuous Improvement initiatives in manufacturing was previously fragmented. This was addressed through the completion of a systematic literature review to identify the core themes contributing to failure. The output of this was the identification of eight themes: Management Leadership, Organisational Culture and Environment, Motives and Expectations, Implementation Approach, Training, Project Management, Employee Involvement Levels, Feedback and Results.

The purpose of this chapter is to validate the findings of the systematic literature review and develop the research further. An online survey was therefore distributed to experienced Academics, Business Leaders and Continuous Improvement Practitioners.

The participants were identified through various channels, utilising existing contacts of the researcher and research supervisor. Academic respondents were identified and contacted through the researcher's Heriot Watt University supervisor. Business Leaders and Continuous Improvement practitioners were contacted by distributing the survey link through contacts at the Scottish Manufacturing Advisory Service and the Institute for Six Sigma Professionals. The inclusion criteria for each respondent sub group is detailed in Table 5.1.

Respondent	Criteria for inclusion (minimum)	Criteria for inclusion (preferred)
Academic	<ul style="list-style-type: none"> • Professor or lecturer in the area of Quality Management 	<ul style="list-style-type: none"> • Research published in the area of Continuous Improvement • PhD in the area of Continuous Improvement
Business Leader	<ul style="list-style-type: none"> • Management position within a manufacturing company 	<ul style="list-style-type: none"> • Senior Management position within a manufacturing company
Continuous Improvement Practitioner	<ul style="list-style-type: none"> • Practical experience of involvement in implementing Continuous Improvement 	<ul style="list-style-type: none"> • Experience of leading Continuous Improvement implementations • Experience of delivering CI training and projects.

Table 5.1 - Selection criteria for inclusion in the online survey

To further the research a survey questionnaire was developed driven by the fundamental objective of identifying the key factors contributing to failure from those previously identified in literature. To achieve this, the overall objective was divided into three main questions:

1. In the experience of the survey respondents do each of the themes identified through the systematic literature review contribute to the failure of Continuous improvement initiatives? If not, in their experience which themes do not contribute and should therefore be removed from the current list?
2. In the experience of the survey respondents are there any additional themes not detailed in the systematic literature review that also contribute to the failure of Continuous Improvement initiatives? If so, which themes should be included in addition to the current list?
3. Including any additional themes identified, which themes most contribute to the failure of Continuous Improvement initiatives?

The output of this stage of the research will be the validation or update of the eight themes identified.

5.2 Methodology

Due to the aims of this stage of the research, the study was felt to largely be theory testing in nature. No model exists at this stage of the research, although initial concepts have been developed in the form of the eight failure themes identified. The survey will explore the validity of those themes and confirm the significance of each. It is predominantly designed as a brief, yet important, stage in the research to validate the findings of the systematic literature review.

The approach taken in developing the online survey is based on the key steps outlined by Edwards and Thomas (1993), with key considerations at each stage detailed (Figure 5.1).

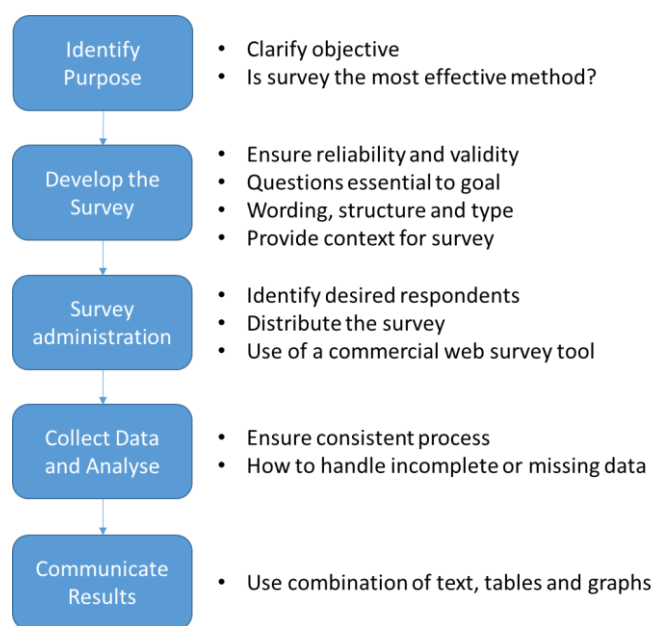


Figure 5.1 - Survey process and key considerations (based on Edwards and Thomas, 1993)

An online survey was chosen as the most suitable method of data capture due to the dispersed locations of respondents, brief nature of the enquiry and number of responses desired. Online surveys allow access to large and geographically dispersed populations and can achieve fast response rates (Lefever et al. 2007).

Certain challenges also exist with online surveys. Most significant of these is the reliance on self-report data which can include bias and therefore be unreliable (Kirk-Smith and McKenna 1998). These were felt to be minor in relation to the benefits achieved. By comparison, a postal survey suffers from poor response rates, slow response and the need for manual transcription and analysis of the data that is collected. This leads to higher levels of non-response and increased instances of data entry errors (Ilieva et al. 2002).

Specifically, Qualtrics was chosen as a web survey tool to provide assistance with survey layout, compiling responses and survey analysis. Although many web survey tools exist, Qualtrics was chosen due to the superior functionality it was felt to provide. When compared to the likes of Survey Monkey, it was found to benefit from not having a limitation on the number of pages or questions that can be incorporated in the survey. Qualtrics also has the ability to provide reporting and analysis within the software rather than having to export the data for separate analysis elsewhere.

The survey was deliberately brief in nature in order to promote high response rates and due to the difficulty in gathering detailed information through this format. An expected completion time was communicated to potential respondents as part of the invite to participate.

The survey was sent to a cross section of academics, business leaders, and continuous improvement practitioners. In total 67 survey requests were sent out via email, with 46 starting the survey and 43 fully completing it via the link provided. That generated a response rate of 64% based on completed surveys. The input from partially completed surveys has been disregarded.

The survey was deliberately brief, aiming purely to validate the themes previously identified through the literature review, establish any additional themes missing and identify the most influential themes in relation to initiative failure. It is felt the brief nature of the survey, and the effort to communicate this clearly in the email invite have contributed to the high completion rate.

5.3 Survey Results and Analysis

The first part of the questionnaire simply introduced the participant to the purpose of the survey and gathered basic information to understand the category of respondent and their suitability to contribute.

5.3.1 Current Role

Of the 43 people who fully completed the survey, 7 (16.3%) were Academics, 10 (23.3%) were Business Leaders and 26 (60.4%) were Continuous Improvement Practitioners. Whilst this is not an even split between the 3 target groups, it does demonstrate that each were successfully reached and their opinion has been incorporated.

5.3.2 Experience of Continuous Improvement failure

When the respondents were asked if they have experience of Continuous Improvement failure, 41 (95.3%) replied positively and were therefore able to contribute to the remainder of the survey. This high percentage also serves to reinforce the perceived failure of Continuous Improvement initiatives, and validate the need for the research.

5.3.3 Validation of themes

The second part of the survey was focused on establishing if the themes derived from literature did contribute to Continuous Improvement failure.

Of the 41 people able to contribute to the remainder of the survey, 40 (97.6%) believe that each of the eight themes identified from the systematic literature review contribute to the failure of Continuous Improvement initiatives. The single respondent who did not highlighted five of the themes (Motives and Expectations, Implementation Approach, Training, Project Management and Employee Involvement Levels) as not contributing. This high positive response rate strongly validates the findings from the systematic literature review, with all but one respondent confirming the eight themes contribute to failure.

5.3.4 Missing Factors

Next respondents were asked to identify any factors they believed to be missing from the eight identified.

12 (29.3%) of the respondents identified additional areas they felt contribute to Continuous Improvement failure. Each of these responses was individually evaluated to establish whether it truly constituted a new theme, or whether it belonged as an addition to, or duplication of, a current theme. This evaluation was initially completed by the author individually, before being validated through a focus group of Continuous Improvement practitioners.

From the evaluation it is clear that each of the responses can in fact be considered to belong with one of the existing eight core theme headings. The majority of the responses were duplication of either the theme itself or issues detailed within. Where additional insight has been provided however, the response is detailed in Figure 5.2, along with the rationale for its classification under one of the existing themes.

Survey Response	Allocation to a current theme
Politic / power within the organisation	Politics within an organisation was not specifically a factor mentioned in literature, but can be allocated to Organisational Culture and Environment
Communication: Failure to articulate the compelling need for change and secure buy in at all levels	This lack of a communication strategy would be considered a failure of the Implementation Approach and can be categorised with this factor
Skill level of employees	A skills gap would be addressed through Training and can be allocated to this factor
Employee willingness and ability to learn and utilise new ways of thinking	The attitude of the employee would be allocated to the Employee Involvement levels factor
Resistance to change: particularly among middle managers	This would be allocated to the Management Leadership factor as it specifically relates to resistance from that group
Not having a people engagement management style	Management style was not a specific issue identified in literature but would fit under the Management Leadership theme
Mergers and acquisitions	Not mentioned as a specific issue but reference is made to the external environment and other business pressures. Would therefore go under Organisational Culture and Environment.
Capability of change agent	Whilst not explicitly stated as a factor, many of the symptoms of an incapable change agent are identified in the Project Management theme.

Figure 5.2 - Additional issues identified and allocation to existing themes

From the survey additional variables to consider within six of the eight core themes have been identified, but no new themes have resulted.

5.3.5 Most influential themes

Including any additional variables identified during the previous question, respondents were next asked to select the three themes they felt most contributed to the failure of Continuous Improvement initiatives. Any votes for additional suggested themes have been reallocated to one of the eight themes as detailed previously in Figure 5.2 and included in the survey results.

Taking into account the original votes for the themes only, Management Leadership received 29 votes from the possible 41 available, and Organisational Culture and Environment received 28 votes. This equates to a 71% selection rate for Management Leadership and a 68% selection for Organisational Culture and Environment. In addition to these original votes, Management Leadership and Organisational Culture and Environment also received an additional two votes each through the reallocation of suggested themes detailed above. This raises the selection rate to 76% and 73% respectively.

The remaining themes of Motives and Expectations (29%), Implementation Approach (41%), Training (7%), Project Management (10%), Employee Involvement Levels (49%), Feedback and Results (12%) received less votes overall (Figure 5.3).

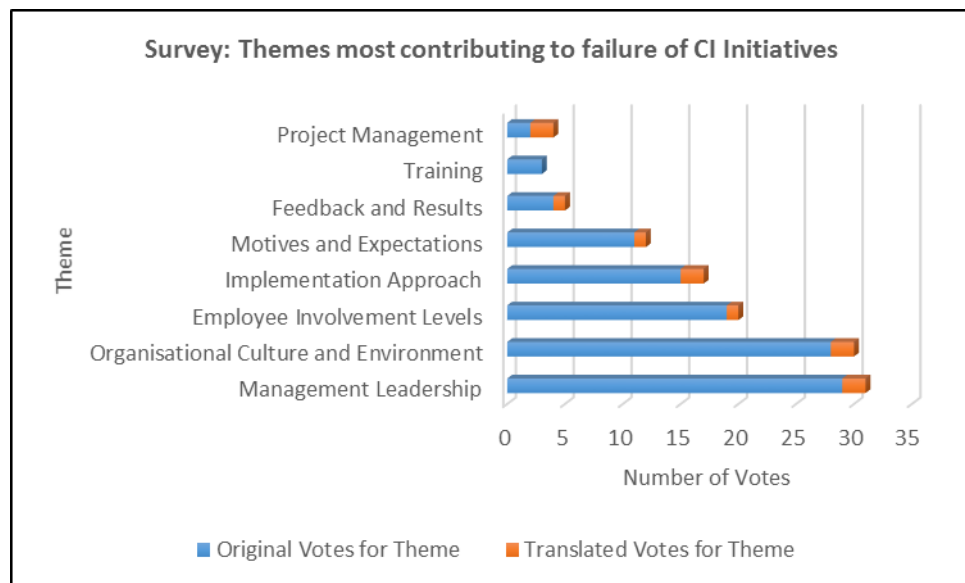


Figure 5.3 - Survey results: Themes most contributing to the failure of Continuous Improvement initiatives

All available themes did however receive votes. This further strengthens the evidence that the eight themes identified from the literature are all valid and all contribute to failure of Continuous Improvement initiatives to some degree.

When the responses are analysed by respondent group the two themes of Management Leadership and Organisational Culture & Environment are consistently selected also. Table 5.2 demonstrates that the percentage selection rate of the majority of the themes is similar from each of the three respondent groups. Minimal bias was introduced through differing sub-group sizes.

There are however a couple of differing selection rates between sub-groups that stand out in the results. Specifically, the increased level of importance Academics place on Employee Involvement and Business Leaders associate with Project Management. Due to the limited sample sizes involved, this should be noted as an area of interest rather than one of continued focus with this research. Future research may be warranted to further investigate these results and explore the reasoning. From the experience of the author it is expected this is due to the differing points of view that each sub group approaches the topic from.

	Selection Rate (%)					Variance
	Survey	Academics	Business Leaders	CI Practitioners	Unweighted	
<i>Management Leadership</i>	76%	71%	80%	75%	75%	-1%
<i>Organisational Culture</i>	73%	57%	80%	75%	71%	-2%
<i>Employee Involvement</i>	49%	71%	40%	46%	52%	3%
<i>Implementation</i>	41%	38%	50%	38%	42%	1%
<i>Motives</i>	29%	29%	20%	33%	27%	-2%
<i>Feedback & results</i>	12%	14%	14%	13%	14%	2%
<i>Training</i>	7%	14%	0%	8%	7%	0%
<i>Project Management</i>	10%	0%	20%	8%	9%	-1%

Table 5.2 - Survey results: % selection rate for each theme by respondent group

Based on the overall selection rates for each theme, Table 5.3 translates this into a percentage contribution to failure for each theme. Using the Pareto principle, companies should focus their efforts on the top four themes in order to combat 80% of the likelihood of failure.

Theme	Selection Rate	% contribution to Failure	Cumulative Contribution
<i>Management Leadership</i>	76	25.6	25.6
<i>Organisational Culture</i>	73	24.6	50.2
<i>Employee Involvement</i>	49	16.5	66.7
<i>Implementation</i>	41	13.8	80.5
<i>Motives</i>	29	9.8	90.2
<i>Feedback and Results</i>	12	4.0	94.3
<i>Training</i>	7	2.4	96.6
<i>Project Management</i>	10	3.4	100.0
Total	297	100	-

Table 5.3 - Survey results - % contribution to failure

Comparison of the overall selection rates for each theme through Chi-square analysis demonstrates the statistical difference in the proportion of votes achieved. Chi-square analysis was used as it allows analysis of the selection rates for all themes to be conducted together and identifies if there is a statistically significant result within the population of data that warrants further investigation using other evaluation tools. The Chi-square analysis (Appendix B) returns a p-value of 0.000 which clearly indicates a statistical difference between the theme selection rates, and therefore that some themes are more significant than others. Although it can be inferred through the ‘contribution to Chi-square’ figures provided in the analysis, it is not clear which themes are of statistical significance. Each theme has therefore been subjected to a 1 Sample t-test to establish if the response rate achieved is statistically different to the expected rate of 0.375 (37.5%).

This expected response rate was used as each respondent had the opportunity to select three of the eight themes. Each theme therefore had a three in eight (37.5%) chance of being selected by each respondent. The results of this individual analysis of each theme is summarised in Table 5.4.

Theme	Responses	Sig. (0.375 mean)
Management Leadership	31	0 *
Organisational Culture and Environment	30	0 *
Employee Involvement Levels	20	0.09
Implementation Approach	17	0.614
Motives and Expectations	12	0.259
Feedback and Results	5	0 *
Training	3	0 *
Project Management	4	0 *

Table 5.4 - Results from 1 sample t-test to identify significant themes

This analysis demonstrates that several of the response rates are statistically different to that which could be expected by chance. In terms of high selection rate it would appear that Management Leadership and Organisational Culture and Environment are the two themes which have a strong impact on the failure of a Continuous Improvement initiative. Conversely, however, the low selection rate of three of the themes; Feedback and Results, Training, and Project Management are also statistically different to those that would be expected by chance. These low response rates however indicate that although valid themes, they do not negatively impact a Continuous Improvement initiative to the same degree as the others.

5.4 Conclusion

Continuous Improvement initiatives continue to have a reported high failure rate, and from the survey it is clear that all eight of the themes identified from the Systematic Literature Review (Chapter 2) contribute towards this failure in a manufacturing environment. There are however certain themes that impact initiatives more than others, with the themes of Management Leadership and Organisational Culture and Environment

found to be the most critical. In addition, further issues have been categorised to develop the information contained in each theme and give more information to consider.

As stated, previous literature specifically focused on failure is limited and largely fragmented. This stage of the research has further developed and reinforced the previous findings of the systematic literature review. Although a limited sample size has been used for the survey, the findings still allow for statistical significance to be found with two factors identified as more influential than the others.

At this stage the research has demonstrated the difficulty in implementing a Continuous Improvement initiative in a manufacturing environment. For business leaders specifically there is important learning from the themes, which indicate that failure will result more from the more qualitative and subjective people issues than from the application of the tools and techniques themselves. This would indicate that the themes of Management Leadership and Organisational Culture and Environment need closely assessed and aligned before undertaking any improvement initiative. Further discussion of these main themes is provided in Section 7.2.

5.5 Summary

This stage of the research, through an online survey of Academics, Business Leaders and CI Practitioners, has validated the eight themes identified in literature and further advanced this by ranking the significance of each theme. This further enhances the achievement of the initial objective of the research which was to evaluate why Continuous Improvement initiatives fail in the manufacturing industry. The survey results provide more confidence in the initial literature findings and therefore a stronger foundation from which to continue the research.

A limitation of this stage of the research that is worthy of note is that potential correlation between the themes has not been explored. It is possible that some themes are influenced by others. This will be captured as a potential future research direction.

Chapter 6 Testing and validating the framework using the Delphi method

6.1 Introduction

Change efforts, in particular Continuous Improvement implementations, continue to report high failure rates. This in part is due to the absence of industry and region specific implementation guides. The purpose this chapter and the next is to present a validated framework tailored to the practical needs of users in UK manufacturing companies. The conceptual framework derived from existing literature (Chapter 3) is validated using a Delphi study. An expert panel is used to review the content of the conceptual framework and its suitability for real world application.

The Collins Dictionary defines an expert as “a person who is very skilled at doing something or who knows a lot about a particular subject”. A similar definition of an expert being “a person who is very knowledgeable about or skillful in a particular area” is provided in the Oxford Dictionary. Ericsson et al. (2007) state that expertise is present when three criteria are met. Firstly, the performance of the person should be consistently better of that of their peers. Secondly, this expertise should mean that tangible results are achieved. Finally, this expertise should be able to be replicated and measured in order that it can be improved.

Soon et al. (2012) completed a Delphi study in the UK using an expert panel. For that study experts were defined as meeting two criteria. The criteria were that the person was currently working in the sector being studied and had knowledge of the specific topic being researched. Chu and Hwang (2008:2826) state that “multiple experts may have different experiences and knowledge” and it is therefore necessary to gather and collate these in order to define the solution to the problem being studied.

Based on the definitions above, an expert has been defined in this research as someone currently working for a UK manufacturing company with several years of Continuous Improvement implementation experience. Their expertise is considered to be demonstrated by the job roles held; either a senior manager within their company or a Continuous Improvement practitioner. The term ‘expert’ in this case refers to the participant’s applicability to be involved in the study. Although the panel is predominantly comprised of ‘experts’, a cross section of Continuous Improvement experience was deliberately sought. A small proportion of the panel therefore have little

expertise but are operating in management roles and companies appropriate to the objectives of the research.

The framework presented for Continuous Improvement implementation in UK manufacturing companies provides a clear overview of the process and the key activities involved. The layout and content have been tailored to appeal to a real world audience, therefore enhancing the probability of successful implementation. The implementation framework presented is the first to be tailored to the needs of the UK manufacturing industry. It has also been demonstrated that the framework robust in its content; incorporating the literature findings as well as the experience of the expert panel.

6.2 The Delphi Methodology Used

6.2.1 Overview

In order to take this research toward completion, and provide an output that both addresses a research gap and is of practical significance, the conceptual framework developed in Chapter 3 has subsequently been reviewed with a panel of industry experts through a Delphi study.

This combination of initial literature review and Delphi study is similar to the approach used by Hinckeldeyn et al. (2015). These combinations of approach “achieve more coherence in findings and a more complete overview” (Hinckeldeyn et al. 2015, pg. 464). Supplementing existing research with a Delphi study, specifically including individual interview, is an appropriate approach as it allows the Delphi study to “complement and triangulate these results along with the methodology of previous research” (Saizarbitoria et al. 2006:817). The carefully selected panel consisted of 20 people with various degrees of Continuous Improvement implementation experience. All currently work for, or with, UK manufacturing companies.

When selecting the panel, the objective was to have a relatively even split between business leaders and Continuous Improvement practitioners or consultants. This was done in an attempt to ensure the final framework would meet the needs of both user groups. Largely, experts (people with a minimum of 5 years of experience of implementing Continuous Improvement) were invited to participate in order that their input was based on extensive exposure to CI implementation. Within the 20-person panel however, a limited proportion of the spaces were deliberately allocated to business leaders with little

or no experience of Continuous Improvement implementation. Again, with the final framework in mind, the desire is to have the content suitable to businesses starting their CI journey. Input on the content and layout of the framework from people likely to be in this user group was therefore felt to be essential. Finally, in order that the final framework be appropriate for manufacturing companies across the UK, businesses from different sectors, of different size and from varying locations were invited to participate. Each confirmed participant was sent an email introduction to the research and was asked to complete a consent form (Appendix E) prior to the start of the Delphi study. A maximum of two people from any company were included. A summary of the participants is given later in the chapter in Table 6.2, with a detailed breakdown of the individual Continuous Improvement experience of each participant in Table 6.3 and details of the companies involved in Table 6.4.

Unlike many other Delphi studies, this research seeded the process with the conceptual framework developed in Chapter 3 and utilised individual interviews in the early stages rather than purely using an online survey tool.

The author has explored the typical process followed in tackling a Delphi study. From these, an example of the main phases and features of a Delphi study are outlined in Figure 6.1. These principles have been used as the basis for this Delphi study, and applied in order to develop a methodology to meet the requirements of this research. Although other Delphi papers exist (e.g. Campos-Climent et al. 2012, Inaki et al. 2006, Nordin et al. 2012) these were not felt to provide as clear and concise a systematic process to follow.

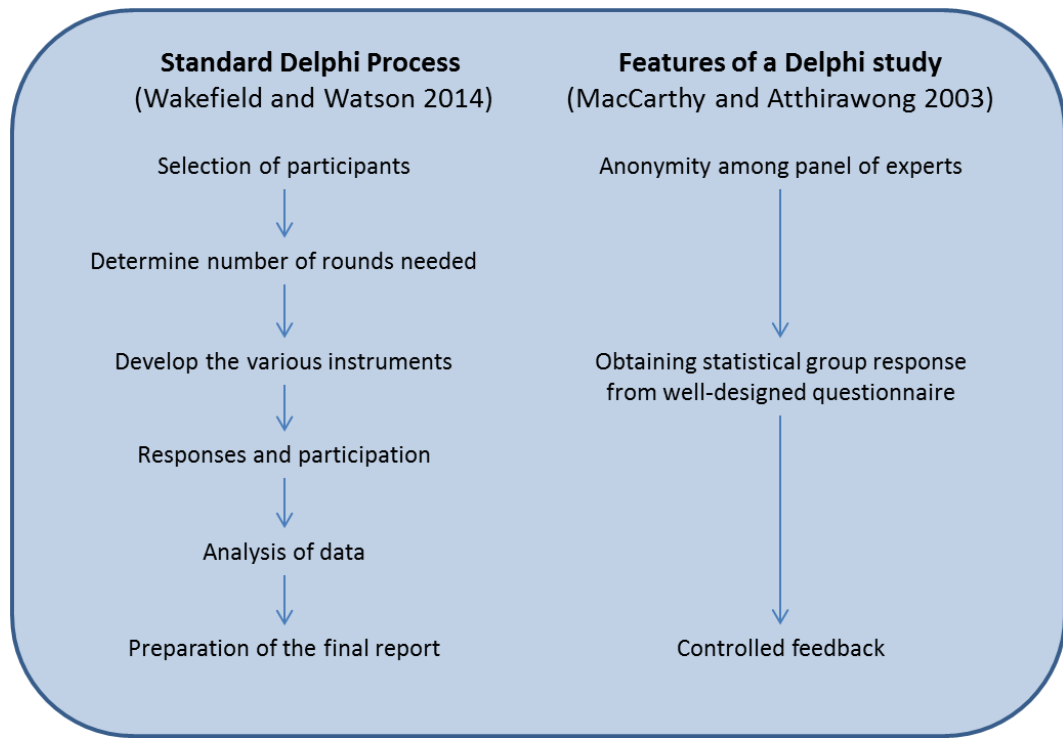


Figure 6.1 – Main phases of a Delphi study

The success of the approach hinges on the correct selection of the expert panel. The capability and experience of the participants is more critical than the number of people involved (Wakefield and Watson 2014). Potential panel members for this study were identified by utilising the networks of the authors. A clear panel make up was desired, with a balanced mix of job role and differing levels of Continuous Improvement experience. Suitable candidates were identified and approached directly or through a shared contact.

The Delphi approach has been utilised for this stage of the research as it is particularly suitable when the elements which will be contained in the final solution are not fully known (Wakefield and Watson 2014).

This Delphi study was conducted through the combination of two approaches. Initially semi structured interviews were completed with each participant. Soon et al. (2012) state that it is advantageous to complete the first round of a Delphi study using face to face interview as this is likely to increase response rate.

The interview was used to review the framework and identify required updates based on feedback from the group. Interviews were used at this stage due to the richness of data

that can be collected. Saizarbitoria et al. (2006) states that interviews are not only useful for validating literature findings but also for collecting new points of view which could guide future research. Each interview was fully transcribed and the transcription shared with the interviewee to ensure accuracy.

Thematic analysis was then used to collate the feedback and update the framework accordingly. Braun and Clarke (2006) state that the purpose of thematic analysis is to identify, analyse and report patterns within data. Thematic analysis was used as it allowed the identification of key and recurring themes and sub themes within the interview transcripts. The feedback received during the interviews was coded, with 17 main themes emerging through this process. An example of the thematic analysis for the Training theme is shown in Appendix C, with colour coding also utilised to indicate if agreement (green text), a general comment had been made (blue text) or if an area for improvement had been suggested (red text).

Following the interviews an online survey was distributed to all interviewees. The survey was used to gain measurable feedback on the updates made to the original framework. The analysis completed demonstrates agreement on the final framework. The full results are discussed in Section 6.5.

The activities involved in this Delphi study, and key points associated, are summarised in Table 6.1.

Sequence	Delphi Study Activity	Key Point
1	Identify potential panel members	Ensure required mix of job role and experience
2	Send invitation to participate	Outline purpose, phases involved and timescale
3	Draft interview format and questions	Question sets tailored to job role and experience
4	Complete pilot interview	Approach updated based on pilot feedback
5	Organise an individual interview with each panel member	Researcher flexible on time and place of interview
6	Complete consent form with each panel member	Complete prior to interviews commencing.
7	Complete interviews	Full interview tape recorded. Interview seeded with conceptual framework.
8	Fully transcribe each completed interview	Transcription shared with interviewee to ensure accuracy
9	Thematic analysis completed after all interviews transcribed	Identify themes and sub-themes within interviews
10	Update framework based on interview content	Highlight changes for ease of identification
11	Draft online survey	Design with desired analysis approach in mind
12	Complete pilot survey	Wording of questions updated based on feedback
13	Share updated framework and summary of feedback with interviewees	Identical email sent to all participants to ensure consistent messaging
14	Share survey link via email	Communicate desired response date
15	Send email reminders to those still to complete survey	Weekly reminder sent. Written off after seven reminders and still no response
16	Complete statistical analysis on survey results	Establish if consensus exists or another round of survey is required
17	Write up findings.	

Table 6.1 - Activities involved in this Delphi study

The first stage of this study was the identification of the panel members. The purpose of this stage of the study was clarified to ensure the desired make-up of the expert panel could be stated. Next, invitations were sent to the potential panel members identified. Importantly, background to the study, the research purpose and the individual's role in achieving this was clearly articulated. The expected time commitment and activities involved were also expressed to allow an informed decision on whether to participate. Once the expert panel was identified, the interview questionnaire had to be developed. In line with the make-up of the panel and the objectives of the study tailored question sets for each participant group were created based on experience and job role. Prior to the interviews being conducted with the expert panel a pilot interview was completed to ensure clarity of the questions and resolve any issues where necessary.

Once the interview format was finalised the interviews required to be organised and conducted. As each of the participants were in full time employment and based in various locations the researcher was as flexible as possible in terms of location and time of interview to ensure completion in a timely manner. Each interview was tape recorded to allow subsequent transcription. The transcript from each interview was shared with the participant to ensure accuracy of the information captured. Once confirmation was received from all members of the expert panel the researcher completed a thematic analysis to identify the main points and themes that existed within the responses. The information contained within each of these themes and sub-themes were used to either confirm the current content of the framework or to update the format or information contained as appropriate. Each time an update was made to the framework this was highlighted to allow ease of identification in the next phase of the study. The next stage of the Delphi approach required collective review of the framework changes. This was completed through an online study. Again, prior to distribution to all this was piloted and updated as necessary to ensure clear and meaningful questions were contained. The survey was sent out along with a copy of the updated framework and a summary of the feedback received from the expert panel. A desired response time was requested, with weekly reminders sent as necessary to prompt response. The survey, utilising a Likert scale, allowed a quantitative analysis of the level of consensus that existed. Based on this the need for another round of the study is established. In this case the necessary level of consensus was demonstrated. The study was completed with the write up of the findings.

This broad starting approach followed by narrowing in subsequent rounds mirrors the approach of Ray and Sahu (1990:29) who designed Round 1 "so that any panellist could

express his views freely and independently” before using Round 2 to gather panellist feedback through an ordinal scale. This allowed numerical scores to be calculated and consensus analysed. The full results are discussed in Section 6.6.

6.2.2 Pilot Study

Similar to Saizarbitoria et al. (2006), a pilot study of the interview questionnaire was conducted. This stage is completed in order to test the methodology and to refine the approach as necessary (Eriksson et al. 2016). A pilot can be used to either run a small scale version of a study or to pre-test a specific research instrument. The benefit of a pilot is the identification of issues with the overall research approach or the inappropriate design of the research instruments. Issues such as the wording of questions, the ordering of questions, or the range of responses available to the respondents may be identified (van Teijlingen and Hundley 2001).

In order to ensure the validity of a questionnaire, Peat et al. (2002) suggest the following steps when completing a pilot study:

1. Distribute the survey instrument to the pilot group in the same manner as it will be to the main study
2. Request honest feedback from the pilot group to allow any errors to be identified
3. Evaluate the time it takes to complete the survey and compare this to the expected duration
4. Evaluate whether the number of response categories provided for each question is sufficient
5. Ensure all questions are completed and that responses can be interpreted
6. Remove, shorten or update any questions that are identified as difficult to interpret.

In this case the pilot highlighted the need to alter the phrasing of some of the questions to better suit specific roles, as well as the broader need to have a slightly different set of questions dependant on the role and experience of a respondent. It was also suggested that the respondent should see the framework for the first time during the interview in order to best gauge their initial reaction and understanding of the content. These suggestions were acted upon in order to improve the interview process.

Once the individual interview was complete an online survey incorporating a Likert scale was developed. This was distributed along with a summary of the group response to allow

a quantitative response to be gathered. This was again tested and updated prior to distribution.

6.2.3 Interview Questionnaire

The success of the interview phase hinges on the development of the questions. These must be clear to ensure understanding by the interviewee. The preferred approach within a Delphi study is to start the process with open ended questions, narrowing the focus through subsequent rounds to achieve measurable results (Saizarbitoria et al. 2006).

The interview questionnaire consisted of two parts for each respondent. Part A was the same for each person, whilst Part B was based on their role and level of experience with Implementing Continuous Improvement. The option to have either a single panel design or to include several panels existed (Worrell et al. 2012). The decision was made to use a single panel but ensure it had the diverse expert composition required. In line with the approach adopted by Schroeder et al. (2008:538) interviewees were selected to “provide enough differences to support the development of an emergent theory that can potentially apply across industries and to different stages of implementation maturity”. To ensure this, a similar approach to that of Eriksson et al. (2016) was taken; the expert panel was comprised of several job roles. Through the selection of the panel it is felt that the output will be suitable to different industries within the UK manufacturing sector, to various company sizes and to users with different levels of Continuous Improvement experience.

There were four sub groups within the panel identified, with specific questions that could be asked of each within Part B of the interview questionnaire:

- Business Leader with experience of Continuous Improvement implementation
- Business Leader with little or no experience of Continuous Improvement implementation
- Continuous Improvement practitioner (within a company)
- Continuous Improvement consultant (external advisor)

As with the Delphi study completed by Campos-Climent et al. (2012), a balanced sample of experts was sought. In this study there was an equal ratio of business leaders and CI practitioners/consultants taking part.

The tailoring of the interview format to respondent, the planned one to two-hour duration of each interview, as well as each interview being tape recorded with the permission of

the respondent is again similar to the approach taken by Schroeder et al. (2008). The interviews were scheduled and completed over a 5-month period (10/11/15 – 14/04/16).

6.2.4 Online Survey

After the open-ended nature of the Interview, the online survey was used to narrow the discussion towards consensus through the application of a five point Likert scale to allow quantitative analysis (Appendix D). The purpose of a survey is to be able to ask the same questions, in the same manner and same order to various different respondents. This allows information to be gathered in a systematic fashion from one or more people on a chosen topic. A particular strength of a survey is the economy of time and cost versus the large volume of data that can be collected (Saunders et al. 2009).

Kirk-Smith (1998) outlines some of the strengths and challenges associated with questionnaire based research. Questionnaires are a useful method of gathering data, and also allow the responses to be subjected to statistical analysis. The approach however does rely on self-report data, and this is acknowledged to include bias and unreliability.

When designing a questionnaire, it is critical to ensure the structure is suitable, the questions are clear and the questionnaire is easily read. The questions used can either be structured or unstructured (O’Gorman and MacIntosh 2014).

6.2.5 The Delphi Panel and the Delphi process

The panel was designed to have individuals and companies with different levels of experience of implementing Continuous Improvement in manufacturing. Academics were not included in the panel as the research to this point had been largely academic in nature and the focus now was ensuring this output mirrored real life experience and that the framework was also of practical value. All respondents currently work in UK manufacturing companies.

A total of 23 people were invited to participate, with 20 participating in the initial interview and 19 completing the entire study. A breakdown is provided in Table 6.2.

Category	Number of persons invited	Agreed to participate	Completed Round 1	Completed Round 2
Business Leader with CI experience	9	7	7	7
Business Leader without CI experience	3	3	3	3
CI Practitioner	9	8	8	7
CI Consultant	2	2	2	2
Total	23	20	20	19

Table 6.2 - Breakdown of Delphi participants

Of those who confirmed willingness to participate, this provides a 95% completion rate from the initial stages. This compares favourably with response rates reported on other Delphi studies (Hinckeldeyn et al. 2015).

A summary of each respondent's current role, previous CI experience and whether the company has a CI initiative in place is shown in Table 6.3.

Based on the information the interviewees were able to provide, a summary of each business (in terms of employee numbers and financial turnover) is provided in Table 6.4.

Interviewee 1 (GB) was used as the pilot for both the interview format and the online survey. This person was chosen for this role as they had experience of all job role types that would be interviewed and was therefore able to provide feedback from each perspective. As the pilot, the feedback from GB has not been included in the thematic analysis or final survey results.

Of the remaining 20 interviewees, 17 are currently working in companies as either a CI practitioner or business leader. Two of the remaining interviewees are CI consultants providing external support to UK manufacturing companies implementing Continuous Improvement. The final interviewee (AL) was in the process of changing jobs at the time of interview but has 15 years of CI implementation experience as a practitioner.

		Company	Current Role	Company CI	Previous CI Experience
1	GB	-	CI Consultant	-	CI Manager, Operations Manager
2	DP	A	CI Manager	Yes	-
3	BL	A	Ops Director	Yes	-
4	GF	B	Manufacturing Manager	No	-
5	SA1	C	Lean Coach	Yes	-
6	AS	D	CI Coach	Yes	-
7	PA	E	CI Manager	Yes	CI Manager
8	DM	-	CI Consultant	-	Operations Management
9	CY	F	Chairman	No	Manufacturing Manager
10	RH	G	UK Lean Manager	Yes	CI Consultant
11	SC	H	Head of Operations	Yes	-
12	EB	I	Quality Manager	No	Operational Excellence Man
13	PO	J	Manufacturing Man	No	Plant Manager
14	PR	K	Ops Manager	Yes	CI Consultant
15	GA	K	Lean Manager	Yes	Industrial Engineer
16	NP	J	Managing Director	No	CI Consultant
17	AL	-	-	-	CI Engineer, CI Contractor
18	SA2	-	CI Consultant	-	Process Engineer
19	CB	L	Managing Director		-
20	SM	M	General Manager	No	-
21	PJ	N	Operational Excellence Man	Yes	CI Consultant

Table 6.3 - Summary of the interviewees

A wide cross section of business size was interviewed with companies ranging from single site with sales turnover of £1 million and only 17 employees (Company F) to a company with 8000 employees across various sites (company G). There were several companies interviewed that would be categorised as a Small or Medium Enterprise (SME) based on the number of employees or sales turnover and several that would not be. A

SME is defined by the European Union as a firm with less than 250 employees or with a sales turnover of less than €50 million (Altman et al. 2010).

It was also possible to gain input from both experienced and inexperienced interviewees. This was important as the dual aim of the interviews was to have a framework that represents best practice but also that would appeal to people new to Continuous Improvement implementation. The framework should aid the future uptake of these approaches in companies that are not yet practicing it.

Company	UK Employees	Turnover	Years of CI
A	605 across 4 sites (part of larger multi-national)	£55 million (for 4 sites)	12 years
B	225 across 3 divisions	£15 million	-
C	160 across 3 facilities	£42 million	6 years
D	2500 between 2 sites	£300 million	6 years
E	175 at local site (part of larger group)	£35 million (local site)	3 years
F	17	£1m	-
G	8000 across various sites	-	4 years
H	170	£15 million	25 years
I	300 at local site (part of larger group)	-	-
J	180	£45 million	-
K	195	£70 million	2 years
L	120	£14 million	-
M	300	£16 million	-
N	650	£170 million	2 years

Table 6.4 - Summary of the companies interviewed

6.3 Delphi Study Round 1: Individual interview results

As stated previously in Section 6.2.1, thematic analysis is a popular qualitative method to analyse data and identify themes or patterns (Braun and Clarke 2006). Thematic analysis of the feedback received allowed it to be grouped into headings and sub headings. The framework was updated in line with this. In total 17 main themes were identified based on the original sub-themes. A summary of the six main themes leading to update of the original framework is provided, evidenced by direct quotes from interviewees. Transcripts from a selection of the interviews completed are provided in Appendix F to I.

Theme 1: Level of detail

The majority of interviewees agreed that the content was largely correct, and did not feel that any particular element should be removed. Some did however feel that the level of detail was too high and that the layout of the information could be clearer. Several of the respondents suggested that whilst the current level of detail in the framework is necessary, the framework would benefit from an additional layer(s) above to provide a clearer overview of the phases and their purpose. It was felt by business leaders and practitioners that providing this would allow users to gain a general understanding, and importantly interest, in the framework before taking the time necessary to read the existing layer.

In relation to each theme identified quotes from the expert panel, captured during the interviews, are provided:

- *I can't think of any gaps in the information. What I do think is there is a lot of information. It's very busy – SA1.*
- *There is a lot of stuff on there. If you were going to a company that hadn't done any of this, it would be a big challenge for them – SC.*
- *I would envisage that business leaders probably don't realise that there is as much in it. As a business leader...there is a danger they could be frightened by it. – RH.*
- *There is a lot. That can put some people off. I don't know if it can be condensed? – GF.*
- *Where is the top level thing that is going to help me actually understand what I am trying to do? I think it is all about keeping it a bit simpler. For*

me there are top level things you can get wrong. From a human business point of view, give people more of a top level steer – CY.

Theme 2: Visual Management

Several sub headings appear in each phase of the original conceptual framework but the interviewees found difficulty in tracking the progress of these and linking back to information contained in other phases. There was a need for clearer identification of the themes running throughout the framework and better linking of the content within these.

- *You could have a strand that runs through it to do with Culture, Leadership and Communication. You could say these are all things to do with Leadership; as it flows through we are going to understand the Leadership piece. You need to stream it in one way or another – CY.*
- *Where you are talking about Communication for instance, I would try to have that linked so people could follow it – SC.*
- *You could do Training on the same line all the way across, or in the same colour. There are so many things that link into each other that you could put them into boxes. You have Communication all the way across, Management Leadership all the way across – EB.*

Theme 3: Phases

Respondents agreed that the phased approach was correct and the ideal scenario. In terms of an ideal framework and something to strive to achieve this was felt correct. Several respondents did believe there would be blurring between the phases in practical application but that this is not ideal, and was not possible to capture in a framework.

- *Agree with the phased format – EB.*
- *Use of phases makes sense – PR.*

Respondents however did query the timescale associated with completing each phase, and felt that the addition of this information would be beneficial.

- *Company will want to know how long this will take – SM*
- *Show typically how long it would take to implement – SA1.*

Theme 4: Terminology

Some of the terminology within the framework was felt to be a little specialist, and therefore not easily understood by someone new to Continuous Improvement. Where possible some of this terminology has been altered or removed entirely. Abbreviations such as 'VoC' (Voice of the Customer) and 'TTT' (Train the Trainer) have been updated.

- *Some of these things are a little bit jargony – GF.*
- *What's 'TTT'? – SA1.*
- *What do you mean by 'Extended Diagnostic'? – NKP.*
- *I was turned off by 'Extended Diagnostic' – PR.*
- *When consultants come in and say I want to do a Diagnostic, I'm thinking I want you to fix my problem not produce a fancy report. I have always used the language 'Gap Analysis' – SA2.*

Theme 5: Sustainability Loop

Some interviewees felt that the framework lacked depth within the final stage, and could in fact benefit from a more detailed 'Sustain' phase. This has been added with the activities recommended by the interviewees detailed. The existing sustainability loop has also been extended. Two separate return loops are now included to represent the need for consistent short-term evaluation and realignment, as well as the need for less regular but more formal evaluation of the initiative that may lead to more fundamental re-design.

- *There is not a lot in there about actual controls and how you control it – PR.*
- *Finish with a fifth box which is sustainability. I would be tempted to express it as a box; 'Sustainability' – SA2*

In relation to sustainability, focus on this topic would appear to date back as far as the work of Lewin (1951) who asserts that the successful change is not purely about achieving a new level of performance but maintaining that performance. This is defined as the 'freezing' phase of the change process which endeavours that the change is made sustainable by ensuring that it is resistant to other forces and changes that may take place within the business environment.

When discussing the sustainability of change efforts Buchanan et al. (2005) define this concept as “the process through which new working methods, performance goals and improvement trajectories are maintained for a period appropriate to a given context” (Buchanan et al. 2005:189). This definition helps to describe sustainability as the implementing of a new approach and the ability of an organisation to keep that in place for at least the desired duration. In slight contradiction to this definition, it is also stated that this “stability has been regarded not as a condition to be achieved, but as a symptom of inertia, a problem to be solved” (Buchanan et al. 2005:189). The overall aim therefore is to embed a change and sustain its benefit, but not to become stale by maintaining the same approaches over the long term. It would therefore appear to be important to both seek ongoing improvement but also to incorporate the mechanisms that allow the benefits of a change to be realised before seeking the next. Various factors are identified through the study that influence sustainability. Importantly, Buchanan et al. (2005) conclude that the significance of these factors, including individual, managerial, financial, leadership, cultural, and organisational factors, will vary in significance depending on the context of the change being made. This further strengthens the need for change guides specific to different contexts; such as Continuous Improvement implementation in UK manufacturing. The concept of Sustainability is explored further in Chapter 8, when examining the theoretical contributions made by this research to the topic of Change Management.

Theme 6: Pilot Project

With the amount of detail and considerations within Phase 1 and 2, it was commented on the impatience that could result from not seeing any change during these stages.

- *Everything is there but I think you might lose some people. Some people might get lost because of the time it is going to take. You need to make sure there are things in there (alongside Phase 1 and 2); there are wins there – SAI.*

It was therefore suggested by several respondents that a ‘quick wins’ or ‘pilots’ sub phase should run alongside the Diagnostic and Design phases in order to inform the roll out and feed the overall Design phase. This would be used to trial potential solutions and demonstrate to the business the benefits that can be achieved. This will aid buy in, understanding and momentum building.

- *Quick Wins buy you favour. Anything you can do to buy favour chips is going to help any initiative – EB.*
- *Have you got somewhere a 'quick wins' process? Whenever you embark on one of these programs you have got to create momentum. You have got to demonstrate that it works. Then you will start getting the snow ball effect- NP.*

Through thematic analysis of the interviews there was consistent feedback identified in regards to potential improvements and changes to the framework. These were incorporated in an updated version of the framework and distributed to the 20 respondents through an online survey. Sent to each respondent was a summary of the points made during interview, the original framework reviewed during interview (Figure 3.2), an updated version of the original based on the feedback (Figure 6.2) and additional summary pages; the new top (Appendix J) and middle layers (Appendix K). Any changes made as a result of the individual interviews are highlighted in red text for ease of identification and review.

Continuous Improvement Implementation Framework for UK Manufacturing companies: Practitioner Guide

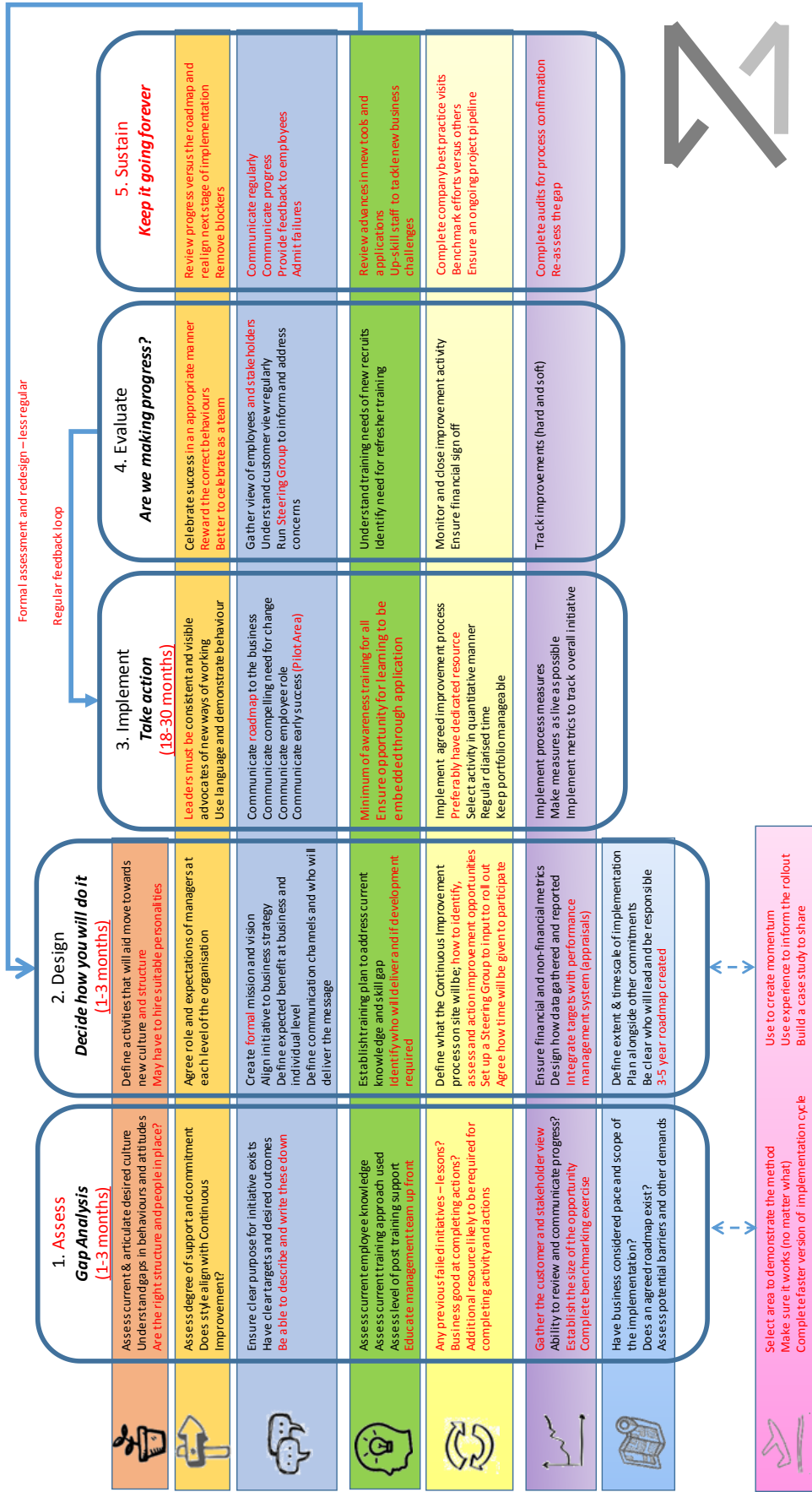


Figure 6.2 - Updated framework based on interview feedback

6.4 Delphi Study Data Analysis - Establishing Consensus

The aim of a Delphi study is to reach consensus on the topic under review. Despite the use of Delphi studies and Likert scales being common, there was difficulty in finding specific guidance on what would constitute consensus. When using a five point Likert scale, Nordin et al. (2012) looked for an average score of over 3.7 to demonstrate consensus but reference is not made in the paper to why this value was chosen. Tastle et al. (2005) developed a formula to quantify level of consensus achieved from Likert responses. This ranges from 0 (no consensus) to 1 (full consensus) but no definitive level is given as demonstrating enough consensus has been reached. The most common measure used in literature is the Interquartile Range (Campos-Climent et al. 2012, Saizarbitoria et al. 2006). The greater the range calculated; the greater the dispersion. Where the range is equal to zero, full consensus exists. The acceptable level of consensus is considered to exist when the range is equal to or less than 1. This measure was therefore used to ensure consensus existed within the survey response.

When analysing the survey responses, it is possible to use either Likert type or Likert scale data. Likert type items are questions treated in isolation, whereas Likert scale is used to combine four or more Likert type items and summarise these using an overall score (Clason and Dormody 1994). As they fall into the ordinal measurement scale, when analysing individual questions, it is wrong to treat the responses as continuous, normal data (Boone Jr. and Boone 2012). For this reason, it should be analysed using the median and mode as an indication of central tendency rather than the mean. For each individual statement the level of agreement is therefore analysed using the mode (selected most often) response.

Where four or more questions relating to the same topic are asked these can be analysed together at the interval measurement scale with the score averaged in order to provide an overall score for that topic (Boone Jr. and Boone 2012). The selected responses were scored as follows:

1. Strongly Disagree
2. Somewhat Disagree
3. Neither Agree or Disagree
4. Somewhat Agree
5. Strongly Agree

6.5 Delphi Study Round 2: Survey results

Questions were asked in the survey under 10 different headings. Where four or more questions were asked under a single heading an average score (mean) for that section has been provided as well as the mode and median score for each individual question. Although no consistent guidance was found, where a mode or mean score of 4.0 or higher ('Somewhat Agree' or 'Strongly Agree') was established a suitable level of consensus was felt to be reached.

This is the same method used to establish consensus as used by McIntyre et al. (2010) who also used the median and IQR to establish consensus. The study also sought to achieve responses with a maximum IQR of 1.00 and a median score indicating agreement to each statement. Avery et al. (2005), also using a 5-point Likert scale, analyse their results through the calculation of the median score and the percentage of respondents agreeing with a score of 4 or 5.

The results from the online survey are shown below in Table 6.5. This details the number of times each of the five possible responses were selected for each individual question as well as providing the median, mode and interquartile range for each question based on these selections.

Similar to the analysis completed by Ray and Sahu (1990) and Campos-Climent (2012), Figure 6.3 shows the selection frequency distribution of each response for each group of questions. This demonstrates the lack of variation in response that exists. Plotted are the average (mean) selection rates for each response category under the main section headings. This visually demonstrates that the majority of respondents selected either 'Somewhat Agree' or 'Strongly Agree' for each section.

Section 1 - Layers		SD	D	N	A	SA	Mode	Median	IQR
1	Addition of top layer beneficial	0	2	1	8	8	4,5	4	1
2	Content within top layer suitable	0	2	2	11	4	4	4	0
3	Addition of middle layer beneficial	0	0	0	5	14	5	5	1
4	Middle layer effective	0	0	0	5	14	5	5	1
5	Middle layer more likely	0	1	2	8	8	4,5	4	1
6	Bottom layer still necessary	0	0	3	1	15	5	5	0
7	BL: necessary level of guidance	0	0	3	8	8	4,5	4	1
Section 2 - Bottom Layer Presentation									
1	Improved ease of understanding	0	0	2	6	11	5	5	1
2	Colour coding contributed	0	0	2	6	11	5	5	1
3	Themes through each phase	0	0	1	4	14	5	5	1
Section 3 - Bottom Layer Phases									
1	Phased approach correct	0	0	1	1	17	5	5	0
2	Titles describe purpose	0	0	0	11	8	4	4	1
3	Addition of 'Pilot'	0	0	1	3	15	5	5	0
4	Content of 'Pilot'	0	0	2	13	4	4	4	0
5	Addition of 'Sustain'	0	0	0	4	15	5	5	0
6	Content of 'Sustain'	0	0	1	10	8	4	4	1
7	Timeframes useful	0	0	2	7	10	5	5	1
8	Timeframes sensible	0	2	3	9	5	4	4	2
Section 4 - Bottom Layer Content Changes - Phase 1									
1	Right Structure	0	0	1	6	12	5	5	1
2	Be able to describe	0	0	1	6	12	5	5	1
3	Educate Management up front	0	0	2	1	16	5	5	0
4	Questions in Activity section	0	1	2	7	9	5	4	1
5	Questions in Measure section	0	1	1	7	10	5	5	1
Section 5 - Bottom Layer Content Changes - Phase 2									
1	Culture section	0	1	2	8	8	4,5	4	1
2	Identify who will deliver	0	0	0	5	14	5	5	1
3	Activity section	0	0	2	7	10	5	5	1
4	Integrate targets	0	2	1	2	14	5	5	1
5	3-5 year roadmap	0	0	3	8	8	4,5	4	1
Section 6 - Bottom Layer Content Changes - Phase 3									
1	Education Section	0	1	0	9	9	4,5	4	1
2	Activity Section	0	3	2	6	8	5	4	2
Section 7 - Bottom Layer Content Changes - Phase 4									
1	Leadership Section	0	0	1	2	16	5	5	0
Section 8 - Bottom Layer Content Changes - Phase 5									
1	Leadership Section	0	1	0	4	14	5	5	1
2	Communication Section	0	0	1	4	14	5	5	1
3	Training Section	0	0	2	3	14	5	5	1
4	Activity Section	0	1	0	6	12	5	5	1
5	Measures Section	0	0	0	8	11	5	5	1
Section 9 - Middle Layer Content									
1	Content of middle layer	0	0	0	7	12	5	5	1
Section 10 - Feedback Loops									
1	Regular loop reinforcing	0	0	0	5	14	5	5	1
2	More formal review	0	1	0	5	13	5	5	1
3	Represent need for evaluation	0	1	1	8	9	5	4	1

Table 6.5 - Table of survey feedback

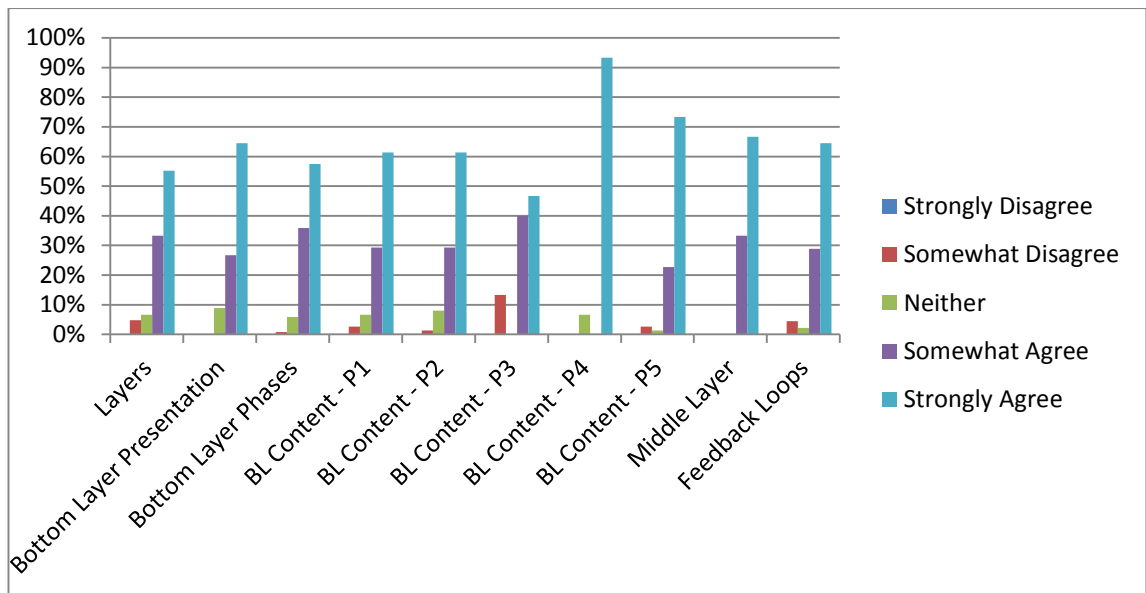


Figure 6.3 - % selection of response category within each section

No further rounds of survey were felt to be required on an individual statement or overall section where the mode and mean scores were ‘Somewhat Agree’ or ‘Strongly Agree’. All but two individual questions achieved an Interquartile Range of one or zero, the necessary level of consensus required, indicating that an adequate level of agreement had been reached.

Of the two questions that did not, it was not felt another full round of survey was justified in order to address these areas. It should therefore be noted that a limitation of the final framework is the failure to achieve consensus on the timescales associated with each phase of the implementation, although consensus was achieved on the addition of the predicted timescales being useful. From the interviews it is clear that respondents found difficulty on placing timescales to the phases and had differing ideas based on the size of their organisation. The other question which did not achieve consensus is the one probing whether having dedicated Continuous Improvement resource is preferable. Whilst the mode response for this was ‘Strongly Agree’ there was enough variation in response to push the Interquartile Range above 1. As the Interquartile Range is calculated to indicate the level of variation that exists within the responses, this indicates that a higher level of disagreement existed regarding these statements than any of the others.

Once the results were established, the reliability of the findings was confirmed by establishing the Cronbach Alpha coefficient for each construct tested. The results are provided in Table 6.6.

Construct Tested	Sections Associated	Number of Questions	Cronbach Alpha
Use of Layers	Section 1	7	0.758
Bottom layer presentation	Section 2	3	0.770
Bottom Layer phases	Section 3	8	0.744
Content Changes	Sections 4-9	19	0.937
Use of feedback loops	Section 10	3	0.772

Table 6.6 - Cronbach Alpha results for each sub group of questions

As stated in Section 4.6 Cronbach's Alpha is most commonly used as a measure of survey instrument reliability. It generates a score of between 0 and 1, with a suitable level of reliability indicated by an alpha score of between 0.70 and 0.95 (Tavakol and Dennick 2011). As the survey contained sub-groups of questions these were analysed individually with a separate score for each established. This demonstrates the reliability of the findings from the survey.

6.6 The final framework

Through the original interview responses and the subsequent survey, the updated conceptual framework has been validated by a group of business leaders and CI practitioners from the UK manufacturing industry. The final framework now appears in 3 separate layers.

The top layer is designed to be a quick snapshot of the key themes, as well as providing a logo for the framework to help provide it with an identity. The purpose of this layer is to generate interest and intrigue in the user and lead them to explore the subsequent layers

in more detail. This need for an initial ‘hook’ was identified during the interviews, as demonstrated by this comment:

- *There has got to be some way for a really high level version of this. A logo, some kind of logo as well that encompasses what you are doing – SAI.*

The graphics used in this layer could potentially be improved as the ones used are purely to give an indication of the concept. That said, the existence of the top layer, and therefore the use of the icons and logo received positive feedback during the survey process.

The bottom layer has retained a similar level of detail to the original conceptual framework that was used to seed the Delphi process. Survey questions relating to the continued need for this level of detail and therefore the existence of this bottom layer both received a mode response of ‘strongly agree’. Importantly, this level of detail was predominantly felt necessary for the CI practitioner, but probably not for the sponsor of the initiative (the business leader). This layer has therefore been titled the ‘Practitioner Guide’. This layer has retained the majority of the original content but has again been updated visually in line with consistent feedback from the interviews. The appearance has been improved through the addition of visual management in the form of swim lanes for each theme and colour coding. Additional phases in the form of the ‘Sustain’ and ‘Pilot’ were added along with predicted timescales for each phase and additional feedback loops.

The new middle layer; the ‘Management Overview’, is an abbreviated version of the ‘Practitioner Guide’ providing a simplified overview of the implementation process. The survey respondents felt this was effective in providing an overview and is more likely to encourage interest and use of the framework.

The Delphi study has demonstrated that whilst the majority of the content from literature was correct, to be able to bridge the gap from academia to achieving practical application requires it to be captured and communicated in a user friendly format. What has been developed is a layered framework that captures the implementation best practice of UK manufacturing companies and communicates it in a way that appeals to both experienced and inexperienced business leaders and practitioners. As a model or framework is a simplified explanation of reality (Ackoff and Sasieni 1968) and therefore whilst wrong can still be useful (Box and Draper 1987), it cannot be expected that uniform agreement on the content, layout or level of detail will be achieved. With this in mind it has been

demonstrated that a required level of consensus exists amongst the expert panel. Manufacturing companies of differing size and from multiple industries have been involved in the two stage Delphi study. The panel are therefore an accurate representation of the overall target audience.

The final framework has been evaluated against the original criteria used in the Critical Literature Review in Table 6.7.

Framework Criteria	Criteria Achieved?	Evaluation of Framework
Must cover the eight themes identified from the Systematic Literature Review	Yes	<p>Most of the eight failure themes identified from the SLR are used as the basis for the titles used to name the swim lanes included in the final framework.</p> <p>Some the terminology used to identify these themes has been altered slightly through the subsequent research phases. In particular, 'Training' and 'Projects' are now captured under 'Education' and 'Activity'.</p> <p>A new 'Communication' swim lane has been created due to the importance placed on this topic during the Delphi study interviews. This has replaced the original Motives and Expectations theme title and also incorporated the need for Feedback within the implementation. The remainder of the original 'Feedback and Results' theme is now addressed through the 'Measures' swim lane.</p> <p>The final themes of 'Implementation Approach' and 'Employee Involvement Levels' are not used as swim lane titles but are felt to be addressed through the 'Roadmap' swim lane and the overall content of the final framework.</p>
Must be specifically tailored to the manufacturing sector	Yes	<p>Throughout the entire research process, a focus on manufacturing has been explicit.</p> <p>The original SLR focus on Continuous Improvement failure within manufacturing environments.</p>

		The Delphi study focused specifically on manufacturing, including only people working in that sector in the expert panel.
Must be designed for a site or companywide Continuous Improvement implementation	Yes	<p>During the CLR this criterion was used to exclude content from existing frameworks that did not meet this requirement.</p> <p>When developing the conceptual framework therefore only content relevant to site or companywide implementations was included.</p> <p>The final content of the framework is clearly much broader than that which would exist for the implementation of a stand-alone Continuous Improvement project within a company.</p>
Must provide guidance on 'how to' and not just what areas to cover	Not entirely	<p>The increased level of guidance provided through the different layers of the framework is felt to largely achieve this objective as specific activities to complete within the implementation process are identified, not just generic topics to tackle.</p> <p>'How to' achieve success within an implementation is therefore felt to exist within the framework as it should direct the user and prompt the necessary activities to be completed.</p> <p>'How to' complete these activities could still be even more detailed however.</p>
Must be specifically tailored to the UK	Yes	The need for a region specific output was identified within the literature and to achieve this the Delphi Study included only experts based within the UK. This ensures that the output content and style is suitable to this specific user group.

Table 6.7 - Evaluation of framework versus the original criteria

Through this evaluation the author feels the majority of the criteria have been achieved completely. The only criterion where further development may be necessary is the 'how to' element of the framework content. This was however identified through the Delphi study interviews although it did not prevent consensus being achieved on the suitability and value of the current content.

Through the rigorous application of both quantitative and qualitative methods a finalised Continuous Improvement implementation framework has been validated for application in the UK manufacturing industry. Depending on user preference and role within the implementation three layers of guidance have been developed. The first layer identifies the main themes that must be addressed. This is then built upon with an overview of the areas to tackle within each. Finally, a much more detailed bottom layer is provided that details the specific actions required in order to successfully implement Continuous Improvement. The importance of presenting the information in a user friendly format is clear, and should be given consideration where the aim is to have academic findings translate into practical application. This is a key element of good theory building (Wacker 1998).

6.7 Summary

The final objective of the research was stated to be the development and validation of a practical and strategic framework for implementation and sustainability of Continuous Improvement initiatives in UK manufacturing.

This objective has been achieved through the completion of the Delphi study. The semi-structured interviews, used to review the conceptual framework arising from the Critical Literature Review, allowed an updated framework to be developed. This includes several changes identified through thematic analysis of the feedback gathered. In terms of implementation sustainability, important changes to the original framework are the addition of a new final phase, the addition of another feedback loop, as well as the addition of the Pilot activity.

This updated framework was subsequently validated through the second phase of the Delphi study, the online survey. The use of a Likert scale survey allowed a quantitative analysis to be completed and consensus demonstrated.

In order to fully validate the framework a focus group review will be completed with people not previously involved in the research. It is hoped this will provide neutral and honest feedback from another desired user group. The focus group feedback is detailed in Chapter 7.

Chapter 7 Discussion

7.1 Introduction

Through Systematic and Critical literature review, online survey and Delphi Study a finalised conceptual framework has been created. The purpose of this chapter is to detail the findings of a final validation exercise, a focus group with people not previously involved in the research, as well as summarising the main findings of the research and comparing these to existing literature.

7.2 Focus Group Overview

As discussed in Chapter 4, a focus group can be used to provide a shared discussion and review. In this instance it was used to evaluate the final conceptual framework derived from the Delphi study (Figure 6.2) from the point of view of inexperienced Continuous Improvement practitioners. The objective was to understand how useful the framework would be to people in the early stages of Continuous Improvement application. Through the Delphi study both inexperienced and experienced business leaders as well as expert Continuous Improvement practitioners were able to input and share their view. This left a final target user group to review the content; inexperienced Continuous Improvement practitioners. A further focus group was organised in order to achieve this.

Beck et al. (1986) defined a focus group as 'an informal discussion among selected individuals about specific topics'. 'The most common purpose of a focus group interview is for an in-depth exploration of a topic about which little is known' (Stewart and Shamdasani 1990). The use of focus groups as a research strategy is becoming more widespread and more respected. This, in part, is likely due to the low cost associated when compared to other available methods (Parker and Tritter 2006).

A focus group will involve a group discussion on a particular topic which is typically structured through questions set by the researcher (Wilkinson 1998). Participants therefore are gathered in order to share their knowledge or opinion on a specific topic that is of interest to the researcher (Parker and Tritter 2006). The discussion will typically take place in an informal setting, allowing people to feel able to openly share their views on the specific topic under review (Bloor et al. 2001). The distinguishing element of focus groups compared to other research methods is the interaction that takes place between the

participants. The discussion will typically be audio recorded and subsequently transcribed in order to allow analysis of the content through the likes of thematic analysis (Wilkinson 1998).

The size of the focus group is usually between six to eight participants who may already know each other or may have been gathered for that specific purpose. It is preferable that the group members are fairly similar in terms of 'status' in order to aid the group dynamic (Carey 1994).

A key distinction between a focus group and a group interview lies in the role of the researcher during the meeting. A focus group relies on the researcher remaining more detached from the discussion rather than guiding it in an overly prescriptive manner. The objective is for the participants to discuss the topic under review not to answer directly to the researcher. This interaction between the participants is key, with the role of the researcher to prompt this through the use of open-ended questions (Parker and Tritter 2006).

An issue that typically surrounds a focus group is that of participant recruitment. This should be completed in a structured manner to give best chance of the desired interaction taking place and a high quality output being achieved (Parker and Tritter 2006). There is a danger that participant selection is based more on convenience and availability than on strict criteria. This can significantly impact the validity of the final output (Parker and Tritter 2006).

Another area the researcher must be mindful of is whether a balanced level of participation takes place during the focus group to avoid the findings being overly influenced by particular people (Parker and Tritter 2006). In order to maximise the interaction between participants it may be necessary for the researcher to intervene. This may be to extend conversation, challenge a statement or to highlight inconsistency in the points being made (Kitzinger 1994).

7.2.1 Focus Group Methodology

The focus group involved a total of five newly qualified Lean Six Sigma Black Belts trained by the Institute of Six Sigma Professionals (ISSP). ISSP was established in 2011 in order to connect like-minded Six Sigma professionals. The Institute delivers accredited Lean Six Sigma training and organises best practice events in the UK. The Black Belts were from three UK manufacturing companies of various size and industry, and had all

met previously at these training sessions. Through a contact at the Institute a one-hour focus group session was arranged. This was completed on 05/09/17. A summary of the participants is detailed in Table 7.1.

Participant	Company	Job Title
A	1	Senior Chemist
B	1	Technical & Improvement Manager
C	2	Process Engineer
D	2	Production Manager
E	3	Operations Manager

Table 7.1 - Focus Group Participants

The recruitment of the focus group was facilitated through a contact of the researcher and therefore control of the recruitment was somewhat lost. This had to be balanced against the increased level of access the contact had to the type of respondent desired and was managed by providing criteria to which people could be matched. Overall, the recruitment was successful in identifying people suitable to the research purpose and also of similar ‘status’. This should aid the level of interaction achieved.

The focus group involved the Black Belts being firstly introduced to the background to the research and then provided an overview description from the researcher of each layer of the final conceptual framework. A series of open questions were then used to prompt response from the group (Appendix L).

Although seeded with some open questions, the objective of the researcher was predominantly to prompt discussion amongst the group rather than be a central figure within the dynamic. In this sense, it is felt this group exercise was more of a focus group than a group interview. At points during the discussion however the participants did seek clarification regarding some elements of the framework content or the background to the research.

Each participant was provided an A3 paper copy of the framework at the beginning of the session. The framework was also projected onto a screen in the room throughout to allow shared discussion of any specific points raised.

7.2.2 Focus Group Feedback

The initial feedback on the format and layout of the framework was positive. Participant E commented, “it’s easy on the eye. The first impression is that you have got clear channels for areas that you deem as critical to having Continuous Improvement put in place. It becomes easy for people to look at and pick up on”. It was felt that the use of the swim lanes made the main themes stand out. It was also felt to be positive that different levels of detail are provided on each layer for different people. Participant A stated, “I like the different levels of detail”. Having a less detailed management overview layer was felt to be the right approach.

There were however questions from the focus group around the swim lanes for the topics of Culture and Pilot. The group did not understand why these themes do not progress through all the phases of the framework like most others. Participant D in particular felt the current format looked like the Pilot just stopped abruptly. It was asked, “why does the Pilot stop at Design? Would you not implement the Pilot meaning there would be an evaluation of the Pilot as well?” Participant A also felt similarly about the culture theme. In relation to Culture specifically, it was felt this was the wrong message as this is such a critical theme within the implementation. It was explained that the change in culture, once articulated in the Design phase, is achieved through the activity delivered in the other themes. Whilst the group understood this logic, it was suggested that the achievement of the Culture change through the other themes could perhaps be better illustrated on the framework. It was also questioned whether there should be an evaluation of the Culture to understand if it had changed as desired.

There was also discussion regarding the labelling and theme titles and a desire amongst the group to have these more consistent between layers. Participant C commented that the symbols are good but unless the user refers back to the top layer forgets what each represents. It was suggested that addressing this would prevent the need to flick between the layers as often. Participant A also picked up on a couple of other points, suggesting that, “it would be good if the flow of the icons on the front page matched the other layers” and pointing out that, “you have ‘Leadership’ on the front and in the other layers ‘Leaders’”. As it stands different layers of the framework use either symbols and/or text to represent the themes. The focus group suggested having it laid out in the same manner in each layer with both text and symbols used to represent the themes. It was commented that addressing these points would positively impact the ease of use and therefore the likelihood that someone would pick up and utilise the framework.

On the front page of the framework it was questioned by Participant A whether there was more of a meaning to the logo and icons than just the things you see on the next two pages. It was explained that the logic, based on the Delphi study, was to not have the user hit with too much detail initially but instead create a little awareness and intrigue through a front page. The top layer exists to let users see the key themes and give the framework an identity. A question was also asked by Participant B regarding the significance of each theme in relation to the others and whether some were more critical. It was explained that this had been explored earlier in the research and was part of the reason that Leaders and Culture appeared at the top of the framework.

Participant C also demonstrated a desire for further detail to be available:

“It depends how deep it has to go? If you are a practitioner, you might want more on each of these areas and what it is you can actually do and how you do it. What are the tools you would use in each square? Each of them could be worthy of its own sheet almost. If you are a practitioner, you might want more pointing where to go to do these things.”

In terms of assessing culture in particular, the group questioned how to do this, desiring a pointer on where to go for this information to understand the tools to use. It was explained that the scope of the framework is to provide guidance on the areas to tackle and the activities required, but not to be overly prescriptive in how to do these. It was acknowledged however that the fact the discussion on how to do it had taken place was an indication that the framework had served a purpose. It was explained that the development of that level of detail was known as a potential gap and future research direction.

Participant A questioned, “What’s the name of the framework?”. It was explained that the framework does not currently have a name as such but that an identity had been attempted to be created through the use of the logo and symbols for the themes. It was felt by the group that the framework could benefit from a name and identity to aid selling it into companies.

It was commented upon by Participant D that a timeline is provided for the early phases but that Evaluate and Sustain do not have this. The group however discussed this and came to the conclusion that this was the correct approach as the latter phases effectively continue forever. The feedback loops being labelled as ‘regular’ and ‘annual’ were considered to provide a clear enough indication of timescale and frequency.

The consensus was that the framework would be useful, and as well as being used as a guide could also serve as a useful reference tool. Participant E stated:

“Yes I would use it. It would be worthwhile us measuring ourselves against this also. Do we have evidence of that activity, are we happy it is done, or do we need to go back in to that a bit more?”

Participant A and Participant C also agreed that the framework could be applied in their companies.

The suggestion was also made that the framework could be used as a method of tracking progress through an implementation and could be easily adapted into a tracker.

This was prompted by a question from Participant C:

“Is there an overall way for someone, such as the MD, to track the progress of this and make sure it is all hanging together?”

This led to a group discussion regarding converting the framework into a one-page tracker that could be filled in as progress was made. It was felt this could provide a strong visual and highlight if one swim lane is progressing ahead of others. Participant E stated, “it would be good to go through this and tick off what we have done. It would be a nice indicator if there is something obvious that we have missed or that we are well behind on. As a practitioner I would find it useful as a reference tool.”

Participant C added that, “it would be good to go through this with the steering group in my company because we might not be where we think we are in certain areas.”

It was therefore felt that it would be useful to tick off activity as it is completed and check if there are any important areas that have been missed as the implementation progresses. Participants from one of the companies agreed during the session to use the framework as a tool to review their implementation progress with the senior sponsors. They agreed that it would provide a shared understanding and a standard point of reference for everyone to use.

In terms of the content there was not much of it that the participants found surprising. The main comment was that further content, in the form of a supplementary toolkit, would be useful. As people who would be using the framework without experience of ‘how’ to carry out the activities detailed it was felt that this guidance could be supplied in further layers or a reference document.

Participant B felt, “if someone was picking this up totally cold, there are a lot of good things that would give them pointers of where to go but nothing that tells them what tools and how to do it. It was suggested that on another layer “you could have the same thing but in the boxes detail suggested tools”.

There was also a query from Participant C regarding who should be responsible for each swim lane and whether this should be detailed. Participant D interjected at this point and stated, “that would be different for different companies. That is the problem. But this is not trying to detail ‘the how’, it is trying to indicate ‘the what’”. Through further discussion the group agreed that this would be different within each company but would be a worthy conversation at the outset of the implementation efforts. Through review of the framework, Participant A pointed out that this is referred to in the Assess phase within the Leaders theme through ‘agree who is responsible’. Once discussed this was felt to be a sufficient reference.

As the group had recently been through Black Belt training the question was asked by Participant B if there had been any attempt to link the structure of the framework to the Six Sigma DMAIC approach. Upon comparison it was felt that the framework did not strictly follow this sequence. It was explained that existing CI terminology had been avoided so that the framework was not viewed as solely a Six Sigma implementation guide or one for Lean. It is intended to be suitable for any, with the specific tools and techniques selected during the implementation journey.

It was commented by Participant A that the whole thread across the Leadership theme, based on their experience, would be particularly challenging. Specifically, it was felt that getting genuine buy in from the middle layer of management would be most difficult. Participant D agreed with this, stating, “the middle management is the most difficult”. Participant E suggested that the person at the top of the organisation will typically kick off the implementation but those working under do not necessarily know or understand what that means. Participant A added that the people operating at that middle level are typically measured on quite a short term horizon and it is not therefore in their interests to take a hit today to be better tomorrow.

This again led to a comment about the Culture swim lane stopping being the wrong visual and sending the wrong message because the Culture and Leadership are so important to the success of the implementation.

Participant E argued that the most difficult part of the implementation will be the Sustain phase as this is ultimately impacted if there is a lack of management buy in:

“I think out of all this the hardest bit is probably the sustain. If the leadership are not bought in that ultimately affects your sustainability. You can have lots of activity as an initiative but that’s what it ends up becoming; another initiative that runs for 18 months or 2 years and then the focus goes on to something else.”

The group was in agreement that the framework is suitable now that each of them have some knowledge of Continuous Improvement. This context is required as had the framework been shown to them 18 months ago, prior to any knowledge or involvement in CI, they would not have struggled to make good sense or use of it.

7.2.3 Focus Group Summary

Overall, the group agreed that they would use the framework and would find it useful to measure themselves against. There was discussion about being able to evaluate their own company roadmap against the framework to establish if there has been anything overlooked and to ensure there is evidence that each element has been completed satisfactorily. The use of the different phases chunks the process up to make it more manageable. Based on the feedback, the framework would be a useful point of reference.

In general, the feedback received from the focus group was positive and confirmed the framework was deemed useful to an inexperienced Continuous Improvement practitioner. The focus group displayed a genuine interest in the content and a desire to use the framework within their organisations.

The focus group was useful also in highlighting some further areas for improvement within the framework. As identified previously, and stated as out of scope for this research, there is a desire for further detail to be provided to inexperienced practitioners regarding how to tackle each of the activities identified in the framework. This is slightly different to the Delphi study results, as those respondents were in agreement that the current level of information contained in the bottom layer is sufficient. In order to aid the inexperienced Continuous Improvement practitioner this will be captured as a future research opportunity, with the recommendation to develop a further layer of the framework.

Further improvement was also identified to make some of the visuals clearer in order to give the framework a stronger identity and improve linkage between the different layers of the framework. The Delphi study panel were in agreement that the colour coding and swimlanes were a positive change to the original framework. The focus group however has highlighted slight improvements that can be made to this in order to further enhance use. Based on this feedback an updated logo for the front page of the framework has been developed. This logo contains a relevant title for the framework and now links to the five implementation phases contained in the subsequent layers of the framework through the use of the new ADIES (Analyse, Design, Improve, Evaluate, Sustain) graphic (Figure 7.1). The final framework will be titled the UK Manufacturing Continuous Improvement (UK:MCI) framework. This logo also appears on the subsequent layers of the framework.

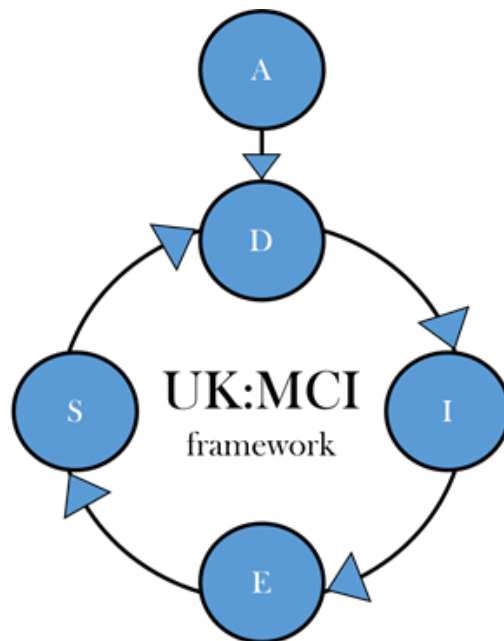


Figure 7.1 - Final logo for the UK:MCI framework

The final top layer (Figure 7.2) now includes the new logo, a clear title for the framework and has the symbols for each theme appearing in the same order as in subsequent layers. These minor alterations all address points raised during the focus group and aid the ease of use.

The UK Manufacturing Continuous Improvement (UK:MCI) Framework

A Continuous Improvement Implementation Guide for UK manufacturing companies

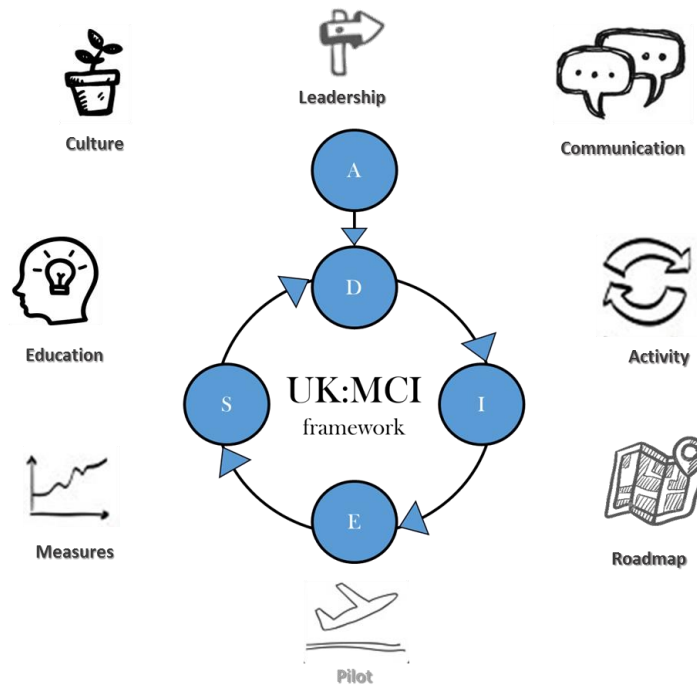


Figure 7.2 - The final top layer of the UK:MCI framework

The final management overview layer (Figure 7.3) is unaltered except for the inclusion of the new logo and changing the ‘Leaders’ theme to ‘Leadership’ in order to match the top layer.

The final practitioner layer (Figure 7.4) now has the new logo included also.

Overall, the focus group served its purpose well; providing the opportunity for the final target user group to input to the research process. With most of the suggested updates now included, although not altering the core content of the framework, the content and presentation of the final UK:MCI framework should better appeal to each user group and be of use to them.

Continuous Improvement Implementation Framework for UK Manufacturing companies: Management Overview

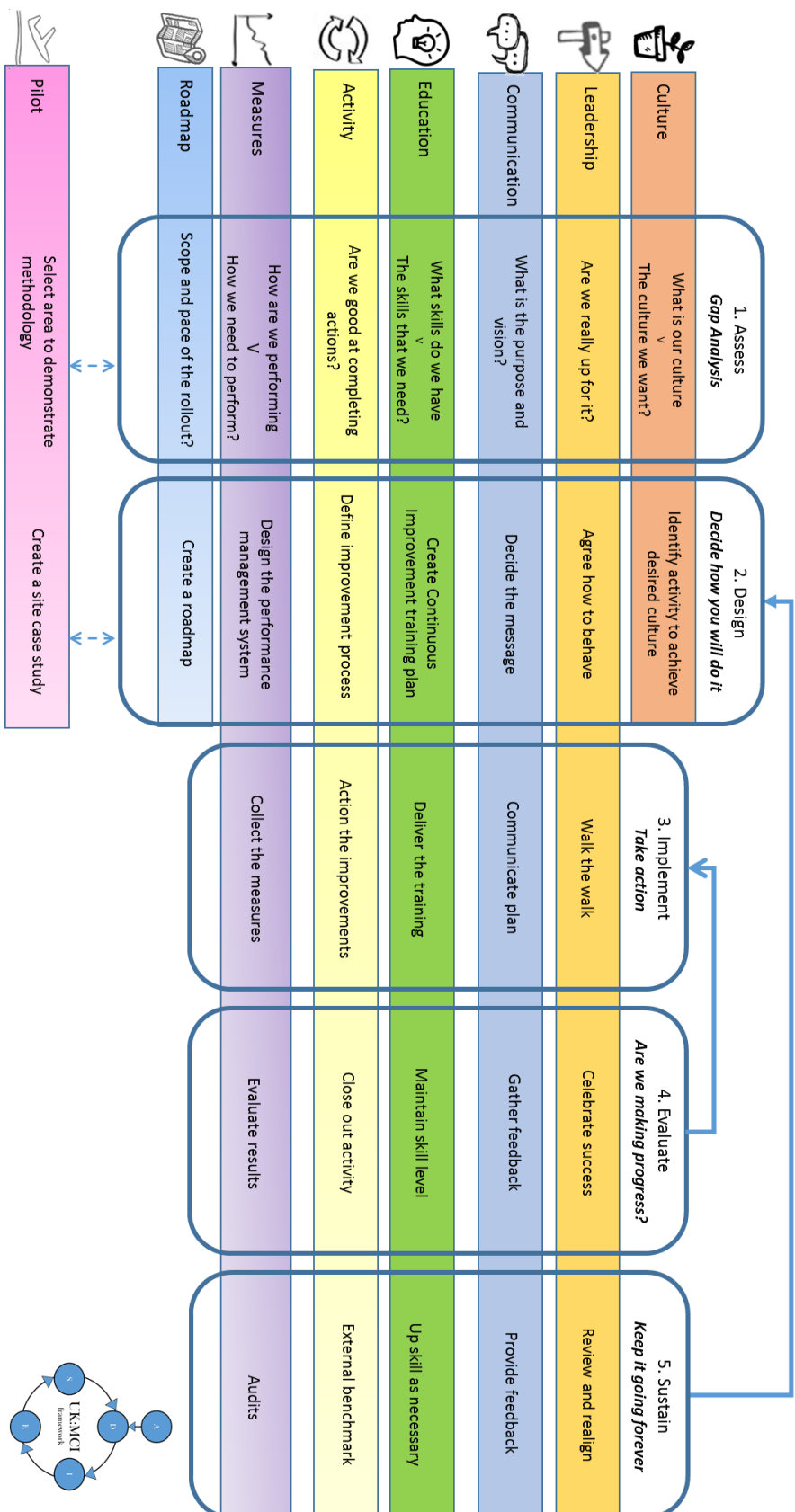


Figure 7.3 - The final management layer of the UK:MCI framework

Continuous Improvement Implementation Framework for UK Manufacturing companies: Practitioner Guide

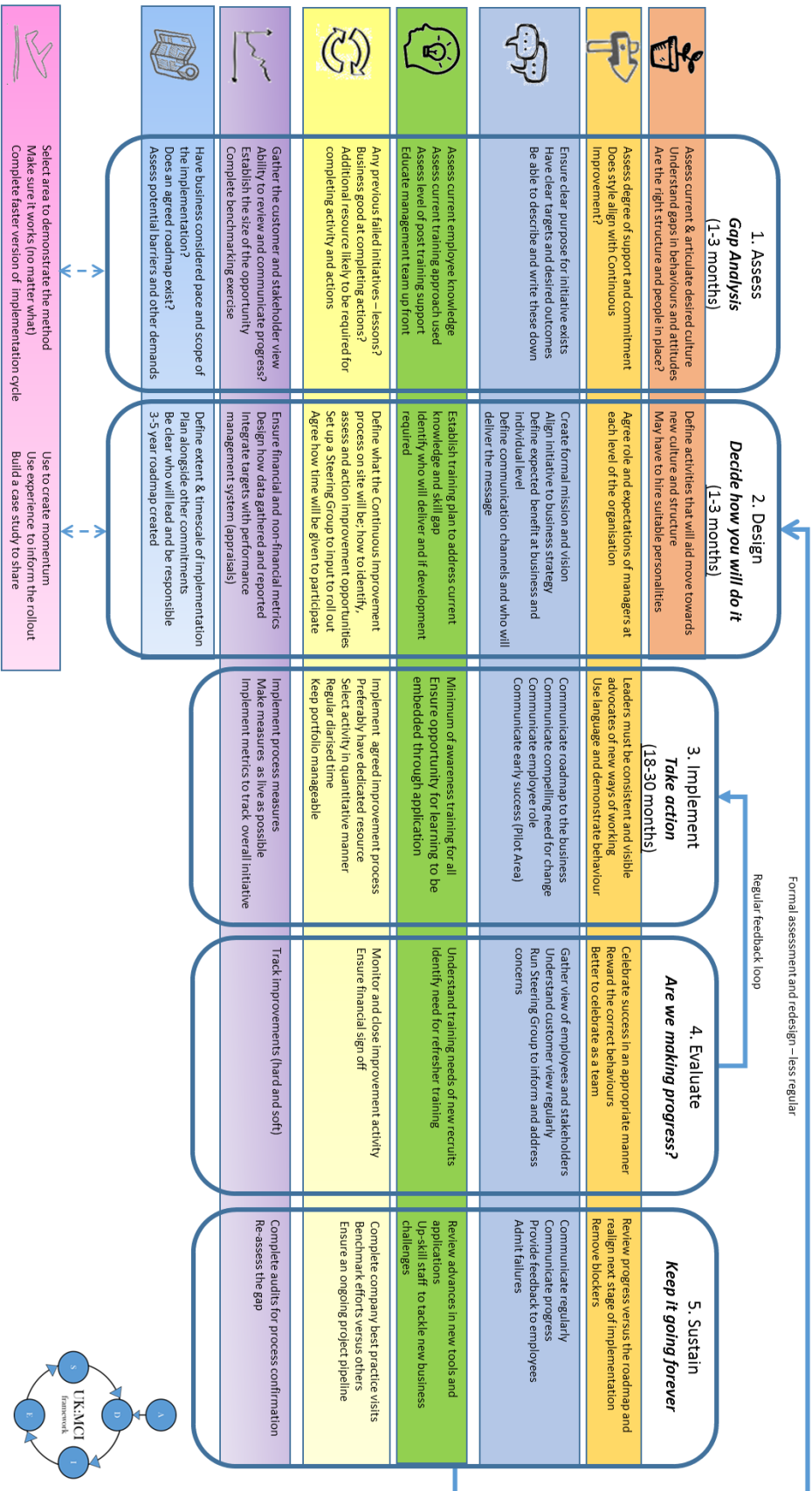


Figure 7.4 - The final practitioner layer of the UK:MCI framework

7.3 Key findings of the research

The initial finding of the research, which provided the foundation for the subsequent research phases, was the identification of the eight main themes contributing to the failure of Continuous Improvement initiatives in manufacturing environments. Key to this is the fact that these themes centre on the manner of implementation rather than the tools or techniques themselves. This emphasises that it is not the theory (tools and techniques) that fails; it is the application of this theory and the approach taken to implement it that will ultimately dictate its success.

This initial collating of the existing theory into themes was developed further through the distribution of the initial online survey. This served to validate the themes derived from literature as well as to rank the impact of each. Based on the response gathered through the survey the existing literature would appear to cover well the main themes contributing to failure, although this was largely fragmented prior to the completion of the systematic review. Previous literature instead largely focuses on success factors rather than failure. Whilst no additional main themes were identified through the survey the respondents did identify additional variables within some of the themes that warrant consideration. Based on the subsequent individual interviews, the most significant of these variables would appear to be the absence of effective communication. Within the final framework a 'Communication' swim lane is now included, demonstrating the importance of this aspect at each stage of the implementation process. "Successful communication of change demonstrates an understanding of the cycle of change, the importance of trust in the communication process, the essential personal nature of change, the necessity for continuous face-to-face communication, and a recognition that current global changes are symptoms of a shift in the human condition" (Goodman et al. 1996).

Leaders within a business must be able to maximize the output of their workforce and must therefore be able to communicate effectively with them. The more effective the communication skills of a person, the more effective a leader they will be. When communicating, people should therefore focus on three key areas: the message, the audience and the medium used to deliver the message. In addition, business leaders must also be able to listen and take on board the opinion of the workforce. Questioning styles and body language are critical in being able to establish this connection in order for the employee to feel they have had a genuine opportunity to share their point of view (Aziz 2003).

Trust is an essential element of effective communication and managing the change process. Change initiatives, by nature, are disruptive to the status quo and trust is essential to their eventual success. Communication within an organisation should take place when either making a change to something familiar, introducing something new or terminating something already in existence.

For communication to be effective it must be ensured that any information is shared honestly, with employees provided the opportunity to be involved in the decision making process. It is also recommended that any initial communication takes place face-to-face. This approach will ensure clear and personal communication. This is one of the primary characteristics of a successful change program (Goodman et al. 1996).

Lewis (1999) states that communication is an important element to consider during any planned organisational change, with the two topics closely linked. During an organisational change the information that is provided to employees is critical and should therefore be a considered part of the overall change strategy. This can aid the implementation efforts by helping to reduce the level of resistance to change that may exist within an organisation (Elving 2005).

Klein (1996) identifies that “organisational changes often flounder because not enough strategic thought is given to communicating” and therefore studied the various stages of an organisational change, the type of communication required at each stage and the appropriate strategies to use in order to be effective. Initially, the organisation must create a readiness for change amongst its employees. It is important therefore to share information regarding what is changing and why. Once the change is underway, the focus of the communication should change to providing updates on the progress to the workforce and how and when people will become involved. It is important also to correct any misinformation that exists regarding the change efforts. Finally, once change is in place the communication should become multidirectional with the majority of communication occurring with direct reports rather than from senior leadership. It is important to communicate successes that have been achieved and to understand how it has affected individuals.

The original survey also ranked the themes in relation to their contribution to Continuous Improvement initiative failure in manufacturing. Other authors, typically studying Success Factors, have completed similar studies. The findings of this research, that

Management Leadership and Organisational Culture and Environment are the most critical, align well with other literature as will be discussed in the next section.

These phases of the research were important for several reasons. Firstly, the research was focused purely on manufacturing. This makes the findings more specific and therefore more relevant to this audience. As the majority of change programs and Continuous Improvement implementations fail it was also essential that this angle was covered in case the previous focus on success factors was causing anything to be missed. Finally, the identification, validation and ranking of the themes have served to extend the current knowledge of success and failure factors, specifically when discussing manufacturing environments. The fact that Organisational Culture and Environment was found to be one of the statistically significant themes further emphasises the need for region and industry specific frameworks.

Another main finding of the research was the current absence of robust implementation guides for Continuous Improvement. Those that currently exist were thoroughly evaluated in Chapter 3 and demonstrated to be lacking in the required criteria.

No current offering addressed the eight failure themes identified in Chapter 2, is specific to both the UK and the manufacturing sector, and provides clear guidance regarding a site wide Continuous Improvement implementation.

This absence of a practical and strategic framework or model provided the main research gap that this research has bridged. In the case of this research this has been achieved specifically for UK manufacturing companies implementing Continuous Improvement. The new framework comprehensively covers the eight failure themes and has been validated by an expert panel. These are two criteria that the majority of current offerings lack.

As demonstrated in Chapter 3, only two of the existing frameworks reviewed are considered to address the eight failure themes and none are specifically tailored to UK Manufacturing. None of the current offerings therefore address both of these criteria.

The translation of theory into practice should be an objective of undertaking operations management research. To aid this, the research has identified some key findings that should be considered by others pursuing similar research in the future. When attempting to translate academic findings for practical application the need to tailor the presentation and level of detail to the target audience has been found to be critical. Whilst the content

of the conceptual framework did not alter hugely through the Delphi study, the manner in which the information was presented to the user did. This is a key finding that should be taken on board by future researchers who wish their work to not only have academic merit but practical merit also. In its original form the business leaders and Continuous Improvement practitioners interviewed would not have engaged with the content and would therefore not have applied the information contained. The involvement of a representative group of target end users in the theory building process is therefore invaluable in order to have credible output from the research.

7.4 Counter arguments with literature - synergy and differences

Despite the large volume of articles and journal papers written on the topic of Continuous Improvement, there is almost a complete absence of one's directly addressing the failure of these initiatives. There are very few journal papers or articles currently published specifically on the failure of Continuous Improvement initiatives. Non-existent are those focused purely on the manufacturing industry. The findings from the original systematic literature review and the subsequent survey results detailed are therefore original and provide increased insight. Of the previous papers published focused on CI implementation failure, the study by Pinedo-Cuenca et al. (2012) is not industry specific, by Antony et al. (2012) is focused on Higher Education, and by Albliwi et al. (2014) is not specifically focused on manufacturing although it does discuss barriers related to it. From all of these papers the factors and barriers detailed are all well covered within the eight themes (Table 7.2). This would appear to make this study the most rigorous and detailed to date providing the greatest level of awareness of the issues and themes contributing to Continuous Improvement initiative failure. It has also taken the next step in validating the findings through survey and identifying the most significant failure factors. The previous studies are limited by being purely a literature review in isolation (Albliwi et al. 2014), being limited in the scope of the single case study used to validate the results (Pinedo-Cuenca et al. 2012), or being based largely on the experience of the authors rather than academic rigour (Antony et al. 2012).

	Albliwi et al (2014)	Antony et al (2012)	Pinedo-Cuenca (2012)
<i>Motives and Expectations</i>	<ul style="list-style-type: none"> • Lack of awareness of benefits of LSS • Narrow view of LSS • Lack of awareness of the need • Threat of redundancy • Replicating another organisations strategy 	<ul style="list-style-type: none"> • Lack of awareness of benefits that can be achieved • Initiative viewed as quick fix 	<ul style="list-style-type: none"> • Alignment of business objectives with improvement objectives • Unleashed Six Sigma business strategy
<i>Management Leadership</i>	<ul style="list-style-type: none"> • Lack of top management commitment and involvement • Lack of leadership skills and visionary leadership 	<ul style="list-style-type: none"> • Lack of management support and commitment • Lack of visionary leadership 	<ul style="list-style-type: none"> • Lack of top management support
<i>Organisational Culture and Environment</i>	<ul style="list-style-type: none"> • Lack of resources • Resistance to culture change • Poor organisation capabilities • Weak infrastructure 	<ul style="list-style-type: none"> • Culture of organisation • Lack of communication at various levels; silo culture • Lack of resources 	<ul style="list-style-type: none"> • Lack ability to monitor and influence employee attitudes • Lack of culture to embed CI • Bureaucratic structure • Insufficient financial resources • Resistance to change
<i>Implementation Approach</i>	<ul style="list-style-type: none"> • High implementation cost • Lack of experience in implementation 		<ul style="list-style-type: none"> • Inadequate planning and alignment • Lack of dedicated resource

	<ul style="list-style-type: none"> • Lack of clear vision and plan • Lack of model or roadmap • Poor execution • Lack of estimation of cost • Lack of understanding how to get started • Weak linking to suppliers 		<ul style="list-style-type: none"> • Lack of recognition and incentives
<i>Training</i>	<ul style="list-style-type: none"> • Lack of training and education • Poor selection of trainees 		<ul style="list-style-type: none"> • Lack of knowledge about Six Sigma • Lack of training • Training delivered without opportunity to apply • Poor selection of trainees
<i>Projects</i>	<ul style="list-style-type: none"> • Poor project selection and prioritisation • Weak link between CI projects and strategic objectives • Wrong selection of tools • Lack of process thinking • Ineffective project management • Time consuming • Lack of application of statistical theory 	<ul style="list-style-type: none"> • Sub-optimisation of processes due to lack of systems thinking • Weak link between CI projects and strategic objectives 	<ul style="list-style-type: none"> • Unclear prioritisation of projects • Insufficient time to work on projects
<i>Employee Involvement Levels</i>	<ul style="list-style-type: none"> • Poor communication 		<ul style="list-style-type: none"> • Poor communication to

	<ul style="list-style-type: none"> • Lack of consideration of human factors • Lack of employee engagement 		<ul style="list-style-type: none"> • enhance employee commitment • Negative human consequences
<i>Feedback and Results</i>	<ul style="list-style-type: none"> • Lack of understanding of different types of Voice of the Customer • Lack of performance measurement system 	<ul style="list-style-type: none"> • Lack of understanding of voice of the customer 	<ul style="list-style-type: none"> • Poor estimation of financial gains • Poor measurement of customer satisfaction • Difficulty obtaining baseline data • Selection of metrics • Difficult to sustain improvements

Table 7.2 - Comparison with other papers investigating CI implementation failure

Organisational Culture and Environment and Management Leadership were found to be the two most critical themes. This finding is similar to the critical success factors for Lean Sigma implementation identified by Laureani and Antony (2012) and to Anwar et al. (2015) who identify Organisational Infrastructure and Management Commitment and Leadership as the two most critical factors of Lean Six Sigma deployment.

Within UK manufacturing SMEs Kumar (2007) found the most critical factor to successful Six Sigma implementation to be commitment from top management. In the Malaysian automotive industry, leadership was also established as a critical success factor along with customer focus (Habidin and Yusof 2013). Similarly, Achanga et al. (2006) concluded from their review of literature and study of UK SMEs that amongst the critical factors when implementing Lean is Leadership, Management and Organisational Culture. Lande et al. (2016) explored the critical success factors for Lean Six Sigma implementation in an Indian context and concluded that the most critical are Management Involvement and Commitment, Training, Customer Satisfaction & Leadership. The most critical factor in relation to Total Quality Management was found to be related to Management Leadership also (Karuppusami and Gandhinathan (2006). From a study of Six Sigma in UK organisations Antony and Banuelas (2002) also concluded that

Management Commitment and Involvement is the most critical factor. Overall, Naslund (2013) found similarity in the critical success factors associated with all Lean and Six Sigma change efforts. Of those detailed, Management Support and Organisational Culture were found to be most critical.

Of those reviewed in Chapter 3 of the research, the frameworks presented by Baidoun (2004) and Jeyaraman and Teo (2010) were identified as the most complete in terms of addressing the eight main failure themes. These frameworks were also intended to guide a site wide implementation. The frameworks however were not specifically tailored to the UK region or the manufacturing industry. In terms of content, both fail to present the content in a cohesive manner that could be easily followed. The user friendly element found to be important during interview is lacking. The finalised framework presented from this research has therefore ensured the visual management element received focus to ensure the information was clearly presented and easily followed. In terms of promoting practical application this was found to be critical.

Of the remaining frameworks, those by Mostafa et al. (2013), Nordin et al. (2012) and Thomas et al. (2008) are the only current offerings specific to the manufacturing industry. None of these however are also specific to the UK region.

In the case of Thomas et al. (2008), the researchers are based in the UK (Wales) but no reference is made in the paper to the location of the case study company upon which the findings are based, with no statement made either of the findings being region specific. Rather than assume, the findings have been taken not to be intended as region specific. The output of the paper is also not pitched at the organisational level. In the case of Mostafa et al. (2013) there is a failure to incorporate all of the key information from their paper in the framework and to provide a necessary level of detail on the content to allow it to be clearly followed. Unlike the panel size used for this study, Nordin et al. (2012) only based the framework on an expert panel of 3 people. The content is also felt to be lacking in the depth required to be comprehensive. There is therefore a failure to cover the two most vital topics of Leadership and Culture.

The finalised framework has each of these topics included as prominent swim lanes, providing guidance at each phase of the implementation on the activity required to be successful. Key to Leadership is for the Management team to be credible and visible advocates of the change. In order for this to be possible the leaders must be educated at the outset and must be involved in the sustainment of the process; reviewing progress and

removing blockers. In terms of Culture, the leaders will play an important role in this also. The Culture swim lane is only present in the Assess and Design phases of the framework, as the achievement of the desired culture is then made through the completion of the other activity detailed. The Culture, and the activities required to achieve it, will be reviewed on an ongoing basis through the secondary feedback loop.

The final framework from this research also addresses these shortcomings through the use of different layers to provide different levels of detail, the use of a 20-person expert panel to ensure robust findings and the tailoring of the content to reflect a site or organisational implementation.

Finally, the framework developed by Kumar et al. (2011) was intended to be specific to SMEs. It is recommended that there would have to be further research as to whether this is necessary. Given the wide range of company size involved in this research it would pose the question of whether a SME specific solution is in fact required when developing implementation guides. Both SMEs and non-SMEs contributed to this research with consensus found on how to implement Continuous Improvement when region and industry are considered.

Whilst the phased implementation approach and areas to address remain the same irrespective of company size, it is expected that within the areas needing addressed within the framework different approaches may be required. For this reason, the content of the framework is not overly prescriptive, instead identifying the areas needing consideration and action. The biggest and most obvious difference based on organisational size is the resource available; both in terms of staff and finance. This will likely alter the amount of resource that can be committed to achieving the desired change. The rate of change that can be achieved, and therefore the overall implementation timeframe is also likely to be influenced significantly by organisational size. This is emphasised by the failure within the Delphi study to achieve complete consensus amongst the expert panel on the expected timescale associated with each implementation phase. Within a smaller organisation the ability to commit resource to the change efforts may be less, but the opportunity to alter the culture quickly is probably greater. There are less people that can be involved but also less people to influence, educate and ultimately change.

Other Continuous Improvement implementation research which warrants consideration in comparison to the findings is that developed by Bessant et al. (2001) and Cafynn (1999). During the individual interviews, some of the expert panel expressed a desire for

more detail to exist behind the current bottom layer of the framework and for a measure of ‘maturity’ to be included. This was considered out with the scope of this research. This area however has been tackled previously by Cafynn (1999) and Bessant et al. (2001) who developed a self-assessment tool and maturity model respectively. Whilst neither can be directly compared with the output of this research as not attempting to achieve the same objective, each can be considered complimentary and able to address other areas necessary for implementation success. The self-assessment tool is a 32-page assessment for companies to use to understand their current situation. This could feasibly be used in conjunction with the framework to add more depth to some of the statements and questions contained. Especially in the initial ‘Assess’ phase of the framework this could add value for users seeking further guidance. Equally, the maturity model could be used during annual reviews to determine the amount of progress made in the areas highlighted in the framework. The framework developed has bridged an existing research gap but is not necessarily intended to be used in isolation.

Within the paper, Bessant et al. (2001) state that three major criticisms can be levelled at CI literature as it does not tend to address the behavioural aspects well. It is felt that the final framework is successful in avoiding the identified pitfalls as it is:

- (1) Not overly prescriptive,
- (2) Includes activities to build the necessary behaviours and,
- (3) Does not work on the premise of either having or not having CI.

The framework is deliberately not overly prescriptive. Whilst there are phases, there is not a defined order to the activity within the phases. Often reference is made to the need to address a certain area but is not prescriptive in the exact solution to achieve that. There is an understanding that the required approach will differ between companies and even site to site. Secondly, although Training and Projects are important elements of a CI implementation, these are only two of several swim lanes contained within the framework. There is a strong acknowledgement of the other activity required along with ‘exposure to tools’ in order to be successful. The majority of the content is focussed on behaviour and ‘soft’ elements rather than the process of training and project delivery. Specifically, significant focus is given to the essential role of leadership and the critical nature of communication in achieving the desired culture change.

As identified in Chapter 5, Leadership and Culture are the two most influential factors in relation to Continuous Improvement implementation. Through the Delphi study interviews the critical role of effective communication during an implementation has also been identified. In relation to communication, the interview transcripts were used to identify the activity required at each phase of the implementation. The business must be able to articulate the purpose of the initiative and translate this into a clear mission and vision, engaging staff in the benefits to them and their role with the implementation. Clear communication channels must be established to allow this up front communication as well as ongoing dialogue with employees to communicate progress, success and gather feedback.

Finally, there are both a regular short term and a less regular, more detailed feedback loop included in the framework. The inclusion of the two feedback loops demonstrates that the process will develop over time. This evolution will build maturity and capability with CI.

The eventual aim of for Continuous Improvement to be 'the way we do things around here'. There is a culture of seeking improvement and the processes in place to support this. A learning organisation will develop that is self-sustainable in its Continuous Improvement journey.

A single pass through the framework is unlikely to make a company 'have CI'. Bessant et al. (2001) detail a model to describe five different levels of Continuous Improvement maturity that can be achieved (Figure 7.5). The 32-page assessment tool by Caffyn (1999) is aligned to these five levels of maturity.

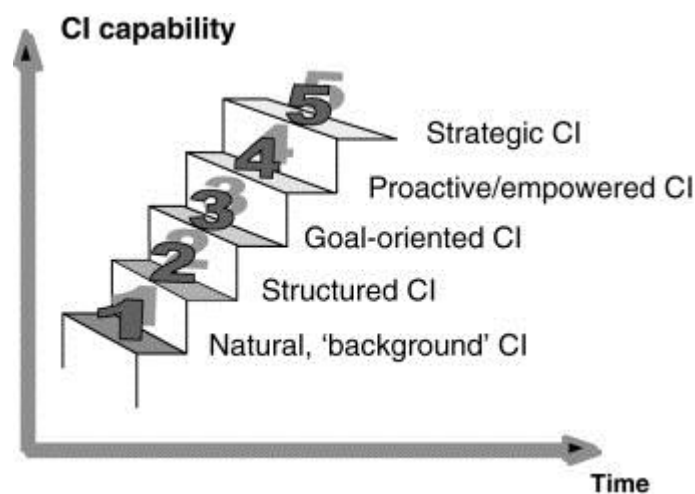


Figure 7.5 - Stages in the evolution of CI (Bessant et al. 2001)

Bessant et al. (2001) state that “the evolutionary model has some value in explaining CI behaviour and in differentiating the range of experience of firms” but concede that it “does not yet explain how routines can be developed within the firm” (Bessant et al. 2001: 75). The framework presented helps to fill this void for UK manufacturing companies.

Aside from these specific examples which are felt to fit well with use of the framework, there is a plethora of other Continuous Improvement literature which companies can reference during their implementation journey. The framework developed however has packaged this in a user friendly manner that allows quick reference of the most critical points.

Chapter 8 Conclusion

8.1 Introduction

The purpose of this final section of the thesis is to ensure the necessary reflection is undertaken; both in terms of the research and on a personal level. This chapter will therefore review how successful the research has been in achieving the original objectives, the limitations that exist in the approach taken, the agenda for future research as well as capturing reflections by the author on the journey taken to complete the research.

8.2 Achieving the research objectives – how well have you met these?

There were three main research objectives stated at the outset:

1. *Evaluate why Continuous Improvement initiatives fail in the manufacturing industry.*

In order to achieve this objective a thorough review of existing literature was completed through a systematic literature review (Chapter 2). This collated reference to 211 individual variables that can contribute to the failure of Continuous Improvement initiatives in the manufacturing industry. To be able to successfully communicate, develop and validate these variables each were grouped under one of eight main themes. This was achieved through the use of idea maps and affinity diagrams. These themes were subsequently verified through the distribution of an online survey. The survey was completed by a cross section of academics, business leaders and Continuous Improvement practitioners with experience of Continuous Improvement implementation failure. As well as validation of the existing themes, each was also categorised by importance with additional variables identified within certain themes. The two themes which contribute most to initiative failure were found to be Management Leadership and Organisational Culture and Environment. Although also confirmed as valid themes, three were identified as less significant in terms of contribution to Continuous Improvement implementation failure. These themes are Feedback and Results, Training and Project Management.

This objective is felt to have been achieved during the research. The initial Systematic Literature review was thorough and the findings have subsequently been reviewed and evaluated through various research phases. Strong confirmation of the eight themes was achieved when reviewed originally by online survey and served to provide the content for the conceptual framework and final framework with little requirement for revision.

2. Critically evaluate current models and frameworks for implementation and sustainability of Continuous Improvement initiatives in manufacturing.

Having identified why Continuous Improvement initiatives fail in the manufacturing industry it was next necessary to begin to develop this new knowledge into a useful tool to combat the current high failure rate experienced. The first step in doing this was to review existing implementation frameworks and models. This has been completed through a Critical Literature Review, identifying both the strengths and weaknesses of existing frameworks and models against the criteria set out.

Existing offerings were identified and fully reviewed for content, structure and presentation in order to establish if a new conceptual framework was necessary. This has identified that no existing framework fully achieves the objectives of this research and therefore a research gap exists. This process identified limitations with each of the current offerings versus the desired output of the research; a framework specifically tailored for use in the UK manufacturing industry. The majority of the current frameworks and models also fail to address the eight main themes identified in the Systematic Literature Review which lead to failure. This demonstrates the absence of sustainability that exists in these current models and frameworks. The research objective to critically evaluate current models and frameworks has therefore been comprehensively achieved.

The opportunity was also taken to gather the strengths of each to allow these to be incorporated in any future framework. The findings of the Critical Literature Review have therefore been used to begin to tackle the final objective of this research by capturing these in the form of a conceptual framework.

3. To develop and validate a practical and strategic framework for implementation and sustainability of Continuous Improvement initiatives in UK manufacturing.

Having demonstrated the main research gap of an absence of a suitable existing implementation framework, the findings of this Critical Literature Review were

combined with the eight failure themes identified in the Systematic Literature Review to develop an initial new conceptual framework.

In order to review the content of this conceptual framework a two phase Delphi study was designed and completed. As a key objective of operations research is to translate academic theory into practical application the Delphi study was completed with an expert panel comprising only business leaders and continuous improvement practitioners.

The first stage of the Delphi study was used to review the conceptual framework and gather individual views of best practice. The interview transcripts were fully reviewed and the feedback collated. This allowed an update to both the content and format of the conceptual framework. These updates include several changes identified through thematic analysis of the feedback gathered. In terms of implementation sustainability, important changes to the original framework are the addition of a new final phase, the addition of another feedback loop, as well as the addition of the Pilot activity.

A further review of the updated framework was completed by the same expert panel through an online survey. The use of a Likert scale survey allowed a quantitative analysis to be completed and consensus demonstrated on the final format and content of the framework.

The Delphi study was complemented by a final validation of the framework completed through a focus group review. This focus group was completed with people not previously involved in the research. This allowed the final research objective to be achieved with the finalisation of a new practical and strategic Continuous Improvement implementation framework for use by UK manufacturing companies.

8.3 Managerial and theoretical implications

Demonstrating the research contribution made through the completed doctoral research is essential (Easterby-Smith et al. 2012). Good research will provide an original contribution to both theory and practice (Karlsson 2010). The theoretical contribution is often demonstrated through publication of the research as articles in respected academic journals (Karlsson 2010).

Each stage of this research has been accepted for publication in established peer reviewed journals (a list of publications related to this research is provided), or is currently in the

process of review, demonstrating the research is both robust and valuable to a wider community; particularly practitioners and business leaders. As well as the overall theoretical contribution, the specific contribution made to change management theory, motivation theory and organisational learning theory will be detailed. In addition, the research also contributes to practice as the findings will be of value to both business leaders and Continuous Improvement practitioners. Through evaluation of the current literature and gathering of best practice the research has provided an original output which will help to better guide future Continuous Improvement implementations in UK Manufacturing companies. This section will also demonstrate gaps identified in the current literature and outline an agenda for future research.

8.3.1 Contribution to theory

In terms of a doctoral thesis, the clear demonstration of the contribution to theory is the most critical element (Easterby-Smith et al. 2012). There are different ways in which the contribution can be made including the confirmation or extension of an existing theory, the combining of two previously separate theories, the development of hypothesis or the advancement of methodologies (Ates and Bititci 2008). As detailed in the 'Defining Continuous Improvement' Section in Chapter 2, Continuous Improvement continues to evolve through the development and combining of existing approaches. Despite the popularity of Continuous Improvement, however, failure of an implementation attempt is still the most likely outcome. The development of guides (frameworks or models) is therefore essential to better inform those leading the implementation to ensure a higher rate of success is achieved in future. Industry and region specific guides are required, with the manufacturing industry particularly in need of guidance. Prior to this research a practical and strategic implementation guide for UK manufacturing companies did not exist.

This research therefore contributes to the advancement of Continuous Improvement research in the context of UK manufacturing companies by providing a practical framework which broadens the body of knowledge on change programs in the form of Continuous Improvement implementation. This has been achieved through the combination of literature reviews, online surveys and individual interview, ensuring both the content and presentation matches practical application needs as well as being of academic relevance. To the best knowledge of the author, the research is the first to study the main failure themes associated with Continuous Improvement implementation; specifically relating to the manufacturing industry.

It is also original in specifically developing a Continuous Improvement implementation framework for UK manufacturing companies. It has made a contribution to theory through assessing the existing implementation guides (models and frameworks) to identify and address a research gap. The clear research gap identified in the Critical Literature Review (Chapter 3) was the absence of suitable industry and region specific implementation guides. The frameworks and models evaluated also failed to adequately address the eight failure themes identified in literature (Chapter 2). The research identified the need for region and sector specific implementation guides, identified the current absence of such a framework for UK manufacturing companies, as well as demonstrating the frailty of the current Continuous Improvement frameworks that do exist. A research gap was clearly demonstrated and a robust solution for that presented. Bridging this gap has been achieved by combining the findings of the systematic and critical literature reviews with the input of an expert panel (Delphi study).

The combination of a systematic literature review, to initially identify 200+ variables, with thematic analysis to group these into eight main themes for ease of dissemination was also novel. The variables identified are discussed in Chapter 2 under the eight failure themes identified. These eight themes, which were subsequently validated and ranked, are expected to provide the basis for future research into these areas.

The eight themes identified as contributing to initiative failure were then used in conjunction with other criteria to evaluate current frameworks and models. These were all found to be deficient, providing the main research gap to address. An initial conceptual framework was developed to address this. Importantly, this was an end-to-end solution that provided guidance to a company wishing to implement a site or companywide initiative.

Finally, an additional contribution to theory has been achieved by addressing each of the research questions outlined at the beginning of the research. Through this a contribution to several existing theories has been made as detailed below.

Through the process of completing this research the relevance of the findings in relation to existing theories has become apparent. Specifically, Change Management theory, Motivation theory and Organisational Learning theory have been explored and expanded. Although not an identified swim lane category within the final framework, achieving change is the overall objective of implementing Continuous Improvement. It is a change program which will hinge on effective change management of the process detailed.

Reflection in relation to change management theory is therefore felt to be necessary. Another recurring theory throughout this research is Motivation. Conflicting views of effective reward and recognition was first highlighted within the Systematic Literature Review and has subsequently been explored further through the Delphi study interviews. The findings from this are felt to warrant discussion in relation to existing Motivation theory. Finally, a key difference between the original conceptual framework and the final framework is the need for multiple feedback loops to be included in order to ensure the necessary level of organisation learning is occurring throughout the implementation. Organisational Learning theory has therefore been examined.

8.3.1.1 Change Management theory

In terms of the history of change management, Kurt Lewin is regularly cited as the most influential individual. Lewin is famous for the invention of force field analysis as well as his three phase model describing the change process (Cooke 1999). At this time, however, there was no formal change management discipline in existence. This was only truly established during the 1990s through the work of well-known authors such as Jick (1993) who described the ‘Ten Commandments of Implementing Change’ and Kotter (1996) who outlined eight steps to change failure. These authors, and others, developed recognised approaches to guide change efforts through their work. The topic of organisational change is now an important issue within theory and management (Quattrone and Hopper 2001). It is therefore studied in various contexts, including healthcare (Moran and Brightman 1998), ERP implementation (Aladwani 2001) and engineering changes (Huang and Mak 1999).

During the development of the final Continuous Improvement implementation framework for UK manufacturing companies, direct reference to change management theory was not made. Now that the framework has been finalised however, comparison of the content to influential change management theory is felt appropriate.

In their book on Change Management, Cameron and Green (2009) present an overview of change models and approaches developed by key authors in the field. A summary of each change approach is detailed in Table 8.1.

Author	Overview
Lewin (1951)	<ul style="list-style-type: none"> • Introduced force field analysis, which examines the driving and resisting force in any change. • Proposed a three step model to organisational change; Unfreeze, Move, Refreeze.
Bullock and Batten (1985)	<ul style="list-style-type: none"> • Four step model to organisational change; Exploration, Planning, Action, Integration. • Uses the machine metaphor of organisations and assumes that change can be clearly outlined and progressed in an orderly manner.
Kotter (1995)	<ul style="list-style-type: none"> • Eight step change model based on his observations of organisational change issues • Outlines eight key lessons and sequences these in a linear manner to outline the desired change process.
Beckhard and Harris (1987)	<ul style="list-style-type: none"> • Provide a change formula; Change = (Dissatisfaction X Desirability X Practicality) > Cost of changing. • Factors must be greater than the cost of change for the change to take place. • Simple formula that can be used as a point of reference at any point in the change process.
Nadler and Tushman (1997)	<ul style="list-style-type: none"> • The congruence model aims to represent what occurs within an organisation when attempts are made to change it. • Represents an organisation as a set of interacting sub-systems that also take account of the external environment. • Considers that organisations collect both internal and external inputs and translates these into outputs.
Bridges (1991)	<ul style="list-style-type: none"> • Distinguishes between planned change and transition • Provides a three phase model of transition; Ending, Neutral Zone and New Beginning
Carnall (1990)	<ul style="list-style-type: none"> • Model focussed on the role of the manager during the change process

	<ul style="list-style-type: none"> • States that management skill is required in managing transitions, dealing with cultures and managing politics.
Senge et al. (1999)	<ul style="list-style-type: none"> • Provides a set of guidelines in order to avoid change initiative failure; Start small, Grow steadily, Don't plan the whole thing, Expect Challenges. • Incorporate the concept of redesigning the change, as well as the more common elements of initiating and sustaining.

Table 8.1 - Summary of Change Models and Approaches (based on Cameron and Green, 2009)

Of the existing change models examined, the output of this research is felt to be most comparable to the work of Lewin (1951) and Kotter (1995) due to the sequential and phased nature of their models.

In particular, the work of John P. Kotter (1995) is well known and often referenced as he is considered the foremost authority on the topic of change management.

The eight steps he details as necessary for successful and sustained change will therefore be compared to the content of the framework to establish if each has been incorporated. Of interest will also be whether the framework has extended any of the steps in the particular context of the research: implementing change in the form of Continuous Improvement.

Kotter (1995) originally published an article in the Harvard Business Review outlining why organisations fail with change. He has since further developed this in a book detailing the eight steps to successful change efforts (Kotter 2012).

The eight steps outlined are:

1. Establish a sense of urgency
2. Create the guiding coalition
3. Develop a vision and strategy
4. Communicate the vision
5. Empower action
6. Generate short term wins
7. Consolidate gains
8. Anchor new approaches in the culture

Within the book Kotter (2012) also more broadly states that “useful change tends to be associated with a multistep process” (Kotter 2012:22) and that “this process is never employed effectively unless it is driven by high-quality leadership” (Kotter 2012:22). The need for strong leadership is demonstrated within the framework by the swim lane dedicated to this area. Within the Leadership swim lane specific areas for consideration and necessary actions are detailed.

The purpose of the first four steps are to “defrost a hardened status quo” (Kotter 2012:24), similar to the logic of the Unfreeze stage detailed by Lewin (1947). Kotter also details that many change efforts fail because they jump straight to step 5: Empower action. A key element of the implementation framework presented is the emphasis for much thought and effort to occur prior to the Implementation starting. This is the reason for the Analyse and Design phases of the framework. Within these phases, it is felt that the steps 1-4 are well covered with clear reference made to the need to develop and communicate a vision in order to ‘on-board’ the organisation to the change efforts. The importance of communication throughout the implementation process is again emphasised by the swim lane dedicated to this topic. In terms of Communication and Leadership it could be argued that the framework has in fact developed the work of Kotter by strongly demonstrating the importance of each of these areas through all of the phases and by providing specific guidance of what is required to be successful with each. A greater level of granularity is provided by this research around these key topics.

The purpose of steps five to seven is then to implement new practices and consolidate them. The sequence again aligns well with the next phases within the framework: Implement and Evaluate. The only point in the sequence that does not align exactly to the framework is step 6: Generate Short Term Wins. The feedback from the interviewees was that this would require to happen earlier in the process: typically, whilst the overall implementation was being designed. Agreement was found of the need for wins in the short term but the ideal timing of trying to achieve the first of these in order to build momentum would appear to differ slightly. This would appear to be a slight contradiction between the findings of the research and established change management theory. It is however agreed that “establishing a sense of urgency is crucial to gaining needed cooperation” (Kotter 2012:37).

Finally, emphasis is placed on the need to anchor new approaches in the culture of the organisation. This stage “grounds the changes in the corporate culture and helps make

them stick” (Kotter 2012:24). Through the interviews this element was added to the framework through the Sustain phase. This includes reference to various activities necessary in order to maintain the improvements long term.

An additional element of the framework that does not appear explicitly within Kotter’s eight steps is the concept of the feedback loops in order to make the process continuous. This is arguably an oversight as the interviews conducted have consistently stated that any change process will not happen in a single pass through the change cycle. In this sense, the model detailed by Kotter is extremely linear in nature rather than being more cyclic. It is felt the work of Kotter would benefit significantly if this approach was incorporated. This would allow the stages involving the creation of a sense of urgency, communicating the vision and empowering action to be repeated as the change process evolves. Some of the activities within the current eight steps are probably only required at the outset but it is felt that some, based on this research, would be required on an ongoing basis in order to truly sustain the changes made and adjust as the environment and individuals change with time. This aligns well with work of Nadler and Tushman (1997) who emphasises the need to consider the external environment and also with Senge et al. (1999) who state the need to not only sustain the original change efforts but also to redesign as the process progresses.

Overall, the eight steps detailed by Kotter (2012) and the content of the final framework are extremely similar. In summary, “when you neglect any of the warm up, or defrosting, activities (steps 1 to 4), you rarely establish a solid enough base on which to proceed. And without the follow-through that takes place in step 8, you never get to the finish line and make the changes stick” (Kotter 2012:25). This summarises the importance of the chosen framework structure. There is an absence of this required emphasis on achieving quick wins and ensuring sustainability within the existing Continuous Improvement literature. Both the work of Kotter (2012) and the interview findings have strongly shown the need for this.

8.3.1.2 Motivation theory

Biologically, motivation is the result of neural transmission within the brain. This results in the production of a neurotransmitter called dopamine which causes rewarding sensations when incentives are achieved. Carley (2015) states that motivation is the tendency of a person to be influenced by and react to either negative or positive incentives. In this sense, the term incentive refers to either rewards or aversive events.

Buch and Tolentino (2006) previously identified an absence of research into the impact of motivation on Lean Six Sigma implementation. Although not the main focus of the research, the Systematic Literature Review did identify within the theme of ‘Results and Feedback’ the need to consider the approach taken toward reward and recognition. The opportunity was therefore taken during the individual interviews to ask the expert panel which manner of reward and recognition was felt to be most effective, if any at all. These interview findings were incorporated in the final framework. This study therefore extends the theory of motivation in the context of Continuous Improvement implementation; specifically, in UK manufacturing.

Positive incentives will reinforce a desired behaviour whereas negative incentives are used to punish unwanted behaviours. The presence of either will influence the future behaviour of an individual, although the level of behavioural change achieved with reward is greater than with punishment (Thorndike 1933). People will always seek positive experiences and aim to avoid painful or negative ones. Incentives are therefore central to a person’s motivation (Carley 2015).

The interviews consistently highlighted the need for reward and recognition as part of the implementation approach, but were unable to find consensus on the most effective method. There was however agreement that it is important to reward and recognise in order to promote the desired behaviours and sustain motivation for the change:

- *“Celebrating success I think is massively important” – RH*
- *“In the short term because of the pain that is attached to it, and the discomfort, and the frustrations, I think you have got to do something to convince me that it is worth moving from my current position” - SA2*
- *“It is about rewarding the right behaviour. It’s the same as reprimanding someone for not doing the right thing” - EB*

Another consistent message gathered through the interviews was that team reward is generally considered to be preferential to individual reward.

- *“I would probably start to align the employee incentive plan around about the value stream or team successes. As that value stream is being successful the team are being rewarded as opposed to an individual” – AL*
- *“I think the all in it together concept is the way I would go. Everyone is celebrating together and doing the same thing together” - SM*

The objective of team reward is to promote the shared striving toward an objective and increase the performance of the group toward achieving it. For team reward to be most effective the incentive schemes must be aligned with group tasks where the work completed by each individual is interconnected and contributes toward a shared goal. When designing team reward strategies and deciding where to utilise them it is essential therefore to understand the level of alignment that exists between the performance of the individual and the performance of the group. Team reward strategies will not be effective where the efforts of the individuals have little interaction and therefore little consequence on the overall performance of the team. Team reward is most effective when the complexity of the group task is high and therefore cohesion between team members is paramount (Ladley 2015).

Defining of team reward strategies would appear to be an important consideration for businesses. Aime et al. (2010) highlight that in order to have successful teams it is imperative that reward systems exist that are aligned to promoting and achieving the desired teamwork behaviours. These reward systems will put in place incentives which are directly aligned with the achievement of team objectives or measures of performance. The objective by employing this strategy is to increase each individual's contribution toward the shared team goal.

Importantly, the interviews also revealed that it does not necessarily need to be financial reward that is provided in order to motivate employees, although some respondents felt this depended on the level of the organisation in which the employee operates.

- *“I don't think you can do 'we will give you 1% of all improvements made'. It doesn't have to be a lot. Reward and recognition can be a handshake and a letter saying thank you from the MD” - EB*
- *“People say financial incentives don't work. I think it depends on your salary. I have definitely found it to be a motivation when you are working with shop floor workers” – AL*
- *“The rewards that companies do well will often be an emotional type thing; a thank you or recognition. Very seldom there is a financial reward for doing it. The tangible things are very rarely used and don't have the same impact” - DM*

Through a study of nurse performance in Singapore, Singh et al. (2017) conclude that both financial and non-financial incentives can have a significant impact on the standard of work completed by an employee. Mathauser and Imhoff (2006) also completed a study

of health worker motivation, but this time in Africa. This study concluded that motivation of staff can be positively influenced through the application of non-financial incentives. These non-financial incentives, such as increased training, both improve the commitment of staff and increase their level of self-worth. It is noted however that difficulty exists in the implementation of incentive schemes, and that financial incentives often only have a short lived impact on performance.

Whilst team based, non-monetary reward would appear to be the preference of the expert panel, it would appear the specific approach used will differ due to several factors, and that one best approach does not exist.

- *“Celebrate success; that is always a hard one. I think that is easy for American companies. It’s not so easy for Scottish companies. I think it is a cultural thing. It’s a cultural thing but I think it is important. Even if it is just the act of saying well done. I think that is important for a group that has a broad spectrum of people because there are people that are interested and people that are less interested”*
- SC
- *“I think it depends on the industry. I think it depends on what is the culture of the environment you are in”* – SA2
- *“It depends on the ethnicity of your workforce. My current staff is all Bulgarian and Polish and they like nothing better than a party so two or three times a year I put on a party for them. However, if it was a Scottish workforce it may be something different”* - SM
- *“There is no one method that fits with all people or all sites but it is something we need to do more often”* - RH

These findings would appear to potentially contradict the often referenced theory of motivation proposed by Herzberg et al. (1959) which highlights financial recognition as a key factor in employee motivation.

Whilst the researcher feels that changes in the work environment, management styles, and working practices within businesses over the last 50 years could all explain this potential shift to non-financial reward being more effective, it should be noted that a place still exists for financial reward as a means of motivation as demonstrated by recent research by the likes of Singh et al. (2017).

Within UK manufacturing this would not appear to be the case when motivating staff towards positive involvement in a Continuous Improvement initiative. Given this absence

of using financial reward, it would appear instead that employees are motivated more by intrinsic motivation. The researcher therefore believes that it is important for business leaders to have an appreciation of the different motivational techniques available to them. Despite this being the preferred approach amongst business leaders and Continuous Improvement practitioners in UK manufacturing, and the one they believe works best, a research gap exists as the employees were not interviewed to gain their view. Overall, it would seem important that business leaders assess the workforce before defining a recognition approach to promote motivation towards Continuous Improvement, as what motivates one person might in fact de-motivate another (Harris 2001). These findings align well with Bessant et al. (2001) who state that “most firms make use of some form of reward/recognition system to help reinforce CI behaviour, but the specific variant used will vary between firms” (Bessant et al. 2001:70).

8.3.1.3 Organisational Learning theory

The conceptual framework derived from existing literature differs from the final framework in some key aspects. Most notable of these is felt to be addition of the extra feedback loops. Strong consensus was found during the survey in favour of this change. The two separate feedback loops now represent the need for both regular ongoing evaluation and re-alignment, as well as less regular but more formal re-design, of the initiative. Both of these loops respond to information gathered in either the Evaluate or Sustain phases of the implementation. Argyris (1977) originally promoted this concept of double loop learning to enhance organisational learning. It is stated that single-loop learning occurs when a mistake happens but is rectified without query or modification of the underlying system, whereas double-loop learning takes place when errors are corrected by first reviewing and updating the governing system before altering actions (Argyris 1999). Double loop learning therefore refers to the need to evaluate the situation on an ongoing basis in order to make the decision on how to proceed. A re-evaluation and modification of the goals will alter the action that is taken in light of new experience that has been gained. This is viewed as a higher level of decision making than single loop learning which would involve no variation in the approach taken and no alteration of the goals. Double loop learning requires an ongoing questioning of the goal and the best approach to take in which to achieve it. This more dynamic approach has been incorporated in the framework with the cyclic nature of the feedback loops which respond to the most recent internal information and customer feedback gathered as the implementation progresses. These information streams will alter the implementation

approach taken over time. These feedback loops are designed to emphasise the cyclic nature of the implementation process, ensuring that maturity grows and lessons are learned along the way. When referring to the achievement of culture change Bessant et al. (2001:70) state that “there has to be a process of articulation and reinforcement of the behaviour, and this cycle needs to be repeated frequently and for long enough for the new pattern to take root”. This learning process has been incorporated in the final framework through these feedback loops. Garvin (1993) states that “continuous improvement requires a commitment to learning” Garvin (1993:2) and that “we need clearer guidelines for practice, filled with operational advice” (Garvin 1993:3). It is felt a significant emphasis has been placed on organisational learning within the framework in order to demonstrate the importance of this behaviour and guide the actions required in order to achieve it. Despite the critical role it would appear to play, existing literature does not give enough consideration to organizational learning theory in conjunction with Continuous Improvement.

Whilst the desire to be a learning organisation is acknowledged as sensible, it is highlighted that a “framework for action” (Garvin 1993:3) is lacking. Scholars are accused of producing “mystical terminology” (Garvin 1993:2) but that the need for “clearer guidelines for practice, filled with operational advice rather than high aspirations” (Garvin 1993:3) remains.

Garvin (1993:2) states that “Continuous improvement requires a commitment to learning” and “in the absence of learning, companies—and individuals—simply repeat old practices”. The framework developed through this research has addressed the need for clear guidelines, and incorporated the need for ongoing review and improvement with the inclusion of feedback loops at various phases of the implementation.

Garvin (1993) also details five main activities in which learning organisations excel; problem solving, experimentation, learning from past experience, learning from others, and transferring that knowledge quickly within the organisation. When applying the framework, it would therefore be wise to incorporate these points in order to maximise the likelihood of success. When comparing each of the five activities to the content of the final framework it is felt that each is addressed and therefore application of the framework should aid a company’s journey toward becoming a learning organisation. The ability to problem solve is implicit in the pursuit of Continuous Improvement and would be honed through the structured tools and techniques that would be taught and applied throughout

the implementation. As Garvin (1993:5) states the need for experimentation has “obvious parallels to systematic problem solving”. A point worth noting would be the need for both on-going projects and one-of-a-kind demonstrations. Within the Assess phase of the framework is the prompt to review past initiatives and understand any learning that may exist from this. In terms of learning from others, the activity of benchmarking is promoted within the framework in order understand alternative approaches and capture best practice. The need to keep up to date with the latest Continuous Improvement innovations is also mentioned within the framework. Finally, it is felt the importance placed on communication by making it a separate swim lane within the framework is clear. Guidance is also given regarding the activities necessary within this theme.

8.3.2 Contribution to practice

The research will have positive contributions to practice. The development of the framework should benefit manufacturing companies, business leaders, Continuous Improvement practitioners, Continuous Improvement consultants and academics.

The systematic literature review has provided valuable contributions for managers, practitioners and academics as it has been successful in comprehensively detailing variables contributing to failure, and also in grouping these in broad themes to allow future research as discussed. The findings will benefit both academics and practitioners as it provides increased understanding of the difficulties associated with Continuous Improvement implementation. For Business Leaders and Continuous Improvement practitioners it provides issues to be aware of prior to implementation and as it progresses. Through reference to the Management Leadership theme particularly, which the original online survey identified as most critical, Business Leaders will be able to mould the approach and behaviours of themselves and their extended team in order to avoid recognised pit falls and give their initiative best chance of success. The survey has reinforced the critical role Business Leaders play in shaping and sponsoring the implementation. For the Continuous Improvement practitioner all eight themes have been validated as contributing to failure and will all require consideration whilst leading improvement efforts. Within each theme a multitude of individual variables exist. This will highlight the complexity of an implementation and the many areas that must be considered by the practitioner who is likely to lead the efforts on a day to day basis.

The framework will be useful to companies as it provides a consistent framework, which with its several layers, provides a format that can be reviewed and communicated within

the business. The framework should create a general awareness of the required implementation process and the activities involved. This upfront awareness should better prepare a company and mean that those that do proceed to implementation do so with realistic expectations. As the majority of implementation efforts fail it is clear that vast amounts of business resource, in the form of both time and money, are currently being wasted on poor deployment efforts. Whilst businesses will continue to pursue the implementation of these improvement approaches, those that can do so with a greater degree of success will undoubtedly gain an advantage versus competitors that are not. Having the people, who are the most unique resource a business has, aligned to the business objectives and striving for ongoing improvement will help the company flourish. In the experience of the author, staff who are engaged in Continuous Improvement are also more likely to be flexible, communicate well across different layers of the business, and work in a more effective cross-departmental manner. The effective implementation of a Continuous Improvement philosophy not only improves business metrics but it improves the work environment and therefore aids staff retention levels. A clear and accurate implementation guide is therefore essential.

Continuous Improvement managers and practitioners will also benefit from the framework in several ways. It is a well-researched solution which these users can be guided by and base their implementation efforts upon. The user friendly format used will allow the framework to be easily communicated to others within the organisation. This is important for achieving buy in as people within the business need to understand the journey the company is on and their role within that.

For the Continuous Improvement consultant, the final framework provides a solution which can be sold to clients. Again, the framework is presented in a format which allows the implementation process to be easily communicated to the client. The likelihood is that a consultant would individually brand their own implementation approach in order to sell it to clients. The final framework however provides the basis for the content that solution should contain.

The finalised framework will support managers in the implementation of Continuous Improvement. The framework will provide a clear guide to reference and benchmark against. Applied correctly, the approach detailed in the framework should help to avoid failure; the most likely outcome, when implementing Continuous Improvement. This should aid the avoidance of frustration, allowing companies to gain benefit from their

efforts earlier and therefore build the necessary momentum for successful change. More UK manufacturing companies should therefore realise a positive return on investment from their Continuous Improvement efforts. From a managerial perspective the vital role to be played by leaders within the organisation is made clear. A core strength is also the adaptability of the framework. Whilst providing clear guidance it is not prescriptive, allowing users to tailor the approach to their specific circumstances.

Prior to entering the world of work this is also a tool which could be valuable in teaching students about Continuous Improvement and its implementation; ensuring they are more capable exponents once employed. It is a validated framework that can be taught within Quality Management and Continuous Improvement courses. Continuous Improvement is a key area of operations management as it strives to improve all aspects of an organisations operation. The framework builds on prior Continuous Improvement literature and details the practical application of change in the form of a Continuous Improvement implementation. A new refined methodology for successful implementation within a specific industry and region is provided.

8.4 Limitations

Whilst it has been demonstrated that a robust methodology has been followed in finalising the implementation framework, it is still important to demonstrate awareness of the limitations associated with the chosen approach. Each phase of the research has limitations associated although these were taken into consideration when deciding the most appropriate method(s) to use at each phase.

During the Systematic Literature Review the decision was made, based on definitions found in literature, to study the topic of Continuous Improvement by categorizing it through the use of the search terms 'TQM', 'Lean Manufacturing' and 'Six Sigma'. A limitation of this is the exclusion of other potential relevant approaches such as process re-engineering and TPM which are often discussed in literature in conjunction with the chosen search terms. It was felt however that the chosen terms cover well the most prominent approaches used in industry and discussed in literature.

A second limitation of this stage of the research was the grouping of the findings of TQM, Lean and Six Sigma together. The variables were grouped together as this stage of the research was aimed at generating a starting platform and overall picture of issues to

consider. Finally, through the methodology detailed, it is clear that some potentially relevant literature could have been missed. Due to the time consuming and laborious nature of the review, attention to lower quality papers was sacrificed.

When completing the Critical Literature Review, not as robust a methodology was followed when screening potential papers to review. Evidencing this robustness is more critical when completing a systematic review to ensure traceability of the method used. A critical review does not place the same emphasis on this. In total, twenty frameworks were fully reviewed but it is possible that others could have been missed.

Although closely related to Continuous Improvement, the likes of the EFQM Business Excellence Model and Malcolm Baldrige National Quality Award framework were not reviewed as part of this research because they are largely intended as diagnostic tools rather than implementation guides. They therefore did not meet the criteria for inclusion in the critical literature review.

As with all literature reviews it is possible that relevant articles could be missed. The aim of this phase of the research however was to generate an input in the form of a conceptual framework for the remaining phases of the research. Any gaps that did exist had the opportunity to be addressed in subsequent phases of the research.

Next, the original online survey was designed to be a brief exploratory survey. Beyond the validation and ranking of the individual themes, these have not been examined in much further depth or developed further from their current form. Three separate groups of respondent were surveyed but an equal ratio between each was not achieved. This was however taken into account when analysing the results of the survey to ensure no significant bias had been introduced to the results. The limitations of surveys, and on-line surveys specifically, are discussed in Section 4.5.3. Of these potential limitations, the on-line survey conducted is not felt to suffer significantly. The response rate achieved demonstrates that the respondents took the initiative and therefore a non-response bias was avoided. To alleviate the risk of the results being representative of only a sub-group of potential respondents, sub-groups were identified prior to distribution of the survey and response rate monitored of each. Although an equal number of responses was not achieved from each sub-group, each did respond and analysis of the results demonstrated no significant bias existed as a result.

Cantrill et al. (1996) outline several potential issues with the application of the Delphi method. The main limitations identified relate to panel size, expert selection, response

rate, anonymity, gathering of feedback and ensure validity of the findings. McIntyre et al. (2010) also state various limitations associated with the Delphi technique. Weaknesses can exist due to the selection of the expert panel, which can be a subjective process, and the ability of panellists to remain impartial when the views of the other panel members are shared at the end of each round. In terms of anonymity, concern lies in whether this aspect of the approach can in fact reduce the accountability panel members feel toward the output of the study.

Whilst the compilation of the expert panel achieved a cross section of job role and Continuous Improvement experience, the results are still based purely on the feedback of 20 individuals. Although companies of differing size and industry input to the research, the findings are based on only 15 companies.

The decision was made to seed the interviews with the original conceptual framework. Whilst this is felt to have been the correct decision the potential exists that this could have narrowed the thought process of the respondents.

The researcher has also identified the qualitative nature of the early stages of the Delphi as a potential weakness as the output from this, an updated framework, was highly reliant on the interpretation of the feedback gained during the semi-structured interviews.

This particular Delphi study also inherently has the limitations associated with online survey and semi structured interview. Efforts were made to understand these potential issues, as identified in Chapter 6, and address these as fully as possible. For example, each questionnaire used was piloted prior to distribution and the reliability of the survey results was established to ensure valid conclusions were drawn as an output.

Overall, the findings from the systematic literature review and original online survey results are focussed purely on the manufacturing sector. The final framework developed through the Delphi study narrows the focus further by being tailored specifically to UK manufacturing companies. Although this is a deliberate element of the research it does limit the findings as it is unknown whether these are transferable to manufacturing companies in other regions or to other sectors such as the service or public sectors. Within UK manufacturing, whilst a cross section of companies was interviewed, this sample has been used to infer the broader applicability of the findings.

In order to more fully test the final framework a focus group was subsequently completed. Similar to the Delphi study, the sample focus group of five newly qualified Lean Six

Sigma Black Belts was used to represent a much broader population of inexperienced Continuous Improvement practitioners. Although the focus group was made up of various job roles and people from three different companies, the ability to generalise based on this is not absolute.

8.5 Agenda for future research

The research to date shows limitations which warrant further research activities.

Future Research Direction 1: Independent practical application of the framework in the intended environment

The validated framework is felt to achieve the first ‘Diagnose’ stage of the action research process as outlined by Susman and Evered (1978). It can therefore provide the input to the subsequent action research stages and allow an independent practical application of the implementation framework. Whilst it is hoped that the publication of the framework will naturally lead to this, a further academic evaluation of the theory developed is felt necessary. This would allow final validation of the framework and provide robust case studies for companies to refer to. Use of action research would be a natural next step in order to fully test the validity of the framework within its intended environment. This action research would ideally be completed in multiple manufacturing companies of various size, industry, and location within the UK.

Action research is “undertaken by individuals in work contexts to improve their understanding of the situation they were working in, in order to improve the situation itself”. Action research therefore allows the rapid transfer of learning into improved workplace experience (McNiff and Whitehead 2000). Academics can often be dismissive of the approach as it relies heavily on tacit knowledge and the intuition of the researcher. The output is therefore more difficult to rigorously analyse and validate. The belief surrounding action research is that in order to best study a complex social situation the researcher must influence the process and observe the impact of those changes. Intervention in the scenario being studied is central to the approach (Baskerville 1997). The research should produce an output of ‘actionable knowledge’ that is relevant to both practitioners and academics (Coghlan 2007).

From a research perspective it is important to understand if any modifications to the framework will be necessary with varied company size. As previously discussed it is

likely companies of varying size will face different challenges during the implementation process. These may need to be specifically catered for within an updated version of the framework.

Future Research Direction 2a: Repeat the Delphi Survey with expert panel from other regions and sectors

In order to develop the framework for other regions or sectors out with the scope of this research the Delphi survey tool should be replicated with new expert panels. Of interest would be the content changes required in different regions or sectors where the culture and language will vary. It would be recommended that further research is completed in other European countries as well as more globally to truly capture the differing implementation approaches that may exist and be successful. The composition of the expert panel should be carefully considered to ensure robust findings are attained. A panel size of approximately 20 people would be recommended ensuring a broad mix of implementation experience and organisational size and type within the chosen region or sector. This will allow evaluation of the necessary content and presentation for different regions and sectors and allow comparison of the differing approaches required when implementing Continuous Improvement.

Future Research Direction 2b: Practical Application of the framework in other regions and sectors

Whether the existing framework, or an updated version resulting from the completion of a new Delphi survey, it will be necessary to complete action research in alternative regions and sectors. This would test the applicability of the existing or updated framework in organisations in other regions and sectors. This action research would finalise an implementation framework for other specific regions or sectors.

The opportunity therefore exists to not only apply this framework within the UK manufacturing industry but also to use it in other regions and sectors to establish any changes required due to culture or sector practice. It is expected that the overall structure would likely remain unchanged but that some of the content or terminology may require modification.

Future Research 3: Expand the existing framework by adding an additional layer of detail

The Delphi interviews and the focus group conducted both highlighted a desire amongst some respondents for an even more detailed fourth layer to be developed for the

framework. This would provide a detailed explanation of each point within the framework. Whilst this is a much more prescriptive solution than that desired from this research it would provide additional guidance; specifically, to those with little or no experience of Continuous Improvement implementation. Especially for less experienced users of the framework a detailed guide on how to complete each activity and where to access that information was desired. For instance, when the framework prompts the user to 'evaluate the current culture', the new layer would specifically detail cultural assessment tools that can be used for this purpose with guidance on how to complete this activity.

The research has also not explored the correlation between the themes contained within the framework. This could also be addressed when further developing the framework. It may be beneficial to the user to better understand the relationship between individual themes and the level of impact each has on the others. Although all themes and activity detailed within the framework are confirmed as valid it is possible that certain themes and actions would benefit from being tackled in conjunction with one another.

8.6 Personal reflection

Having been tackling this research over a 6-year period, it is important to take the time to reflect upon the process and the learning it has provided. Despite possessing the desire to achieve a PhD, at the outset the process seemed extremely daunting. The most difficult part was just having the confidence to start. There was a definite hurdle to overcome in the lack of direction that is provided, as the research approach is so different to all other learning experienced to that point. There is not a defined reading list, word count or essay title to complete. This ambiguity is both the biggest challenge and the lure of the process. The research has also taken much longer than expected. The conviction at the outset to devote every waking moment to the research and have it complete in the minimum time frame allowed is soon tempered by the conflicting priorities that exist elsewhere. It has been more difficult than expected to juggle part-time study of this level with a full time job and home life. There have been unforeseen spells of inactivity for various reasons; house moves, job changes, engagement, and wedding.

The fairly unique position of tackling a PhD in a part-time capacity has brought obvious challenges but also many unexpected benefits. The most significant of these is the opportunity to apply the theory and learning to daily work. I have successfully applied

for three improved work roles during my time completing the study and the appreciation of Continuous Improvement gained through this research has certainly contributed to this progression. Another significant benefit of the part-time research has been the ease of access to ‘experts’ in industry as a result of the network of professional contacts gained through work life. A particular challenge however has been keeping experience (bias) out of the findings in order to ensure academically robust findings are produced and not the view of the world possessed personally. Completing the research methodology chapter of the thesis early in the process provided a much greater appreciation of the natural bias that could exist and allowed awareness of this when tackling each research phase. The process of submitting each research phase for publication in peer reviewed journals has been invaluable. This validates that there is value in the work being undertaken and helps to increase the quality of the work through the feedback received.

Particularly through the literature reviews that have been completed, a significant number of journal articles and books relating to the research topic have been read. Some in particular however have proved most influential in the manner in which the research has been tackled. Most influential in terms of the approach taken have been the work of Tranfield et al. (2003) and O’Gorman and MacIntosh (2014). The work of Tranfield et al. (2003) was referenced when completing the systematic literature review and provided the basis for the methodology followed. Most of all, however, the paper placed a strong emphasis on the need for a robust and repeatable methodology to be followed. This notion has stuck with me throughout the research process. The work of Saunders et al. (2009) provided the basis for the structure of the research methodology chapter through the research onion that they describe. The book is written in a user friendly manner making it simple to understand, digest and discuss. The process of understanding my personal research bias was valuable and helped to challenge and improve the approach that would naturally have been selected.

Finally, the individual interviews were invaluable for moving beyond a purely theoretical output. Having the opportunity to reflect on the conceptual framework and gather the experience of those successful with implementing Continuous Improvement was both enjoyable and valuable. Without doubt it improved the quality of the final research output.

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Appendix

Appendix A – Review of existing models and frameworks

Name of Model	Authors	Brief Summary	Positives and areas to consider	Areas for Improvement
Total Quality Management: A Framework for Higher Education Institution	Aziz et al (2018)	Proposes a TQM framework for Higher Education Institutions (HEI)	<ul style="list-style-type: none"> • 4 principles of TQM are identified in the paper and included in the framework. • Feedback loop included to promote Continuous Improvement • Includes a review of outcomes (Results) 	<ul style="list-style-type: none"> • The level of detail provided in the framework does not give direction on how to achieve TQM. • The framework does not cover the eight themes. No mention of motivation, culture or projects.
The implementation of TQM philosophy in Palestinian organization	Baidoun (2004)	Presents a framework for TQM implementation based on case study research. This is focused on Palestinian organisations. The research is conducted in three levels; 1.questionnaire, 2.semi-structured interview, 3.open interview.	<ul style="list-style-type: none"> • Identifies critical quality factors for an implementation • Emphasises importance of soft factors; management commitment, employee commitment, customer focus, and culture. • Findings derived from case study of companies successful in implementation • Groups critical factors into tiers (phases) when they should be addressed • Describes the need for pre-launch and implementation phases 	<ul style="list-style-type: none"> • Does not present the critical factors in the form of a roadmap that could be followed • The framework presented does not contain the eight themes; it relies on constant reference to the article to be understood and gain guidance. • Findings limited to Palestinian setting • Definition of a successful company not clear
A model for sustainable business excellence	Bolboli and Reiche (2013)	Initial 3 level meta model presented containing transformation, system and implementation models. Separate expanded model for implementation also detailed.	<ul style="list-style-type: none"> • Meta model promotes a holistic business view • Emphasis on establishing measures in the Planning and Design phase • Monitoring system for improvement activities 	<ul style="list-style-type: none"> • Not specifically focussed on CI • Models process focused and mechanistic; not much attention given to soft elements • 11 areas identified in System level; only 4 expanded upon in paper. • Model itself lacks the how to • Separate implementation model difficult to follow and understand

Developing a Six Sigma framework	Chakraborty and Leyer (2013)	Paper aims to develop a company-wide implementation framework. Presented in 3 phases; Strategy, Line Management and Project Portfolio Management.	<ul style="list-style-type: none"> • Reviewed with industry experts • Emphasises importance of aligning initiative with overall strategy • Promotes concept that process teams should be constantly monitoring performance and reacting to issues utilising basic problem solving • Evaluation of potential projects in a quantitative manner 	<ul style="list-style-type: none"> • Focused on financial service organisations not manufacturing • Framework does not explicitly address culture or leadership • No detail of training required to equip employees with problem solving skills • Framework fairly light and high level, lacking reference to key themes
Implementation of the Lean Six Sigma framework in non-profit organisations	Cheng and Chang (2012)	Example of Six Sigma application within non-profit organisation, to demonstrate applicability within this context		<ul style="list-style-type: none"> • Title somewhat misleading, as paper has a narrow focus • Details a Six Sigma project rather than an overall initiative
A proposed framework for implementing TQM in Chinese organisations	Chin and Pun (2002)	A 22-step guide for TQM implementation is developed through a literature review of TQM failures and reference to the UMIST-TQM framework. These elements are then used to carry out case study analysis within six Chinese organisations.	<ul style="list-style-type: none"> • Paper stresses lack of attention that is given to cultural elements • 22 steps of framework are split into 6 phases overall; 2 pre-implementation phases and 4 implementation phases • 'TQM Preparation' phase is detailed, containing 9 required steps before the implementation is underway. • Preparation phase promotes assessment of various elements and creation and communication of a vision and strategy • There is a distinct planning phase prior to execution • Several review mechanisms are promoted; employee and customer feedback as well as performance data and benchmarking • Each step within the framework also 	<ul style="list-style-type: none"> • The implementation phases are not particularly detailed; especially the execution phase which only has 3 steps • No reference is made within the framework to assessment of the organisational culture or the environment in which it is operating • Steps relating to Management Leadership do not persist beyond the Preparation phase. Mentioned within the paper but not contained in the framework

			allocated to one of three layers of responsibility; Top Executives, TQM Steering Committee, and Departments / Project Teams	
Lean LPPO implementation model	Dibia et al (2014)	Presents a Lean implementation model derived from literature. Case study of application provided.	<ul style="list-style-type: none"> • Emphasis on effectively communicating change at each stage and ongoing communication throughout. • Several key areas addressed; leadership, people, culture, improvement activity, and feedback. • Strong emphasis on the soft people aspects. • Presented in a logical sequence and in a phased manner. 	<ul style="list-style-type: none"> • Logical content but lacking some of the detail to truly guide an implementation. • Some key areas mentioned within the model (i.e. culture) but without further expansion on the topic to provide guidance on what to do about it. • The process stage is quite generic in nature. Little guidance provided on the improvement activity.
Implementation of TQM and Lean Six Sigma Tools in Local Government: a Framework and a Case Study	Furterer and Elshennawy (2005)	The paper demonstrates the application of Lean Six Sigma in local government through a case study.		<ul style="list-style-type: none"> • The paper fails to provide a framework, instead describing the tasks completed at each stage of DMAIC • An example of carrying out a DMAIC project within local government; not of an overall Lean Six Sigma implementation. • The case study is limited to the demonstration of running a DMAIC project, and the tools used within.
A conceptual framework for critical success factors of lean Six Sigma	Jeyaraman and Teo (2010)	Initial literature review identified 25 CSFs. Through survey the top 10 were identified. These are then discussed in greater detail. Model derived in 4 phases; Formation, Execution, Promotion, Sustention.		<ul style="list-style-type: none"> • Information not presented in the form of a framework or roadmap. Difficult to ascertain order in which areas would be addressed. • Whilst many valid areas highlighted within the model, these are not expanded upon to explain what to do about them or how success is achieved.

				<ul style="list-style-type: none"> • How the areas were allocated to each phase of the model is not clearly explained.
A framework for effective Six Sigma implementation	Jones et al. (2010)	The paper describes a framework for the implementation of Six Sigma. Six Sigma is defined as 'projects aimed at achieving specific goals'. The framework has been developed through a literature review coupled with observations from organisations.	<ul style="list-style-type: none"> • Attempt to address both contextual elements and methodological techniques • The Financial Responsibility construct promotes the close measurement of project results, ensuring that project leaders and management are held accountable for the benefits achieved. • The Black Belt Roles construct raises the question as to whether there should be dedicated resource to the improvement efforts, or if improvement specialists should split their time with other day-to-day responsibilities. 	<ul style="list-style-type: none"> • This is a framework for the effective implementation of projects rather than a broader Continuous Improvement programme. • Framework seems limited in its application, and even for use as a guide to project implementation provides little guidance or detail
An Empiricist Framework For TQM Implementation In Construction Companies	Koh and Low (2010)	Identifies eight elements of TQM implementation. Survey of construction companies used to identify level to which each is used. Findings used to present an implementation framework	<ul style="list-style-type: none"> • Of the eight elements presented the majority are focused on the soft people elements; ie leadership, supplier management, customer management • Eight elements presented in a phased manner and expanded upon 	<ul style="list-style-type: none"> • Findings specific to the construction industry in Malaysia • The detail is at a fairly high level. Sensible areas highlighted but little guidance on how to achieve the output detailed. • Creates awareness of areas to consider but not what to do about them.
Six Sigma implementation framework for SMEs – a roadmap to manage and sustain the change	Kumar et al. (2011)	The paper aims to provide a clear roadmap for the sustainable implementation of Six Sigma in SMEs. The development of that framework is based on a literature review.	<ul style="list-style-type: none"> • Within Step 2: Strong leadership and top management commitment • Step 7: Communicating the Initial Success • Validity in the majority of the points raised, but further examination of the manner of deployment is required. 	<ul style="list-style-type: none"> • The framework seems too idealistic and tidy. Seems too convenient that Phase 1 through 4 all contain 3 steps each and that these should be tackled in an exact sequence. • Although the framework is branded as one focussed on the needs of SMEs, it is not felt that the

			<ul style="list-style-type: none"> Presented in a phased manner with particular emphasis on careful consideration during pre-implementation 	<p>needs of organisations of this size are covered thoroughly enough by the model.</p> <ul style="list-style-type: none"> Whilst it is acknowledged that leadership direction and support is critical, no reference is made to also developing a bottom up method of capturing, evaluating and implementing the ideas generated at lower levels of the hierarchy The theme of Organisational Culture and Environment is not covered, although reference is made within the body of the text not to start an initiative during a business restructure or other activity that will remove top level focus. Step 7: Communicating the Initial Success, feels too late in the implementation as many people will have been involved or witnessed the implementation in progress without understanding what is going on the organisation. Step 10: Commitment to continuous improvement is not felt to be a valid step on an implementation framework as it is effectively the output the entire frame work is trying achieve. The elements that Kumar et al (2011) feel will create this need broken down and articulated within the model.
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A comprehensive model for implementing TQM in higher education	Michael et al (1997)	Basic TQM model developed to account for unique requirements of higher education	<ul style="list-style-type: none"> Starts with a customer focus Covers several critical areas 	<ul style="list-style-type: none"> Specific to higher education needs The model itself is fairly high level and lacks the detail necessary to be used in isolation; reference is required to the full article which covers several critical and sensible areas Very sequential in nature Management Leadership not mentioned in model
A hybrid framework based on SIPOC and Six Sigma DMAIC	Mishra and Sharma (2014)	Hybrid framework presented to improve supply chain management	<ul style="list-style-type: none"> Presented over 3 distinct phases; Design, Implement, and Results. 	<ul style="list-style-type: none"> Framework targeted at the process level rather than overall company implementation SIPOC and DMAIC are tools and approaches rather than an overall implementation framework Not in an intuitive format. Not very clear. Areas would need further explanation to be able to be used.
A framework for lean manufacturing implementation	Mostafa et al. (2013)	Through the evaluation of 27 previous papers published on lean frameworks and roadmaps, Mostafa et al. (2013) develops a conceptual framework for Lean manufacturing implementation. The framework proposed contains 22 elements split over 4 phases; Conceptualisation, Implementation Design, Implementation and Evaluation, and Complete Lean transformation.	<ul style="list-style-type: none"> The need to use an experienced team to deploy is worth taking specific note of. It is stated that this can be achieved either through internal capability or through hiring external consultants. Majority of steps are contained within the Implementation Design phase, demonstrating the importance of this stage. 	<ul style="list-style-type: none"> Not all of the nine critical implementation factors discussed in the paper appear in the framework presented Seems too sequential in nature. Fails to effectively guide an implementation at an organisational level. Whilst 22 elements are contained, these are not expanded upon to a level which will effectively guide businesses or practitioners during implementation
What Determines Lean	Ng and Ghobakhloo (2018)	Identifies the themes that influence effective Lean	<ul style="list-style-type: none"> Outlines the key themes influencing implementation and 	<ul style="list-style-type: none"> Main themes are identified but no further detail

Manufacturing Implementation A CB-SEM Model		Manufacturing and the relationships between the themes. Research specific to Manufacturing industry in Malaysia.	<p>the relationships between these themes.</p> <ul style="list-style-type: none"> • Statistical analysis completed to identify and confirm findings. • Findings specific to manufacturing industry, although region studied is Malaysia. 	<p>provided on these within the paper.</p> <ul style="list-style-type: none"> • Final model is academic in nature. It provides little guidance on practical implementation. • No reference to several themes; Motives, Projects, Training, Organisational Culture.
Validation of Lean Manufacturing Implementation Framework	Nordin et al. (2012)	Initially developed a conceptual framework, and then validated and updated this through an expert panel.	<ul style="list-style-type: none"> • Addresses many of the common themes seen in various frameworks. • Emphasises the importance of the role of the change agent in the overall process. The role is defined as ensuring the principles are understood by all, primarily by developing and delivering training. • The removal of Effective Communication from within the original framework to an element required throughout the entire process 	<ul style="list-style-type: none"> • The expert panel only contained 3 people which would seem insufficient and there is no validation through real life application. • Does not provide the level of detail required to consider it a comprehensive roadmap for implementation.
Towards an integrated framework for Lean Six Sigma application	Psychogios and Tsironis (2012)	Presents a LSS framework and separately LSS dimensions and major factors.	<ul style="list-style-type: none"> • Several valid areas included in the framework, factors and dimensions presented. • Reference made to the need for a quality driven culture and strategy 	<ul style="list-style-type: none"> • Not specific to manufacturing • Valid points raised in the paper, specifically related to management, not captured within the framework • Framework does not provide guidance on how to approach an implementation
Applying LSS in a small engineering company – a model for change	Thomas et al (2008)	Through the development of a previous model, a case study approach is used to present a new LSS model.	<ul style="list-style-type: none"> • Manufacturing focused • Evaluated in conjunction with a company 	<ul style="list-style-type: none"> • Not at the overall initiative level • Does not account for critical themes that support the implementation i.e. leadership and culture • More of a detailed CI process to identify, review and action issues and opportunities.

Australian TQM Model	Turnell and Washbourne (1991)	Proposes a broad TQM framework tailored to application in Australia	<ul style="list-style-type: none"> • Paper covers some good areas, but these are not fully reflected in the model. • Reference to education of upper management being an essential first step • Appraise operating culture • Policy statement and implementation plan • Must provide an operating organisational structure to support TQM; infrastructure of systems, training and resource allocations 	<ul style="list-style-type: none"> • Lack of detail on what to do or how to do it. Companies could not pick this framework up and follow it through an implementation. • Not set out well. The format of presentation, and therefore ease of understanding, is poor.
Focus on implementation: a framework for lean product development	Wang et al. (2011)	Introduces implementation framework for Lean Product Development		<ul style="list-style-type: none"> • Deals with product development process rather than the overall initiative implementation. • Layout is busy and difficult to read. • Does not provide guidance on how to carry out the long list of activities detailed.
A Roadmap for Implementing Total Quality Management Practices in Medium Enterprises	Yadav (2015)		<ul style="list-style-type: none"> • Many important themes identified in the paper and included in the roadmap. 	<ul style="list-style-type: none"> • Paper lacks detail on the methodology followed to justify the themes included in the roadmap. • It is not clear how the structure of the roadmap was decided. • Roadmap lacks the inclusion of information relating to each theme. • Roadmap linear in nature and overly simplistic.
A conceptual framework for TQM implementation for SMEs	Yusof and Aspinwall (2000)	Proposes framework for TQM implementation in SMEs.	<ul style="list-style-type: none"> • Central to the model is having a coordinating body to coordinate the improvement and change initiatives. • Emphasis to roll out new tools/techniques at the correct rate for the business; not wholesale. 	<ul style="list-style-type: none"> • The framework presented in deliberately non-prescriptive but it is felt this is to the detriment of its usefulness. • Provides little in terms of the sequence to follow or how to achieve the areas covered.

			<ul style="list-style-type: none"> • To ensure education of the senior team on improvement principles • Paper mentions carrying out a 'gap analysis' at the outset 	<ul style="list-style-type: none"> • Need for 'gap analysis' not captured in the framework.
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Appendix B - Chi Square Results

Tabulated statistics: Theme, Vote Status

Using frequencies in Count

Rows: Theme Columns: Vote Status

	Not Selected	Selected	All
Employee Involvement Levels	17	17	34
	21	13	34
	0.762	1.231	*
Feedback and Results	29	5	34
	21	13	34
	3.048	4.923	*
Implementation Approach	20	14	34
	21	13	34
	0.048	0.077	*
Management Leadership	9	25	34
	21	13	34
	6.857	11.077	*
Motives and Expectations	23	11	34
	21	13	34
	0.190	0.308	*
Organisational Culture and Envi	10	24	34
	21	13	34
	5.762	9.308	*
Project Management	29	5	34
	21	13	34
	3.048	4.923	*
Training	31	3	34
	21	13	34
	4.762	7.692	*
All	168	104	272
	168	104	272
	*	*	*

Cell Contents: Count
Expected count
Contribution to Chi-square

Pearson Chi-Square = 64.015, DF = 7, P-Value = 0.000
Likelihood Ratio Chi-Square = 68.285, DF = 7, P-Value = 0.000

Appendix C – Training theme thematic analysis



Appendix D – Survey questionnaire

Q1: Layers

- The addition of the top layer; the graphical overview and icon, is beneficial in engaging and communicating to senior stakeholders within the business.
- The content within the top layer; the graphical overview and icon, is suitable for achieving the engagement and communicating quickly to senior stakeholders within the business.
- The addition of the middle layer; the management overview, is beneficial.
- The middle layer, the management overview, is effective for providing a simplified overview of the full implementation process.
- The addition of the middle layer; the management overview, is more likely to encourage interest and use of the framework.
- The bottom layer; the practitioner guide, is still necessary to build on the information contained in the management overview.
- The bottom layer; the practitioner guide, provides the necessary level of guidance on the areas to address and the process to follow.

Q2: Bottom Layer: Overall Presentation

- The change in presentation of the content has improved ease of understanding and makes the framework easier to follow.
- The colour coding has contributed to improving ease of understanding and makes the framework easier to follow.
- The themes (Culture, Leader etc.) running through each phase of the framework improves ease of understanding and makes the framework easier to follow.

Q3: Bottom Layer: Phases of the framework

- A phased approach to implementing Continuous Improvement is correct.
- The titles of the phases accurately describe the purpose of each.
- The addition of the 'Pilot' to run alongside the main implementation is the correct approach.
- The correct content exists within the 'Pilot' phase.
- The addition of the 'Sustain' phase is the correct approach.
- The correct content exists within the 'Sustain' phase.
- The addition of the estimated timeframes for completing each phase is useful.
- The timeframes stated for each phase are a sensible duration.

Q4: Bottom Layer Content Changes – Phase 1 (Assess; Gap Analysis)

- The addition of 'Are the right structure and people in place?' to Phase 1 is the correct approach.
- The addition of 'Be able to describe and write these down' in reference to the targets and desired outcomes is correct.
- Moving 'Educate management team up front' to Phase 1 is the correct approach.
- The questions and points raised within the 'Activity' section of phase one are the right areas to consider and address during Phase 1.
- The questions and points raised within the 'Measure' section of phase one are the correct areas to consider and address during Phase 1.

Q5: Bottom Layer Content Changes – Phase 2 (Design; decide how you will do it)

- The questions and points raised within the 'Culture' section of Phase 2 are the right areas to consider and address during Phase 2.
- The addition of 'Identify who will deliver and if development required' to the 'Education' section of Phase 2 is the correct approach.
- The questions and points raised within the 'Activity' section of Phase 2 are the right areas to consider and address during Phase 2.
- The addition of 'Integrate targets with performance management system (appraisals)' to the 'Measures' section of Phase 2 is the correct approach.
- The addition of '3-5 year roadmap' to the 'Roadmap' section of Phase 2 is the correct approach.

Q6: Bottom Layer Content Changes – Phase 3 (Implement; Take Action)

- The points within the 'Training' section of Phase 3 are the right areas to consider and address during Phase 3.
- The statement to 'preferably have dedicated resource' in the 'Activity' section of Phase 3 is the correct approach.

Q7: Bottom Layer Content Changes – Phase 4 (Evaluate; are we making progress?)

- The points within the 'Leadership' section of Phase 4 are the right areas to consider and address during Phase 4.

Q8: Bottom Layer Content Changes – Phase 5 (Sustain; keep it going forever)

- The points within the 'Leadership' section of Phase 5 are the right areas to consider and address during Phase 5.
- The points within the 'Communication' section of Phase 5 are the right areas to consider and address during Phase 5.
- The points within the 'Education' section of Phase 5 are the right areas to consider and address during Phase 5.
- The points within the 'Activity' section of Phase 5 are the right areas to consider and address during Phase 5.
- The points within the 'Measures' section of Phase 5 are the right areas to consider and address during Phase 5.

Q9: Middle Layer; Management Overview

- The content of the sections and phases within the middle layer; management overview, provide an accurate summary of the content of the bottom layer; the practitioner guide.

Q10: Feedback Loops

- Regular loop re-informing the implementation is correct.
- More formal (annual) review necessary to re-evaluate the overall implementation roadmap.
- The existing feedback loops adequately represent the need for evaluation and realignment during the implementation process.

Appendix E – Consent Form

Consent Form for Interview with Richard McLean as part of PhD research

Privacy Statement:

I am a research student from Heriot Watt University. I am researching Continuous Improvement implementation in manufacturing companies.

It is hoped this research will generate academic journal articles and a thesis culminating in a framework to guide Continuous Improvement implementation.

To achieve this, I have so far undertaken a review of literature. I now need to interview business leaders and CI practitioners to review the findings to date and shape the final output.

I would like to talk to you for around one hour and tape the interview. The interviews will be taped and fully transcribed. The only person to see the transcripts will be myself and my supervisor. No real names will be used in the transcripts. If there are details you would prefer not to be taped I will switch off the recorder.

Consent:

Are you happy to proceed and have company consent to do so?

If so, please print your name and sign below:

PRINT NAME:

SIGNED:

DATE:

Appendix F – Interview transcript: SA

20/11/15 13:09

Company Size:

How many full time employees do you have on site?

On site here we have 60. And we have 4 in an offsite storage facility. And we have about 100 at our headquarters. In a small footprint, which is our 3 facilities and is part of our global headquarters.

So 160 in this area?

Yes.

What is the current turnover of the site?

42m?

Current Position:

What is your current role?

My title is Lean Engineer. My actual role is Production support, in a process engineering way, as well as Continuous Improvement. Also, I cover Health & Safety and facilities management. My role covers quite a lot, and I do what the business needs at a certain time.

How long have you been in this role?

I have been in that role since 2011. That was the end of 2011, so it will be 4 years.

Company CI experience?

Does the company have a Continuous Improvement program in place?

Yes.

What areas of the business do you focus those efforts?

It is mostly focused on operations; predominantly in manufacturing. Overall our operational facility here and our sister plant in the US, both. So production and the supporting functions of stores, QA, a little bit of finance and a little bit of engineering support. It is quite well used within that part of the organisation but in other areas of the organisation not so much.

So when you look at finance as part of the larger picture including customer services, HR, although a lot of these departments are now getting involved in CI projects, and we are doing a lot of VSM to start off in these areas currently. We are branching out a lot more just now. So it is VSM and problem solving tools we are using just now.

How long has the CI program been in place? When did it start?

We started in 2009.

Were you here at that point?

I was, yes.

But not in the role you are now?

No. When we starting our CI initiative I changed from being a process engineer to a Lean Engineer.

So you have seen it from the start?

Yes. Because I had previous experience of CI in my last role I was an obvious choice for the job.

Ok, so it started in 2009. How successful would you consider it to have been to date?

Probably less so than other people have said. I consider myself to be honest and realistic. Others consider me to be a bit more glass half empty. I am a great believer in, I mean part

of CI, is Continuous Improvement of the Continuous Improvement. You can always get better, you can always improve. I would say we are really still at the beginning of our journey. I am not going to say we are experienced and far on until we have got full enterprise alignment, and every part of our organisation is contributing, actively contributing, to our CI program. At that point I will say we are pretty far on. Until then, no.

The stuff that you have done so far, would you consider that to have been successful?

Yes, hugely.

But there is a distance to go?

Yes. We have quantifiable results.

What hard benefits or quantifiable benefits have you achieved through what you have done so far?

The two biggest things, we are a production environment; our main focus is making lots of things faster and more efficiently. We have gone from roughly, on one product line, so we have two product lines just now, on one product line since we introduced it and used CI to improve it we have gone from taking 75 labour hours to build one product down to 7.5 hours. That's labour time on one product. That is from May 2012 to date. In learning through the CI initiatives and how we implemented them on that product line, our second product line which we are still introducing has gone from 200 hours to 27 hours since April this year to date.

Our rate of improvement has gone from that to like that (increased dramatically).

Is that part of the learning process?

It is. It's getting more people involved and more people understanding the importance of the tools. And also making sure you learn from your mistakes and you don't make the same mistakes again. And you're not being scared as well, that is a big part of it, not being

scared to fail and just trying it. Just go for it, really going for it. I would use that 'going for it', just try it and see what happens. Fail if you need to and learn from it and move on.

So that is one element of it. The other two that I think are really important are, the second one is our measure of cost avoidance. That is our main, or one of our main, CI metrics. That is a measure of things that we don't have to do anymore because we are not reducing any staff and we are not reducing the size of the facility and paying less rates.

We do have a measure of that. And we do improve in that way. We do have direct cost savings that affect the bottom line but the cost avoidance metric is our main metric. In the 6 years since we have been doing CI, the first year we were setting up measures and metrics, so the first year wasn't measured. So 6 years is actually 5 years worth of results, and in those 5 years we have cost avoided nearly \$6.5m worth of time. Process time and cost to the product.

I have heard that approach described as wooden dollars. You mentioned it is not necessarily on the bottom line?

From a finance point of view they struggle with that because they don't see a real cost saving. It's not a cost saving it is a cost avoidance because we are removing elements. That is all based and annualised over 12 months so we understand what that means. Everything is done 12 monthly. If we had to continue to do that part over the next 12 months what does that mean to us in dollars. It includes cost of component parts, cost of materials all calculated out on the ROI in those project reports.

So because you rebaseline its \$6.5m but it is much more than that versus where you were 5 years ago?

Yes. We are always re-baselining.

And your third?

Our third one is our measure of engagement, employee engagement. We struggled with that for a while and we now have a metric; a set of tools, a set of systemised tools that we use within our CI framework and we have a measure through each one of them how much,

or who is involved, through different elements. We have a record of everyone who works here against what projects they have been involved in, whether or not they are actively involved in the CI meetings, whether they are part of the Kaizen teams, all these sort of things.

We now have a measure which is either sitting at 91 or 92% of our operational staff, the 60 people here, are engaged in CI. Through all the learning I have had on CI, you get to 80% and you are winning. That is 91% of 60, its not 91% of the 165 that work here.

Interviewee CI experience?

You mentioned you have previous CI experience. What was that? What role were you in and what were you doing?

I was a Technician. Basically, it was an Engineering role. As part of the technician role there was the introduction of a Lean CI training program which ended up with Green Belt certification for me. I went through all of the elements we use here; Problem Solving, Quality tools, 5S, all these different things. I spent 3 years going through on the job, a lot of theory but more on the job training on CI. That ended up with me being certified as a Green Belt and I started to work on projects. So I had that background in CI which I started in 2000.

Then when I came here there wasn't really interest in the implementation of that until the end of 2009. It was nearly 3 years of being here until I got to use it properly. I knew there were things we could do and improve on but we weren't getting to do it.

Review Framework

The framework has been developed through literature and survey, and is intended as a guide to a manufacturing company wishing to start a Continuous Improvement initiative.

Without further explanation, what is your initial reaction to the framework?

So these aren't things that have to be done in any particular order (bullet points within the phases), they have just to be done in tandem I guess?

Yes.

Right, that makes sense.

Assess degree of management commitment; you know they are going to tell you they are going to do it and then they are not going to bother in a lot of instances. But it is the right thing to do.

What's TTT?

Sorry, Train the Trainer.

There is loads in there. The first thing is that you have covered a lot. From what I can think now I can't think of any gaps in the information you have in it. What I do think is there is a lot of information. It's very busy. You need to have this but it would be good if there was a summarised version of this.

Also I think it might be a good idea to connect from phase to phase in a more visual way. For example 'training' and all of the elements within training are in a red box matching the red box in the phase before and after. When you look at it I was looking for that. Having read through it, I'm thinking what did it say about training in the previous section and having to search for it. Being able to see each of the different elements through each of the different phases.

Versus your experience does the content seem sensible? Does it sit ok with you?

There isn't anything missing that I can think of but as I said there is a lot in it. One thing that I'm thinking is that I can't in my head think what the timeframe is from there to there. I know it's going to be different for every organisation. There is a lot of work in it and its all the right things to do. In my experience though if you don't start making improvements and you don't have something in place very quickly people get turned off and bored. That's just who we are as people, it's how we work unfortunately. So some people, a lot of people will love the process of going through this and love the structure of it. I have an engineering brain and it works in compartments like that but not everybody's does. There may be something in there about...

Quick early wins?

Yes, so there is another channel going along with it. This (the existing phases) could be your general population but you have got a CI team in place...

That starts from the start?

Yes, you have got people who have experience anyway. You are doing all this for the rest of the business but you have got people who know what is going on and know what they need to implement and they are actually working on projects. Or for example they pick an area, an operational part of the business we are going to use that and we are going to drive it forward. That can then inform and feed into these things (Phase 1 and 2).

So we have already been working on it, and here is what we have been doing. That is one of the things I have found to be the best way to engage people. Show them objective results and get other people within the organisation, not just your experts, to basically tell everyone else. 'This is amazing, I have learned all these things, and we have taken X% out the process'. All that is going to do is push it forward.

Everything is there but I think you might lose some people, some people might get lost because of the time it is going to take. Realistically, you are not going to be able to get as much of everyone's time as you want. It might take 3,6,12 months to actually get to that point.

To get to the Implementation?

Yes. I think you need to make sure there are things in there (alongside Phase 1 and 2); there are wins there.

In terms of updating the framework, keep this (the existing framework), but have 'Quick Wins' or 'Pilot' that sits under these 2 (Phase 1 and 2) and feeds them...

Yes. Two way. And what can happen from that, early on you are going to get people that want to do stuff, want to make change, want to improve, and if they are business leaders you can use what they have got, you want to hook them. Once they are hooked, you have got them, and they are telling everyone else to do it. And they are doing it whether they want to or not. There is a lot in making people want to do it but sometimes you have got to force them to do it to start with. If you can get a key stakeholder from each of the areas

informing the projects that are working alongside to help move this forward, that is going to be huge.

How would you see that in practice happening? So if it is a business new to CI they might not have any of that knowledge within the business so how would you...

You are going to have to get external support for that. You are going to have to start with consultancy. As long as you get the right person is going to be a good experience. People have to see value in it very early on. It is going to take a lot of time and money, and a lot of people's time to get through this. We have been doing this for 5 years now and I still see us as being at the start of it. We still have so far to go. Not everyone is doing it all of the time and that is fundamental to your CI.

Point I am making is it takes a long time to do any of this and you have got to change the culture before you do anything else, so anything you can do to influence that.

Flexibility as well is huge. This isn't inflexible but anything you can do to build in the ability to go back from any point to any other point. One of the things we have struggled with as an organisation is, I have had my entire years business objectives changed 4 times in one week. The current environment for many organisations isn't dissimilar. It's all 100 mph, and if something changes you have got to be able to respond to that and react to that instantly. Using Six Sigma as an example; that is a long term tool. We haven't been able to use Six Sigma properly ever because of the time it takes to go through a project and go through all the different stages. What we were finding when we were trying to implement it was we were 2 months down the line and there was no need for the project anymore and the guys weren't getting to spend the time on it. It was priority 10 not priority 2 because of changes in the business. That happened with every project we worked on. We decided this is not going to work for us. It might work at some point but while we are unstable, because we are in a lot of ways, we need to find a way to take out some of that. So we now have a DMAIC project reporting format, and all we have done is take DMAIC out of Six Sigma and that is what we use.

So it is a structure rather than strictly an in depth project?

Yes. We have got a really really flexible structure and that has been key to us having the ability to keep going on and to keep making improvements. A lot of what we have done

you get so far and you have to stop it and put it to the side and move on. Not bin it necessarily but put it to the side. I have had projects that I have started and stopped 6 or 7 times now. I have to be ok with that; I have to put it to the side and move on to the next project. To survive in this business I have to do that.

Are people turned off by that or are they understanding of it?

A lot more understanding than they maybe would have been in a lot of other instances because we have allowed our CI program to be as flexible as it needs to be and we try not to see these changes as a negative. It's not necessarily a positive either but the business needs what the business needs. There are a certain set of objectives, and I think people can get blinkered by the project they are working on; 'I need to finish the project'. When you look at the scope of the project and look at where the business objectives are they don't align so why are you working on that. You need to be able to do that and move, and it is ever more prevalent in the way everybody works now. Flexibility is key.

Just on the framework, you are talking about projects or improvement activity, maybe an additional bullet point that makes reference to that; almost like a continual check?

Yes.

Do you agree with the use of the different phases?

Yes. If you look at it from the point of view of how you want to do CI; yes. When you look at it from the point of view of the practical application of getting to do these things, I am not as sure. I think again there is a lot of work on Assessment, which is fundamental, it is really fundamental. It is really important. Nobody ever spends enough time on it. In reality are you actually going to get that much time to spend on assessment? If you look at the assessment box, and rightly so, it is bigger than the rest. But again being realistic about it is that actually going to happen because it is a big chunk of work at the start. What you have got in it is great and you are trying to understand what it is we are trying to do, why we are trying to do it, the importance of it, looking at where we are, looking at what we have got.

Loads of folk don't do it until they are half way through or don't bother to do it, is to actually work out what your customer really needs. I have seen it so often, and heard it so many times that there it is often I think this is what the customer needs. That's more often than not what you do than actually sat down.

Value Stream Mapping is fundamental for the start. If we were to go back and do what we did again we wouldn't start with 6S, and 6S was a good start for us; it let us understand the importance of having some kind of structure in place and more importantly probably the discipline of it. We should have done VSM first because we got massive wins from the first VSM we did. It completely informed and changed the way we produce all of our products, hugely.

That is another thing I should have said, we have gone from manufacturing 5 systems in a month to having the capability to do 300 in a month with the same space and same size of workforce. That's all down to our CI program and our constant push to keep going and keep improving. Also we have been forced in some instances; product launch is coming, what are you going to do about it.

Is that part of your 'what's the purpose?' You have a product launch next week.

Yes definitely.

There is the burning platform

Yes. Not everybody is going to have that, although a lot of people will.

I think there are still not that many companies using CI in earnest.

Ok so Phase 1; agree with the content, could be difficult to do in practice, get something going from the start if you can?

As I said I do agree that this is the right approach but it is just when you actually get into that.

You did make mention of timescales, you made mention it's difficult to put timeframes to it because every company will be different, would it be useful to have a feel for the timeframe or do you think it would be something...

I think it would be a great idea so you have an example for an SME, and you have an example for a global, huge company and a couple of in between. So you can say this is a typical type of project and something that is as rounded as it can be so it relates to as many as possible. So you can show this is typically how long it would take to implement these in this size of an organisation who has been at this kind of level. It would maybe be a good thing as well to have an in-depth case study because you are going to have people who are going to want to see the data, who are going to want to look back and learn how that happened. So having an actual real case study for each of those would be a great idea so that someone picking it up can go, 'right I'm that, if I want to implement it I am looking at doing it in that time'. I think one of the problems is that is not clearing a lot of what comes from senior management and that is I've got an idea in my head that it is going to take 6 months so that is what we are going to go for when actually that could be absolute nonsense. So a lot of the so called informed decisions are based on no data. I have seen so much of it. They often do not understand what they are asking for. So anything you can do to make it clearer in what required is only going to help.

Did this company when they started do something resembling Phase 1?

No we didn't, we didn't at all. We took a tools based approach. We started with 6S before we really started our CI initiative. Our senior management, our director at the time was not interested. So we started off on the wrong foot and then we got a consultancy in to do our first couple of sessions of training, which we great. Everyone saw the value of them straight away. We played the manufacturing game. We did that and it was great. Everybody loved it, and everybody bought into it but then it kind of fell away when finance realised how much it was actually going to cost to sustain that, when every time you bring in a new set of employees you need to put them through the training. Consultancy costs a lot.

So we went for a tool based approach. We basically went for a tool, focused on it, adapted it to work for us and then moved to the next tool. There was an overview, our COO at the time defined we were going to do this, get ourselves properly trained and then self

sustainable, which is what we did next after a bit of training to make ourselves self sustainable. We are not 100% but we are not that far away.

And we were focussed on one operational area, a small part of the business.

Yours was more of a drip feed then?

Yes. There were pros and cons to that. I think one of the key things for this is to make sure you have got the right people in place at the start of it to start it off. That's going to be difficult because if get people in who think they understand it and they don't understand it then no matter how objective you make it there is always going to be subjectivity and there is always going to be somebody view of how you do that and the timescales involved in that.

Before we move on any other feedback on any of the other phases?

I need to get time to soak it in and then I will get back to you in more detail.

But there is loads of good stuff here. Like use standard templates. I still can't get past the shingo model but we have decided that we are not going to go for certification. We short listed last year in the top 6 for manufacturer of the year. We are still using that model to inform us, which is amazing, partly down to its simplicity. I think you need a little more of that here. So this could come from something like that which starts you off and shows you it in much less detail, and captures these elements in that.

I have some questions now to capture some of your best practice or experience.

Are you deliberately trying to achieve a particular culture with what they are doing? Was culture change an objective?

It wasn't. It wasn't a recognised objective. It would never be a recognised objective to change the culture by 20% or whatever. But it is the most important thing really. I think that is why we have been so successful. And that is down to the site leaders focus on the culture and keeping it going. So we didn't have a set objective we just understood that it was fundamental to what we were going to do and we had to have that.

How would you describe the culture you have now got or the culture you are trying to get towards?

Lots of words; cross functional, open, inclusive, fearless, engaging, ever changing, changes as and when it needs to, family atmosphere, everyone understands we are going down the same path, aligned in the same direction, at least in operations there is a really high level of alignment and focus.

Do you know if the management team was educated on CI as part of the roll out?

Some. At the time it was director level at the highest. It was the same training. Everyone went to the same training. All the training we have done, it was people from operator through to director.

So on site, everyone at that level goes through the training?

Yes. Everyone should have had it though, most definitely.

I have seen it; 2nd in command of the company at the time had experience and got it, really got it. When you guys who properly understood to seeing guys that don't understand, they are not driving the same behaviours. They are driving a completely different set of behaviours. And that is fundamental; behaviours. They have got to see the value in it or you are not going to get as much of a buy in as you could and you are selling yourself short.

When you are doing training what format does that take? Who is trained, to what level, who delivers it?

Me. I deliver it. I do classroom training but practical training is me and Sarah.

There is classroom training which comes after online training. Then there is also on the job training which isn't really training, it is real life practical examples. We have a problem, let's solve it. If you have not done problem solving, make sure you have gone through literature, do a bit of training, and then we will actually go into real life. We don't do examples, we do what is actually happening; real on everything. That is how it is done across the board.

Although dependant on the level. Generally the management teams and some of the engineering teams they won't do the classroom training because the online training is enough for them. They will go straight into actually working it.

Where do they access the online training?

We have our QSR. Our Quality System which holds all our records. It is in the same place as the training for the products and training for job specific roles. There is an expectation that everyone is going to go through it and we have a metric that records who has done what. I know who has done their training; who has done the online training, classroom training, and who has done practical examples. It was originally 8 days of training to go through, it can now be done in a day. That is at the right level for us.

People are given time to access that, read through it, and they are signed off?

Yes. Everyone has time for CI and part of that is going through their online training and part of that are real life examples.

You made mention there that everyone gets time for CI. How do you go about created or booking that, or ensuring that it happens?

As a general rule it is 9.30-11.30 on a Tuesday morning everyone has CI time. Realistically, not actually that many people outside production and stores use that time, but everyone has 2 hours a week at their own discretion if you like. If business needs dictate you need to work Tuesday morning you can do it Thursday morning.

Do you literally mean production stops and everyone works on CI?

Yes, but it doesn't generally happen.

But that is the ethos?

That's the ethos, yes.

In reality you have to keep going so maybe half of production will stop, and then half of production will stop later. If it is a busy month no one stops except maybe one guy and then the next day someone else gets to do it. It is project dependant as well and it is driven by the managers of the areas. For example the production supervisor, he defines what the CI activities are based on what is going on. Although if he goes to his guys, which he does, and says 'is there anything you want to work on', the guys that are forward thinking drive their own. Generally they get to work on what they want. They can go ahead and spend some time looking over someone else's shoulder and working with them to come back with a list of suggestions to improve the process with that person. To give a really good example, our systems are all Linux based, and in the production through the testing a lot of it is command line typing. When we released our newest product George was helping Fred, and Fred has a bit more knowledge but George was like 'why are you typing all those commands in again and again?'. So he went away and got a bar code reader, and he created barcodes for all the high running command lines. You have got like 55 characters you are having to type each time, so he created them all on a barcode and printed a standardised sheet on both sides with all the basic commands. The visual management of it is amazing. You can see what process it is for, what command it is for and what part of the process it is in. The guys have all got them velcroed to their workstation now.

He wasn't aware of what that meant so I spent a bit of time with him after to write it up as a project. We sat down and worked out that that project alone for one process stage, which could be then moved onto other process stages, cost avoided \$20k for a year worth of production; for that one thing. Not everyone works in that way but there are a few guys that work that way and they will just go and do things.

Do you have a formal plan or roadmap that you are following in terms of your CI implementation?

Yes and no actually. The goals and objectives will give us that for a year but we have nothing longer term than that. So it is year by year. We no longer actually have, for our last financial year we didn't have any specific CI objectives. The years previous to that they were 'get so many people trained in Six Sigma' or 'get all the work instructions standardised' all those sort of things. We don't have any of that now.

Did you find that necessary previously?

Yes but we don't now. We are now in FY16, so what you see is now out of date. We have changed it and what we have now is a set of corporate objectives and our CI supports our corporate objectives. We don't have a specific CI objective anymore. We have changed the way we have done it. We found that we know now that we will work on the right things. We don't spend time working on projects that aren't relevant because we understand they are relevant to this before we start them, whereas before we didn't. In a lot of ways we were doing Lean for Lean sake, now we are using Lean to help us achieve what it is that the business needs.

Do you have a feel for number of projects carried out annually?

We have got a metric. It doesn't include everything yet. We have a metric of Kaizen, which can be mini projects, of PDCA activity and of DMAIC.

So you are using all of those approaches?

You always start at the Kaizen because it is a basic suggestion. That then drives and informs a PDCA or a DMAIC generally. We are still doing more than we are capturing. Probably twice as much as we are capturing.

There is a challenge of how much time you spend capturing it versus just doing it.

That is what a lot of people are saying; I just need to get it done. I don't have the time to write it up so I am not going to. Then you don't necessarily have a written down formalised version of the learning which for me is important. Then when you revisit it you have got it there and it is documented, you don't have to go back. That's where the value is in it but it is hard to quantify it. If you can't quantify it you are not going to change everyone's view.

What stuff would you take out of the framework?

That's a difficult one because there is not anything I looked at and thought no. There probably is a way within this (the framework) to take a couple of bullet points and make one.

Just make it look less busy?

Yes. And that itself helps a lot. You want it to be on the tip of people's tongues and be able to describe the value of this without having to really think about it. So there has got to be some kind of way I think for a really high level version of this. Include these, the actual phases and then.....or maybe graphically, I don't know. I find I am a very graphic person. I pick up things that are done in that way a lot better. A logo, some kind of logo as well that encompasses what you are doing.

Appendix G – Interview transcript: DM

03/12/15 11:37

Current Position:

What is your current role?

I am a practitioner, a Lean practitioner. I work with companies to improve their business processes.

How long have you been in this role?

This current role is almost 4 years with this organisation

Interviewee CI experience?

Do you have experience of implementing Continuous Improvement in previous roles?

Yes. I worked in private consultancy for about 15 years before joining this organisation. Both in Continuous Improvement and Organisational Development.

Prior to that i worked in various internal roles

Within companies?

Yes. Typically large corporate type companies.

What kind of roles?

It would either be operations management with an improvement focus or it would be explicitly as an improvement person.

Review Framework

The framework has been developed through literature and survey, and is intended as a guide to a manufacturing company wishing to start a Continuous Improvement initiative.

Without further explanation, what is your initial reaction to the framework?

The first instinctive reaction is that there is a structure to it. In my experience and from stuff I have read things are more likely to be successful if they have a systematic approach.

Looking at the headings for the structure they are pretty much the framework I would have used and they have a nice medical analogy. If you are looking to improve something, if you think about visiting the doctor, the doctor would initially do a diagnostic. The diagnostic would have a number of different elements in it. The doctor would diagnose you before he would offer any remedy or solution which is effectively what this framework allows you to do.

I think right away it is good that there is clarity, or intent to seek the clarity of why the work needs to be done.

I like the content of the diagnostic because it covers all of the different kind of systems that a business is likely to have, or the perspectives you need to understand what the current state is.

Is there anything missing in Phase 1?

One of the things that has become apparent, or increasingly has become apparent, is that the performance management bit, and I know you have said culture in there, and the performance management bit is the condition part of the culture. What is it we do and how are we trying to be. Performance management should be the structure for that.

A lot of what I see doesn't focus on that mechanism.

So for instance, when we move into a future state how does the performance management system change to reflect the new ways of working, the new behaviours, the new things, the new measures and the data that comes out of it. What do managers do with that? Often it feels like there is a gap. There is a bit that comes out that says we are going to have much more performance data, we are going to have to be more compliant with standard ways of doing things, how do managers lead that confirmation bit, what do they do with the data that comes out?

CI is about continually closing the gap between your target and your actual performance. Performance management for me is the bit that should do that. Whether it is your daily pulse meeting or whether it is through your appraisal system.

So you would want in the Diagnose phase to take a view on that and see how they are doing that?

Yes because i think even at that stage, when i have done this in practice, at the end of each of these phases, at the end of the Diagnostic there would be a gateway review with the management team to say ‘this is what we have found, here is how it is looking for the future, are you ok with that?’

So there is a sign off that everybody is happy with the progress. At that stage you are saying ‘we need to be thinking immediately about how are your people going to need to be in this new system and how are you going to help them do that?’ ‘Are you going to help with some behavioural stuff, are you going to up skill them, are you going to set them objectives on things and measure their performance against these things?’ Often that is missing.

So a sign off of the work you have done but also using it at the end of each phase as an opportunity to move the management team along?

Absolutely right. Most of the stuff on change will say it is difficult to sustain it. It is called homeostasis; biologically we find it difficult to move to a different state. The behavioural connections in the brain are hard wired. Its like beating a path through a field of wheat; you walk through it at first and it will spring back up, but if you keep walking there it becomes flattened. When you try to do the next one you have to go through that same thing as well.

What you are getting is people defaulting to psychological safety; it is what i have always done, it feels more comfortable, and i know how to behave in it. Homeostatus will drag them back there.

This bit here is saying at the end of the diagnostic, its like, i said sustain is difficult, you start the sustain bit when you are doing the unfreeze bit because you are already saying to them ‘you are going to have to be a different way and we are going to give you time to get used to that’. In whatever way you are going to do that.

So the gateway review is the bit that says here is what we have found, is everything ok for you, here is what we are going to be doing next, does that sound ok, how do we deal with the change issues of that. Already we are thinking about this thing that is probably going to have to happen sometime in the future.

Its the bit you have captured there on the training bit. It is just very explicitly saying that its not just behaviours that have to be different, or some tools and techniques, whats the whole system that rewards and encourages that and incentivises it.

This is facinating, the comelling need for change bit. This is what i have been reading recently. We did a session recently and the company are making money. This first bit here that says 'is there a clear purpose for the initiative'; you are making money.

I have seen it in different sectors before; Oil and Gas. A fantastic current example of having never needed to improve things because they are making money hand over fist. Semiconductors when it was growing in Scotland, 17% year on year growth on average. Huge inventory and it was very difficult to get them to change.

It needs someone at the right level with the right influence to have that insight to help you implement alot of things. So this company is making alot of money so that is not their why question. The research i read says that 95% of companies that go and do Lean for cost saving purposes fail, only 5% are successful. Lean is about changing you way of being in a company. The ones that are successful will change their ways of being. With this company that compelling need for change, if its not money which is the reason businesses exist, it becomes a very human thing. So for change to be successful people dont necessarily feel that responsibilitiy to the business the way they feel emotion. So how can we emotionally disatisfied without creating fear and make that future state emotionally very attractive? So we have to do alot of visioning stuff that is 'when you are coming to work, how are you feeling about coming to work', 'when you open the door to your office how does that feel', 'when you walk to the shop floor what do you see and what do you hear'. It has become a very emotional perspective that we are creating and it has worked really well. The guys came out of the session and one guy said he felt uplifted and another said i feel inspired.

Strong words

Fantastic words. The important thing is to keep that momentum going. At least we have created something that is much more attractive about how they want to be.

How they want to be personally?

Yes. Also, as a leader you have a responsibility not just to make your people productive but also to have them stimulated, to make them feel good about coming to work, to make them happy if you have got that opportunity. The social responsibility we have to each other to help us maintain our society, that is just the same in work it is just a different subset of it.

So i like that there is a structure. I think you have got most if not all of the things i would normally do. You can see there is a nice flow to it and i like that it is rounded.

So you as someone with 25 years experience you are viewing that as 'yes i could use that' or 'that makes sense to me'....

Yes.

How do you think it would feel or land on someones desk who is maybe new to this. How useful do you see this being?

I think there will be two reactions to it. One is, its a structure. When i have come to this and i dont know what to do, well already i can get a feel for it being systematic, i need to get a feel for things, i am not just jumping into it. I will figure out what i am going to do, i do it, and then i figure out what the impact of that has been.

I think secondly, and i have had this experience, there is a 'thats a lot!'. One of the clients i had, a large manufacturing company, £500million turnover company, i tried to sell him that transformation plan and he pushed his chair away from the desk and his face said 'thats too much'. Which at that time it was for where he was; caught up in trying to run that site for that business. To say here is a 2-3 year transformation plan with these things.

Is that the typical timeframe you would put on that level of work? It depends on company size i take it?

Exactly. I would say for the, they talk about culture change. They say it will take 10 years to change the culture of the banking, all those practices because it is such a big thing.

If a company, given that they are doing their day jobs, probably 3-5 years is a reasonable timeframe. I have seen that with this company. We are 2.5, nearly 3 years down the roas

with them and we are now starting to get traction. They have taken a third out of their build cost which is really nice. Behaviourily they look different and they feel different. When i walked in at first it felt quite dark and oppressive, walk in now and the mood feels lighter. You dont hear a much non value add drilling and cutting and banging.

So that 3-5 years, not to complete it, because you never do i suppose, but what is it you are saying is complete? Or different from when you started?

The people, the approach we are taking with that company is almost an academy type approach where we are taking cohorts of people through a similar transformation framework to this. Most times, we are giving them some knowledge about tools and techniques and some techy things to learn, but most times whenyou say to them ‘could we make it better’ they say ‘yes’. Alot of times what we are doing is taking away their performance inhibitors. I think there are 3 categories of performance inhibitors that Toyota talked about; Variability, inflexibility and Waste. What we are doing in trying to take those away and allow them to apply thier knowledge and effort inthe right way. So mostly they get it.

But there is a whole system there that is conditioned to not deal with that. What we are trying to do is we are trying to get people to the place where they have the energy to change that system; the energy, the understanding, the incentive and the intent to do it. That takes alot of time. It takes more energy to change than it does to stay where you are. From a neurological point of view as well it is very very difficult to change.

It is hard to quantify that. It is a qualitative thing; ‘We are now prepared to do it’. At some point for each business if they are successful there will have been a tipping point.

So the framework is sitting ok with you?

Yes

The structure of it?

Yes.

The content seems full enough?

Yes.

The only potential changes or updates you would mention were something about Performance Management and the assessment of that in Phase 1 and after each phase having a more formal gate review with the business leaders?

Yes. If you want something to happen, set a goal for it to happen. Its amazing how many comapanies i have done this with where as part of their performance appraisal system they dont change their objectives. But you want to be different. If you want to be different you have to ask people to be different, give them the skills and then reinforce if they are doing it. Encourage if they are and readdress if they are not. It gets forgotten about.

CI Consultants

I will jump to training because you have mentioned academies. So if you are starting to roll this out; the delivery of training, what format do you think that training should take? Who should be trained, to what level and who should be delivering it?

The training for me is for a couple of different purposes. Firstly it is to, you could say training and education in there, there is an education part that says we would like you to think differently and to feel differently.

There is two different perspectives to this. One is to say here is why we are doing this, and almost a consultation process. The consultation process is a little bit of training and a little bit of education. We are helping you gain new knowlwdge.

It is partly to say we are going to educate you and here is what we are doing and why we are doing it. Its an exchange and its an interesting thing. The training and education is a two way thing. If you think about the action learning model; we try something, we learn from it, and we re-apply the learning. Its helping people understand the context of what they are doing which is a bit of education, a bit of training. Then a bit of on the tools and techniques.

Before the training is delivered it is understanding where you want to be, what should people know, what are they going to do, and how should they be in that future state? Where are people now? Then you end up with a gap analysis; pretty much your daignostic model here.

Going through that same rational but for the training?

Exactly. What do we want, what have we got, and what are the gaps we need to close in there?

It will be partly through on the job training where i am going to show you how to do this task. But it is also a bit about the concepts and principles behind it that helps people understand why they are doing it. That helps their application and their preparedness to go and do it. It is also partly a conditioning thing.

Just to check; what i am picking up from what you have said, there is not a set training approach....

Other than gap analysis.

So you are not saying you must always do a week of this. What you are saying is understand the specific needs and address that.

Yes. It is interesting though because if you are a business and looking to make money and you are a consultancy that does this alot you develop a package. Effectively what happens is that you roll that package out irrespective of whether people need it or not because there is an economic benefit to the consultancy to do that. Any OD book will tell you that you dont do off the shelf OD stuff. You have to do a diagnostic.

I have worked with 2 consultancies just illustrate the point. One had what they called a standard solution. That was this model. We are going to diagnose it, but so we understand to what extent it behaves the way we know it is going to behave. Then you are going to get a standard solution. Irrespective of how it behaves; because we know we are going to have to standardise, we know we are going to need Visual Mangement, these different things moving to a Lean world typically has. And we are going to roll it out. So this consultancy does a push rather than a pull approach.

I think when you are doing skills, people get a little brassed off when you are doing sheep dip. The term comes up because it happens, For it to work well you should do a what do

we need, what have we got, what is the gap and how are we going to tailor that. If that takes more time to do it and a bit more cost then....

It's the right thing to do?

Yes.

So right at the start there is mention of motives and expectations, being clear on the purpose of what you are doing. What do you believe is the purpose of a CI initiative?

I think it is whatever the company wants. That sounds a glib easy answer. My experience of it is that most will do it to improve performance, business performance. For others it will be competitive pressures of the need to reduce the cost of production, for some it might be the focus is purely on quality and the quality system is not that great. I think it whatever the measures of effectiveness are for that system. If they feel they are not meeting that, or wont meet them in the future, then they have to do something to make it like that. In some cases we need to survive.

Do you find that businesses are explicitly trying to change their culture through CI? Is that something businesses are trying to do or is it a by product?

When we have been doing different workshops and we are talking about Lean, we are talking about the lack of success in Lean; two thirds of initiatives fail, why is that? 'Our culture wasn't right, we couldn't sustain it'. When we then explore 'what do you mean by culture' it is very difficult to describe. In some cases, without understanding a difficult concept like culture they are trying to do it. Most times it is a business performance issue. Either their competitors are doing something different, they need to get slicker at getting new products to market or they need to reduce their cost of production. That's the thing, they don't at that point understand that they need to be different as an organisation to sustain this. They think they just need to go through some lean stuff and that's pretty much it.

How do you believe business leaders should demonstrate their commitment to CI?

When you look at all the different management systems or perspectives, when you are having your regular operations or performance review you are talking about financial performance. The more insightful ones will even have HR at their top table; not that many.

They will talk about product development, customer sales, and financial performance. The things that they consider important are part of that company review. If improvement is performance it should be planned, resourced for and managed at that same kind of level. If it important enough to change your business then make sure it is as important as the other important things in your business. It very seldom is.

I want to know how our business improvement is doing. Is it successful and if its not, what do we change, do we stop it? And if it is

Successful in terms of hard measures or tracking softer stuff?

A bit of both because some of it is going to be quite qualitative. We know that if we can get people to identify waste that is a good thing so we are going to train people to identify waste. We might not be at the point yet where we have realised that but we have the process right because we have trained them in it. If you think of KPIs and measures, because we focus a lot on the KPIs, so the KPIs ultimately for a transformation might be the quality improved, cost reduced, and customer happier.

So we have talked about this timescale being long, and there is a lot in the front end activity. While you are doing that should the discipline be not to go and implement anything or if there are obvious things should you be looking to gather that momentum by demonstrating to the business that wins?

There is never a bad time to do good stuff. It is trying to maintain your direction of travel, your traction, and your momentum. Don't be distracted by all the possible things in there.

So it's not being, although this on paper is quite rigid, its not being too inflexible with how you are applying it?

Exactly. The good thing with having a rigid model is it provides a very systematic approach to things and it is important to have that. It is a framework, it is not a recipe for everything. If there is an obvious opportunity by doing something why wouldn't you do that. It is a bit of common sense. It can also be a decision for the company at regular gateway reviews; do we keep doing the transformation framework or do we fix this?

When advising a company through a CI implementation do you have a plan or roadmap that you follow?

Yes, it would be very similar to this, and the timescales would flex depending on your initial understanding of the business and what the level of complexity is going to be, and the size of the organisation as well. For the Diagnostic it might extend from anywhere from a week to four weeks. Design phase similar. With a company of 200 people I would say 6 months to deploy Lean and that is the first stage of eliminating wastes. From there you constantly seek perfection.

Do you believe the management team should be educated as part of the roll out?

Yes, if they are the people who are going to create the environment where CI is going to flourish or operate they need to understand why and they need to know how they need to be within that. The leadership team has to understand, and be educated to understand that if you want this to work here are some of the things you are going to have to think about. You are going to have to make space in your day to day work to allow these things to happen; you have got to support and encourage it and create the environment for it. It is difficult for them because they are usually doing 100% of their day job. What you are asking is to do 120% of the day job or let some of the day job go. That should get better over time but it is a little bit chicken and egg.

Is there a level you would expect managers to be trained to? Is it light touch awareness or should it be deeper than that?

Again it is a gap analysis. From how they should be and how they are there is a gap. That education and training is going to address that gap. So it will depend on whether they are mature in their business processes. They may just need a bit of alignment. If they need a proper transformation where they are caught up in chaos you need a deeper intervention. It depends.

If a business picks this up and it is new to them, do you believe they could internally take themselves through this or do you believe it needs an external view to be successful?

The reason there is a consultancy sector is business are not that good at this. Lean and this change approach is a science in itself. If companies try to do it themselves they will need to build expertise. If two thirds of change fails, even with skilled organisations or consultants doing it the likelihood of success yourself are fairly limited. My view is that organisations need support, either through it or to build the capability to take themselves through it.

So at the front end there is going to need to be facilitation or knowledge transfer?

Yes.

Is employee involvement important?

Yes it is. I think the extent will depend on where you are, where you need to be, and how quickly. It's for every company to say I want my culture to be a particular way. If you are looking to deploy lean or CI then clearly there is a more effective mechanism if everybody knows how to do it. You just have to control the application of that knowledge and that skill.

Do you believe a business should have dedicated CI resource?

I think until it becomes part of how you do your work; yes. Otherwise it can lose focus. The human brain works better if it has got focus. If you focus on one to two things, you will deliver one to two. If you focus on three to six you will deliver one to two. If you focus on ten or above you will deliver none. So that focus of being clear what good will look like from a CI perspective, where its part of a regular review process, identifies gaps through a CI mechanism, there is an improvement element in your objectives for example. When you get to that point what is the need for a function? Until that what is your focus? I am sure there are other mechanisms that work but for me it provides the focus to get you to the bit where rather than a CI group you have a CI business. The CI group is the seed to propagate those practices throughout the company.

What are your thoughts in the Evaluation around celebrating success? How do businesses most effectively celebrate success; reward and recognition?

I think the reward thing, I don't see it that clearly in most businesses. Some do it. They do it to an extent and it disappears. Financial reward is almost a thing from the 70s and 80s. The stuff that I have done and I have read suggests that the drive to achieve something is more powerful than when we have achieved it. We are goal oriented. The motivation to solve a problem or to make something better is very, very powerful. Once we have done it is almost anti-climax; need to go onto the next thing. The rewards that companies do well will often be an emotional type thing; a thank you or recognition. Very seldom there is a financial reward for doing it. The tangible things are very rarely used and don't have the same impact.

I think that is me unless you have other thoughts having chatted through.

A lot of practitioners would probably come up with something similar, probably not to that extent or would have formalised it but intuitively. The delivery of it I think is the most important thing.

The framework is fine, the conduit through which it is delivered is probably the most important thing. I have seen people very good at this and I have seen people who are terrible at it. To engage people in the right way to train them, to standardise the process can take good people skills. There is a need for emotional intelligence if you want this thing to work effectively. I don't know how to capture that in there. I think the conversion mechanism is every bit as important as the framework.

The framework in theory makes sense and the content is correct...

Yes.

But the application of it is difficult and is where it could fall down.

This for me is almost like a buffet. There is any number of permutations of how you combine the various elements. That for me is a skill, and what is effective and right for that organisation within that context.

It feels a bit more technical than it does emotional. The ones I have used would probably have more of an emphasis on technical. In practice I would have much more on the change management.

Is that because it is difficult to capture in a framework?

I think it possibly is. It is easy to write Unfreeze, Change, Refreeze but in the unfreeze bit there is massive amount of thought and options about how to help people do that. It is difficult to document that. In my experience it is a very fluid thing to try and understand it. This is less fluid but a structure needs to be less fluid I suppose. It almost feels sharp edged and rigid but you have got to smooth it when you take it into an organisation.

That's probably the only thing for me. You cant with credibility go in and say I am going to improve a lot of your business processes and not have a process by which to do that. So you are demonstrating integrity and credibility in your approach. The conversion mechanism is the challenge.

To a business new to this do you think there is value in the framework?

Yes. What it starts to do is take an unformed thing and an unclear concept and starts to apply a linear logical model to it. It helos take a lot of uncertainty, unknown, unclear and puts form around it and helps people feel safe.

Thank you very much.

Appendix H – Interview transcript: RH

08/12/15 09:42

Company Size:

How many full time employees do you have on site?

On site here there is approximately 300. 300 to 320; it flexes a little. That's for this site, UK wise I think there is about 8000 people I believe. Of which, just over 300 are supply chain. Globally it is approximately 20000 I think.

Does it make sense for the purpose of this interview that we reflect on this site only?

What I will probably be able to do is give a reasonable impression of where the UK sites are in general with regards to CI infrastructure because I travel about I have seen what most of them do. I can probably speak holistically about that but we can focus more specifically on this site.

Do you have a feel of what the current turnover of this site, UK, globally is?

That is a difficult question. The reason I say it is difficult is because sites are viewed as being cost centres rather than profit centres. The way the financial accounts work the sites themselves don't make a turnover. They are an overhead and are offset in the overhead cost by what they produce. So I'm not sure.

Current Position:

What is your current role?

My current role is Senior Lean Implementation Manager.

How long have you been in this role?

2 and a half years.

Company CI experience?

Does the company have a Continuous Improvement program in place?

Yes

If so, what areas of the business?

Supply chain; so the production side. We have just entered in the last 6 months doing Lean and CI in the admin areas.

How long has this been in place?

It started back in 2009. I would say there was, maybe false start is the wrong word...

Since that date?

Yes, but it has maybe taken a couple of years to get some momentum and get full buy in. I would say it has been fully anchored for the last 3-4 years.

Over that 'anchored' period how successful would you consider the role out to have been?

I think we have done reasonably well in some sites, not all sites. Obviously there is a variation. I should maybe mention there are 12 manufacturing sites across the UK. There is variation. I would say we have probably done well in terms of tools and systems implementation. The behavioural and culture piece still requires more focus and more development.

How do you, or how does the business, measure success of the roll out?

Every site reports annually a CI saving. They have a target and report against that.

Is that bottom line or is that cost avoidance?

Bottom line.

Signed off by finance, you can see it.

Yes definitely, it is physical seen stuff.

So we have that; which I suppose is the true CI. We also have a lean audit programme that we use to assess where all the sites are on their lean journey; albeit that it is somewhat subjective. We use that as our temperature check for where we are with lean deployments.

Is that against a standard scorecard type thing?

Yes. We have a standard audit. it is part of a bigger process. It is not just one event every year. It is part of something we call the lean support cycle. It consists of 6 meeting points throughout the year as a minimum; the lean audit being one. The output of the lean audit should form the activity that happens at the other touch points. That is our core interaction as a central lean function with each site. There is a standard lean audit document that we follow. It is made up of 11 areas. There are 46 questions and it is a rating of 1-5. We are looking for evidence against the 46 questions and provide the site with the output, the score and the feedback.

Is that your sustain loop, or improvement loop?

Yes. Exactly. What the sites also do is take inspiration from that and builds it into their site specific business plan.

You mentioned hard benefits; bottom line benefits. Do you know what hard benefits have been achieved?

Yes. Globally we have just recently delivered £300 million of savings. That has just been signed off at the very top of the company. We have another target by 2020 of another additional 400 million euros.

Is that £300 million since the start of the process or in the last year?

That would have been since 2014.

Do you have experience of implementing CI in any of your previous roles to this one?

Yes.

Could you give me a little background on what those were?

Of course. The role before the one I have at the moment was PTD manager at this site. I was in that role for 18 months. That was to look after the joint site CI process.

Prior to that I was a SMAS practitioner for 3 and a half years. Subsequent to that I worked for Rolls Royce East Kilbride. I worked there for 5 years. My latter 3 years was as a Six Sigma Black Belt. Before that it wasn't a formal CI role although all my jobs, roles, projects have always been improvement related. My formal roles began in 2005 with that Black Belt position.

So 10 years?

Yes, 10 years of full time CI.

Review Framework

The framework has been developed through literature and survey, and is intended as a guide to a manufacturing company wishing to start a Continuous Improvement initiative.

Without further explanation, what is your initial reaction to the framework?

I guess reading it, there is an awful lot around the framework to actually make it a success, which is really good to see because it is often a lot of this stuff from my experience that we don't get right. And if we don't get that right then it is not sustainable. So quite often we find that sites will run in there with an employee suggestion scheme, we'll manufacture a board, well stick it to the wall and we'll expect all these great ideas to come out. You get a little bit of benefit for a short period of time but it is not something that is sustainable long term. I think what you have got here is you have got a lot of the foundations in place to give the process the best possible chance; through the right

communication and engaging with the different levels within the organisation and giving the right training and support to then build upon.

So I guess the actual detail of what the CI framework is is an amendment to this, it sits behind it?

In terms of what their personal roadmap would be? Is that what you mean?

Yes, I guess so.

This is intended to be the thing that tells you the need to address this; it doesn't necessarily tell you how to address it. For every company that could be different. So when it says 'decide what your CI process is going to be', that's up to you, but it tells you the need to think about that. It's not saying communicate in this way, it is just saying you need to communicate and to these people. If that makes sense?

That is the level that it is currently pitched at but that is not to say that is what the final framework needs to be if you feel that more or less detail would be the right thing.

You know what I think of in terms of how it is laid out, and I have got to be honest I hadn't really thought of it laid out like that. It reminds me a little bit, and I don't know why it does, of Kotters eight steps. It reminds me a little bit of that because you are building it up by getting the foundations right.

What do you think of the use of distinct phases?

The phases sit well. As a company we are quite used to using phased approaches like that for implementations. I think in practice the boundaries between the phases are somewhat blurred and a bit grey. In my experience you can be down here and go back in a circle two or three times between the phases. In terms of having a clear logical structure that can be easily communicated and understood I think the phases works perfectly well.

That element of feeding back into previous phases; is that something you think it would be of value to capture within the framework? Or does that create more confusion by stating it as best practice?

I think if you tried to draw all the feedback loops you are likely to experience on this diagram it would probably be a nightmare and not make a lot of sense to people.

Clearly there is a very formal feedback loop that happens from the results back into the implementation. There may be occasion when you are implementing and something crops up that hadn't been thought of or a situation arises where you need to build it back into the design and change how you are going to do it a little bit.

There will be informal loops...

Dotted ones almost?

Yes, that will make it really complicated and a bit difficult to understand.

Focusing on Phase 1, whether you call it a Diagnostic or assessment, baselining, is that something this company did before launching their CI efforts?

Yes. To answer your question, definitely yes. I would say at sites we have had some slightly different approaches. Some sites, I mentioned I was PTD Manager, well all sites have a PTD Manager. Those guys have been recruited externally in many cases and come in with their own ideas and implement Lean at site before our formal roll out has come. What we have done, back in 2011, there was a roll out of Lean, that I wasn't involved in, but it did involve a diagnostic and some recommendations. Since then we have moved on and that process no longer exists. In the UK we launched a more appropriate Lean roll out and that did include 8-10 weeks of Diagnostic where we had a team of analysis people come into site and look at all the data, interview the senior managers, conduct workshops, deliver some initial boot camp training just to give the leaders on site an understanding of what Lean is all about.

In the framework at the moment we have got education of management once you are in the Implementation phase. Back here (Extended Diagnostic) that was happening?

Yes, back here they were getting education. It was 3 days of Lean awareness training, change management training. That continues though in the implementation phase.

This 8-10 week diagnostic happens down here (Extended Diagnostic), then once the diagnostic is complete, as part of that diagnostic a target is set; you need to deliver this through your Lean roll out. The diagnostic is complete and there is an implementation plan for all the activities (a roadmap) that need to take place over the 12 months to deliver that financial target.

So it is very financially driven?

It is very financially driven at the moment. As I mentioned we are getting more into the hearts and minds and the people and the culture side of things. Until this point the purpose of Lean has been financially driven.

After the diagnostic it moves onto the implementation phase and that is where my role as implementation manager comes in because we then support that site for 12 months in the successful completion of the plan that has come from the diagnostic.

That's how the roll out process works.

At the end of that implementation year that is when they get their first Lean Audit.

So that 8-10 weeks, does that actually encompass Phase 1 and Phase 2. You mentioned by the end of it you have your plan, which is effectively the roadmap output?

It definitely identifies training requirements, project and improvement activity that needs to take place. I think we could do more on communication if I am honest. What we find, and maybe it is just how we are in factories, we are not communications professionals, but I quite often see collections of improvement methods and there isn't often a tangible strategy that sits behind that to say these are the groups of people we want to communicate to, these are the messages we need to communicate and this is how we are going to do it. It is more of a collection of communication methods that someone thinks is a good idea. We could do more around this, albeit we do have a mission and vision.

I saw the purpose at the door when I came in.

That's right.

Every site has its own business plan then the supply chain business within the UK has its business plan. Consumer UK has its own business plan. All the business plans are cascaded down from one another which in theory means an operator on the line knows how that contributes to the success of the company.

We do stuff around communication, but in terms of how we communicate the CI roll out and CI infrastructure I think we could do more.

Yes, otherwise we probably cover that within the 8-10 weeks.

Certainly the identification of it, the delivery of it is then in the Implementation.

Absolutely the leaders are consulted within that diagnostic. There is lots of analysis carried out of the business environment. We probably don't do a formal Value Stream Map. We don't have that many examples of that. It's not common. There is a little bit of training of the leaders, not the general workforce. The people leading the implementation are given a little bit of knowledge up front.

Because you can't sponsor it if you don't know what it is. That is the logic I assume?

Exactly. That is precisely the logic. So the leadership team get training here (Extended Diagnostic) and all the employees get training here (Implementation).

What that looks like on site is that all employees on site must go through one full day of Lean awareness. Just to get an understanding of what Lean is and how they will be touched by it and contribute to it.

Then there is a level up from that, and we call that Lean Pilot. We would expect that 10% of the site is trained to Lean Pilot level. That's an extended Lean awareness; that is 2 days. We would want those guys to be ambassadors and champion Lean for their areas.

Then we have a level up from that which we call Senior Lean Facilitator and when you are at that level you have been through all the training on SMED, 5S, problem solving and we expect you are competent to use those tools.

Is that a full time role?

No, that's not a full time role. These guys have other jobs, they just have that accreditation if you like because of the training they have been through and the application they have demonstrated on the back of the training.

Then there is a level up from that which is Master. A Master Lean Facilitator has a bit knowledge about change management and is more responsible and involved in the creation of the Lean Roadmap for the site specifically.

Who delivers that training?

Me. The plan is as we deliver more of that training and we have more and more Masters across the UK then we will devolve some of the responsibility to those guys to roll out as well.

That's what we call our Lean Academy. It's been running for one year now.

Is the Academy the term used for the training the Master gets, or is the Academy referencing all Lean training?

All training. To go through all the levels of training is 9 days in total.

How do you find getting people onto these courses, because 9 days is a lot of someone's time?

There is no doubt it has been a challenge. Labour is a key cost for us. It is always difficult for sure. It is a journey and we are maturing. What I have seen in my couple of years in this role is that it is getting easier. I think we are now at a point where the academy modules are being pulled for more and more. At the start it was a push; it is becoming more of a pull.

So, the phases make sense?

They do.

The content seems full enough?

I think the content is really robust if I am being honest.

I can't think of anything else you would put in it that you haven't already considered.

Level of detail? At the right level?

What would this be pitched at? Who would be taking this and implementing this?

The concept that I had, what I am trying to move towards developing, is a business, however they have come to the conclusion that they need to do CI could pick this up and get a sense of what is involved. It's not a manual but it is a guide.

Have I considered that and have I don't something about it?

Yes, that is the kind of level that I am trying to get; that's not to say that's what has been achieved at the moment.

Is there tools that sit behind each one of these titles? Does it expand out?

At the level this is at, no. I do know from experience, for instance if I want to assess the culture there are 100+ different culture assessment tools you can use. What I haven't heard through interviews so far is 'when I was assessing culture this is the one I used'. So that is not in there. Do you think it would be of use to have maybe a reference guide behind this?

I think it would be really useful. This is what is considered best practice for each one of these areas. It's probably multiple people's research projects pulling that together but I think it would be really useful.

You are obviously viewing this with 10 years of experience, which you can't remove yourself from when reading it, but as that business leader picking this up for the first time what do you think their impression of that would be?

I think I would envisage that business leaders probably don't realise that there is as much in it. Even as someone with experience, when you read that you realise there is a lot to do when you implement a CI framework. Seeing it in black and white like that brings it to the front of your mind.

As a business leader who perhaps has not had the same Lean grounding I think there is a danger they could be frightened by it.

Scared rather than inspired?

Yes. Whereas there will be some business leaders who will have a real appetite for this and get really excited by it and see it as a way to change the business and the culture.

Looking at this for the first time you are going to think there is a lot in it.

Perhaps, I don't know if this has been structured in any particular order, or perhaps could be so there is route within each of the phases that a business leader could take.

If we work through the process, and there is some kind of gate review perhaps at the end of each phase that you could then sanity check where you are in the deployment of this. It might be useful to try and simplify it.

So the addition of gate reviews?

Possibly. So the leadership team could sit down at the end of each phase and say 'have we done everything that we needed to do in Phase 1 and are we happy to move onto Phase 2?'

So, layout or sequence potentially a bit better, sign off at the end of phases. The content seems ok, but maybe a lot of it for someone picking it up for the first time.

Yes.

We talked about potentially having something underneath it with more detail. What about layers above it that don't scare people.

You could create a nice visual that sits above. We use a house or temple.

There might be an all-encompassing kind of model that says this is what we are trying to achieve; sits above.

I think that would be useful to be honest. A model would be useful.

Otherwise I think that's great. It's a really good document,

Anything in terms of audits? You mentioned audits. Audits aren't particularly mentioned in here. Anything else you do in terms of the sustain and evaluation?

We do our Lean support cycle. There are 6 touch points. They are a minimum. This is touch points between the central team and every site. There will be other sessions and other needs that happen. Session 1 is a 3 day annual audit. That's where we are going in, assessing where the site is, in conjunction with the site.

Stage 2 is 1 month after the audit. We get back together again and we reflect on the audit. Reflect on the output and how the site has received the outputs. Some receive it well, others less well. At that point we set some targets; where do you want to be in 12 months time and what are the activities to close that gap. We end up with a plan.

Session 3 is reviewing that plan; what have you done, are you on track, do you require any support? They might need training support for instance.

Session 4 is about the site themselves doing a self audit. They will take the audit document, they will take some time, they will compile their own report. This is a temperature check of whether they are progressing 6 months in and on track to deliver the targets set in session 2.

Within a month of that the central team gets involved again and says 'ok, let's reflect on yourself audit'. Let's ensure we are calibrated.

Session 6 is another support visit and then we are back into the 12 month audit, the next annual audit.

That seems to work for us. It's a process that has been around now for 2 years.

The framework currently doesn't have anything in it about audits, and it also doesn't have anything explicitly that says something comes out of it and it feeds the next phase.

I guess here (Evaluation) there needs to be some kind of measure of whether it is delivering what you want it to and what is the gap. That then gets fed back into the

implementation. You kind of have covered it with that loop but it is suggested rather than stated.

How do you go about celebrating success on site?

That varies from site to site. Some sites reward, some do not.

Monetary reward?

Yes, some sites do. This site does. Every month they give a £100 voucher to the best suggestion or who has contributed the most. Other sites believe that is not the way to go. Money is not a motivator.

Other sites have done something in the middle. Not monetary, but breakfast vouchers for instance.

Having seen across all the sites, what do you think works best?

Personal view is for it not to be monetary. I believe that CI is everybody's responsibility. I do not believe you should be financially rewarded for doing your job. However, celebrating success I think is massively important. Acknowledging. Saying thank you to people. Perhaps putting them up in flashing lights in some way, albeit some people don't like that.

I guess there is no one method that fits with all people or all sites but it is something we need to do more often. I think the answer is to do more of it informally. I think that is perhaps more powerful. To go out as a manager or site director and go up to somebody to say well done and that you value the contribution.

We have here 'Close Projects or Close Activity'. Is that done formally here or does it just close quietly and move onto the next?

Yes, I would say it is probably more so that. don't get me wrong there are some large scale projects that have more structure and are noticed more but in general CI activity will happen and there is not always a big event to celebrate that.

I guess something else we should do more of at this point, and I don't see it written down there either, is how we ensure sustainability; how do we anchor that improvement. So things like 30, 60 90 day reviews to ensure that it has stuck.

So whatever that improvement activity was, yes you close it but also has it stuck.

Yes, that is perhaps an opportunity there. Perhaps some kind of anchoring.

Any other thoughts on it before we move on?

No, I think that's it.

Thank you very much for your feedback, it is appreciated.

No problem.

Appendix I – Interview transcript: PR

01/02/16

Company Size:

How many full time employees do you have on site?

On site it think it's about 195. That's both directs and indirects.

What is the current turnover of the site?

Sales turnover; £70 million.

Current Position:

What is your current role?

Operations Manager. I prefer that title to my official one.

Which is?

Factory Manager.

How long have you been in this role?

3 years.

Company CI experience?

Does the company have a Continuous Improvement program in place?

Yes.

What areas of the business has that been implemented in?

In terms of the current program I would say all excluding sales. Not external sales but everybody else. That doesn't mean they haven't been going through their own improvements, whatever they have been doing, but in terms of the structured formal program that we are running everyone other than external sales. That also includes the 100 people at our other facility.

How long has this program been in place, or underway?

18 months.

How successful would you consider this to have been?

On a scale of 1-10; 8.

Ok

How do you measure that success? Is it tangible or intangible?

Both. I believe we have a suite of Key Performance Indicators in operations of which OEE is the primary driver and our link to the Lean activities. We have two real performance indicators; one is OEE and the other is the number of hours that we put to doing the Lean action activities. Whether that be training, blitz sessions in the factories, or teams etcetera that we are running. From a measurable point of view we have achieved the efficiency improvement targets for the last 2 years and for the hours we only set the target last year and we far exceeded what we were doing.

The intangibles, I have been part of an organisation, a global organisation, that has run programs like this across 80 odd factories, and seen how successful that was. With the resources that we have we are as good as that program given that difference in resources. In terms of what we have achieved and in what time scale.

Interviewee CI experience?

What was your role within implementing Continuous Improvement in your previous role?

Basically, I started off going through as a engineering manager when the program started and then I progressed to be the Continuous Improvement facilitator for the site.

How long were you in that role?

4 years.

Review Framework

The framework has been developed through literature and survey, and is intended as a guide to a manufacturing company wishing to start a Continuous Improvement initiative.

Without further explanation, what is your initial reaction to the framework?

Do you have a roadmap or a plan that you are following?

Yes. We are probably on version 13 or something like that.

I was turned off by 'Extended Diagnostic' to start with.

The terminology?

Yes. I suppose my first question, when is, how to explain it?

Certain programs, whether it be a Continuous Improvement program, it depends on what and when you want to use that for. If you liken it to, let's say the length of grass you are going to cut, so we've got in terms of tools and techniques such SPC etcetera, you need a level of control within the business I think personally before implementing tools like that.

So, when your grass is this tall there are tools and techniques you use. When your grass is like this there is change we can do, and then we can do change that's when I think the Continuous Improvement structure focus, there is still some low hanging fruit there, lots of opportunities there which people can achieve with the current level of capability they have. We might not have given them the skills yet and the knowledge but they have that capability and they can go away and do it.

There is a time before that depending on where the business is in its evolution where the grass might be this tall and you need to stick a tractor in the field first to cut it. Big business decisions and changes to be made which can fall under a banner of Continuous Improvement. You could that potentially as one of the drivers for doing it. Probably we a good example here. We have got the factory today, where scrap was at 9%. Scrap in 2007/08 was around 15%. We had 40 more people than we do today for making the same product. We had a factory here and we had a factory across the road. So we were inefficient because we were transporting product back and forth between the two. We had resources doing all our transport. We could have gone away and said 'how do we make this more efficient', however the business decision was no let's do the big change, get rid of that factory, throw all of the rubbish out of this one, reorganise the factory, do that investment. Take that unmanageable improvement that people on their own cant actually go away and do. For me Continuous Improvement is mainly about what people can do with the same level of capability and resources that we have got today, because that has to be our starting point. Yes we can educate and give people knowledge on different tools and techniques and then we can start investing in some of the improvements, but you have got to get those points first. This is not trying to make that decision for you, I think that is something that comes prior to this. What's the decision of is this the right thing for me to start? Talking to my team about actually implementing. So there is like a Step Zero that comes before this which is are we actually, and I suppose it is more of that leadership team discussion on, are we actually ready for this or are there things outside of the peoples control that we as a business need to do first. Then you get into this once you say yes.

I am not sure if I explained myself well or not there?

So if you have got to the point of saying 'yes'...

...I am not sure if this is asking the question of whether you have the structure to support that. One of the things I was aware of before going into this program is that we had to prepare for it. I suppose that is a little bit what steps one and two in here actually are. It was also in the structure of the organisation to support it. Any improvement program that is run, to be sure one thing that is going to come out of that is you are going to need to do more work. More work being hopefully there is lots of improvement actions coming out of it and therefore you need to put the time, resources in to doing those actual actions themselves. I think one of the measures that you need to look at to start with is, how good are we as an organisation at actually doing? Particularly, doing actions because if we are

no good at doing them today there is one thing that this is going to add and that is a longer list to the things that we don't do today. Therefore if you ask the question 'am I ready' in these phases here it has got to be about the structure as well. The worst thing you can do is start, get people really excited and then don't go and actually deliver on those improvements. You have got to have that structure in place ready for that bow wave of activity that is going to come your way. I think it is a question you need to ask upfront.

We did change here and put some additional resources in first prior to launching this.

Resources of what kind?

Mainly within the maintenance and engineering side. There is going to be three types of actions; those bigger business ones, there will be ones your operators and teams on the shop floor can do themselves, and then there are always those changes to the process and changes to the machine where you need a bit more of a skilled resource to come and assist you with doing all of that. We identified that weakness in skilled resource at actually doing the work we knew would come. If we didn't put that investment in it would have just died. We put the structure and resource in first knowing what we were going to be doing. I suppose you could say that was part of our extended diagnostic. We needed that in place in order for the implementation to be, or at least have a change of being, successful.

Is there something better than the extended diagnostic terminology that would make more sense or be more appealing?

You are going to make the decision are you going to go with this; yes or no? in order to make that decision you need to have evaluated all of this. So whether or not it is a yes/no evaluation, pick your words around it. Extended diagnostic does sound like I have got a machine down in the plant and I am sending some skilled resource in there to go away and do it. Once you know it its ok but if I was looking for a tool to take me through, which we did at the start; we did a fair amount of research in terms of looking at available information, studies that have been done before on those steps to actually go through. I will tell you now we have not found one where we said that is the one. We found that is a good bit, that is a good bit, and that's got a good bit in it.

As a PhD that is almost what I am trying to pull together. That's where I think where a lot of academic stuff goes wrong is it never moves outside of academia so you never get

something that someone in the real world will want to pick up so that is what I am trying to get.

That pick up point of what is it that I am looking at, needs to be clear as well. Clear and catchy. It can have what it wants in the structure of it but it needs to be clear what this is actually trying to tell me.

So as a business you have been 8/10 successful, and part of the reason is that you took that initial assessment, yes/no, and time to do that?

This here is all prior to implementation and the content of those 2, let's say there is 20 points in each of them, so there is 40 points. It is one of those things, you put the effort in up front and the results will be better. It is not about putting a little effort in, launch it, and then it all dwindles away again. All of this effort up front there is going to determine the success in terms of what you achieve and in what timescale you achieve it.

There is nothing to say that in doing it another way you are not going to be successful but what it is going to be is a lot longer to get to that point. And a lot tougher to get to that point as well.

Interesting one, 'complete a current state Value Stream Map'?

Yes.

In the first stage we never did it. Never did it this time, never did it previously. Could be beneficial but I am not sure. For me the business is looking at its performance and saying I want to go from A to B. you are making that decision based on your knowledge of the business and what you want to achieve. Then you are deciding in this section here is this the mechanism and the format, in terms of a Continuous Improvement program, that I am going to use to go away and deliver that. I considered nothing about a Value Stream Map in there. It might be one of the differences between individuals with no experience and then individuals with experience. Certainly within our organisation, we have people with a level of exposure to it.

So without putting it on a bit of brown paper on the wall you can grasp what would come out of that already?

Yes, is it going to work for us; yes or no? then you get into how do we make it work, which is all of the work we did up front then. The decision on are we going to do it and

is it going to be operations or is it going to be business, was all made without going into detail like that.

You either have a belief and determine it is the right thing to do, and then go away and make it happen, or if you haven't had that experience and exposure you may well need to do something. But you also need to have some exposure to know what is that, and what is it actually going to tell me once I have done it. So how do I do it and what is it going to tell me.

Is that a requirement up front, yes or no, is the question there.

Ok.

I would say for me that the terminology there is 'communicate any early success', for me you target one. You might do things in the background to facilitate it being a success as well even if the team wasn't going to go away and make it successful because you need that thing you can pin up on the wall that says that's what you can do. With all of you doing it we can do this now on a much larger scale.

Here, by design, I never did that. If I hadn't been trying to achieve something else I would have gone away and done it. We put a lot of effort in, I am not sure if you are aware we were acquired at the end of last year. We were sold at the end of last year. Part way through the first three quarters last year was very much around targeting the resource for improvements to create a big visual change in the factory. It was done for that reason; do your house up to get it ready for sale.

I would have done things slightly differently if some of the drivers behind it had been different. The driver to introduce the program was not that. I just used elements of the program we were in to do that for me. Focus the team on something I wouldn't normally have done. I do think it is important to have an early success.

And to make sure that happens?

Yes. It is a start of that culture change of they are backing it, we can be successful and there is the proof. You can take anyone in the organisation to see it. I think that is an important one to focus on going through it.

There is not a lot in there about the actual controls, and how you control it. That is something, I am not saying we struggle with it, we are changing what we do with it. I think it is an evolution of control within it.

To start with you have got the group who are going to come up with how we are going to do it and start it. Then the communication and buy in from people, so we want input then from the shop floor and for them to have a say in it. We sort of fumbled our way through that. We invited them in to that group of people who was really making the decisions on what are the strategic elements. They weren't ready for it; one because they hadn't been involved in the why are we doing it discussion up front and being out of their depth in those conversations. That's not their fault that was our fault. We were discussing things which they probably weren't ready for like autonomous maintenance etcetera.

We have sort of split now and we have a Lean Action Strategy Group and then we have the Steering Committee with the shop floor involvement. We are really using that as the communication side of it. Inputs to the suggestion scheme we have running, inputs to the newsletter we have just launched, really about understanding what people are thinking therefore how can we focus on the bits they think are really positive but also try to answer the questions on the bits that aren't so positive. So we did struggle with that control element of it, and we are still struggling a little bit 18 months in but I suppose we are continually improving what we are doing. Not so much in terms of what we are achieving on the shop floor in terms of the projects etcetera, I think we have some very good controls in there, this is really about the program management that we have got. I think we are sorted now in taking it further forward again. Even with all of those issues that have come out I am still saying 8/10 in terms of what we have achieved. I think it is, coming back to that structure is key to it. When we started this I had two key areas of management; the production side and the maintenance and engineering side. I said this is important and I put a new engineering manager in and I put a new production manager in. so the two key people in that factory were both in effect replaced...

Prior to?

Prior to or just going into it.

Selected I would assume as advocates of and with knowledge of how to move these kind of things forward?

No, not really. Recruited for their, not for their experience in Continuous Improvement, but for their way of working which would fit in with what we were looking to do. An engineering guy that is highly structured, highly disciplined, to be anal to that extent because that maintenance and engineering team needed that level of control within it. As I said, when you are going to launch an awful lot of activity their way it has to be structured, it has to be controlled in terms of how they are going to manage that.

And on the production side of it somebody who, those two people have got to be able to work together, which was difficult to find somebody who could work with somebody who was so highly structured and discipline in how he goes about things. He needs somebody who understands that's going to be a benefit but also is a very good communicator with the shop floor because they are the bulk of the resource we have got for doing these programs. Therefore you need to be able to switch them on to this program. I am not saying soft in any way but a good communicator and people person. It was a selection of people I thought could achieve what we needed.

That structure was not just about resource but putting the right attitude in place and the management structure to achieve it as well.

Do you think that needs specifically articulated within that somewhere?

At least know what challenges you are going to face. There is nothing to say you have to change that team. You could say I know what the weaknesses are within that support structure; evaluating the strengths and weaknesses of the support structure that's going to manage the implementation and the outputs from this as well. Outputs being actions and activities that we need to do.

You have to decide if you can change them or not. Either way; change them and then they become a convert or change them and replace them.

You said the control or the embedding it bit at the end is a bit lacking. Is there anything specifically you would put in there?

That for me, once you are past the 'are we doing it', that is the most important element; how do we sustain it?

We like lots of companies 'we have done it all before'. It goes for 12 months and then people lose interest in it, people change, we were a lot like that. sometimes as well it is actually it is the stability in some of the key management positions. I have been in this role now just over 3 years and I was in the company for nine years prior to that and I had 5 bosses all at this level. Therefore with every one of those individuals there comes change. Change in direction, change in their knowledge, and therefore any programs that are launched can change with those people. My objective in doing this was to put a program in place where it doesn't matter if the company fell out with me, it would continue when I am not here because it is not an add on, it is the way in which you work as a company. The way in which we continuously review the failures to learn from them and implement improvements. We continually challenge the KPIs that we have got and have programs that sit behind it. To me a lot of people think the physical work that is done in the plant in terms of the lean activities or in an office, that practical work you are doing in terms of workflow is what Lean is about. One of the most important things for me was being able to define in 35 words saying what is the strategy we have. This took 4 of us about 2.5 hours to come up with 35 words. I am doing one now; what is the logistics strategy to support the organisation. For me until that is clear how do you actually communicate to whatever area it is you are going into. If we are going to increase capacity without increasing costs; the efficiency is going to go up so I am going to work harder. That is how that statement reads to an operator. Therefore how we articulate that and communicate that into the what's in it for me then become the most important thing. We had to determine how we were going to get that message over. That is our operational strategy. We are not going to change it just because people are not necessarily going to like what they hear when we read that out to them. That is what we need to do. Therefore answering the what's in it for me then becomes very important at an early stage, and to show how you are going to improve people's working environments and ultimately what you are going to do with free time.

If that generation of free time is to reduce the head count then that goes in the strategy. Ours isn't. Ours is to develop people, to give extra training. It is why we have measures such as how many lean action hours we are doing. We are developing people as we go. There is a five step training program up there where we are looking to develop peoples skills. There is risk in that, and that is that you develop them and they go. Having all this work done up front defining how we are going to give people the knowledge to do all of this, that's the bullet points. How we are practically going to do it is a major task in itself.

That's the vision of what we want in this plant. You as operators will be leading improvement teams in the factory. You will be training your neighbour next door to you because we have given you the skills to be able to do that. That development of people was important to get across within it. That was the most important thing for me up front and one of the most difficult things actually was defining that.

Defining as a group what this is actually all about?

Yeah.

Everyone has their own ideas. The first question was, right what is the business strategy. It forces you to ask questions to be able to define because if you get this wrong, ok it could change if something happens in the business, but if you get it wrong up front it doesn't matter what you do it isn't going to bring value to the business.

What do we need to do to add value to the business? Defining that up front was difficult.

This is the most important I think, this sustaining it going forward. There is lots within our structures and if you ask different people, if you were to ask the CI guys they might say within that the process confirmation is important. The checking of standards within the plant. That is one element of sustaining it. How do we sustain the improvement? Ultimately this is about sustaining Continuous Improvement in our results. So what structure sits behind this? We have a weekly operations review where we focus on action areas for different parts; one is Lean, one is Health and Safety, and then once every 3 months we review the projects that we have got running. We review the performance in those measures and the detail then. Has anything changed in the 3 months. We are constantly, at the right frequency, determining what direction we are going in, where we are going to launch projects. Also don't be afraid to say, which really disappointed a particular individual, stop that because you have been banging your head against a brick wall for 18 months. All that resource I could have put somewhere else and any improvement would have been better than what you have got me. It's that structure and control that allows you to make decisions as you go through this process.

Structures to review it and reassess where you are?

Yes.

Don't be afraid to change direction a little bit?

Yes, if we know we have got this right (the strategy) and the measures that support that, which ones we are going to focus on, ultimately they all see what is their contribution to all that. your contribution is you are running that project, you are running that project, you are a part of that team, that is your contribution towards OEE which leads to that. I am now making your life harder or am I making your life easier? That allows them to see the link and to see that in action.

A lot of the stuff in front of me is metrics and numbers and performance improvement. Is culture change explicitly something you are trying to achieve or is that something that comes with it?

Fundamental to us yes. That is a result, for me, a culture change is a consequence of doing this correctly. you can change a structure to go into this, but you can't change a culture ready to go into it. It is an awful lot quicker to change structures than it is to change culture. It is a learning process for people and a change process. You will come up against those challenges going through it and therefore it is going to take time to do it. We need to understand, I think it said it in here, what culture you want at the end of the day. Based on what culture you have in your factory today. We are looking at metrics and measuring what culture and engagement we have got. We had a suggestion scheme in before running this and I think we averaged five a year. Now we are already at a run rate to achieve over 100 this year.

That's about engagement.

That engagement shows a shift in the culture we have on the shop floor. We are looking at, our target is not to get to a number, we are now looking for every employee to raise one within that 12 months. I don't care if one wants to go and raise twenty, but I want everyone to raise one.

Have you told the people on the shop floor that is an expectation of them or is that your own thing? Have you built it into their appraisal or objectives?

The shop floor don't have appraisals if you like. Yes we have made it clear that we want everybody to raise an idea. We have shared that with them and we shared that in the steering committee where we have members of the shop floor in with us as well. We are now trying to expose them to more as well. We have been quite introverted as a company, particularly on the operational side, I terms of not sharing with other local companies our

experiences and their experiences. We have done zero networking really in the 12 years I have been here but it is a big thing we are focused on now. We are looking to expose people that have never been to another factory and get them involved. That is a change in culture from us as a management team that we feel comfortable to allow these people to go and represent the company. Also to have an understanding of why they are going there.

On the management side of it we have got to believe and we have got to drive a success through, drive the program through, knowing that without it we are not going to achieve what we have set out to do within our strategy. Therefore we need, I am not going to say 100%, but I would say 80% of the people on board with us to drive those improvements.

That is the biggest amount of resource I have got. If I up skill them to generate improvements then we will achieve the targets we have set and probably exceed those as well.

Just to wrap up on the framework itself, you have mentioned a couple of specific points; you mentioned it probably has to more quickly tell you what it is about and grab you in.

Yes.

What about the use of the phases, the format?

It makes sense. What it is though is very short here (Evaluate/Sustain).

I suppose it depends what you are looking for as an output from it, or an outcome. In that if somebody is thinking about using TPM as a banner within its pillars it brings from a maintenance point of view a route the maintenance team should go through depending on where you are. It puts a structure and a program to all support functions within the business. Now, I would say that's the way larger organisations go; take that structure and implement that way of working within their organisation. We are not, and I think that is another thing up front, you have to decide what you are actually going to call this. You could say we are launching TPM, but what is that going to mean to us as an organisation? What bits of it? If somebody goes and gets a book on TPM...

...like Six Sigma for instance you could read about all the stats and get quite worried...

...yes. again it is why this element up front is so important; deciding how you are going to go away and do it.

If this (Diagnostic) is 3 months, this (Design) could be, it depends on the size of the organisation, but this is another 3 months, so you are 6 months in this stage. I would say

we are still in our implementation phase now so we are 12 plus months here. We have currently close on a 4 year plan from when we started. We go out to 2018 in the plan. That there (Evaluate/Sustain) is 3 plus years worth. So to maintain this going forward for me you need the structure and control in place that then manages this going forward. Have an understanding of what that is actually going to be.

So a strategy, the metrics, and on the back of that the structure and control mechanisms that review those and say is what we are doing giving us the output we desire?

Yes, is it still the right thing to support where the business is going? Is it giving us the outcome that we want both in terms of impact on the metrics that we want and change in that culture of our people.

That's where, I know it is currently just one little phrase 'sustainability loop' but that is where it would be feeding back and continuing to evolve?

Yes, I suppose we are like lots of manufacturing organisations, it starts here in the physical manufacturing plant. The plant is 12 months into its implementation but we are only about to start the implementation in the offices. Our other factory is only 3 months into its implementation. There is also a staged implementation plan as well depending on what the scope of it is. That scope will determine how you implement and where and when because you will repeat yourself. You have done all your communication you have done all your leadership in the factory. You have now got to go back and do exactly the same in the office side of it. One thing we have to be mindful of is that we are now going back to here 12 months ago. People don't have the same level of understanding as we have got. Therefore we have got to go back to those basics again and start the process again; engagement of people, communication with people.

For us, we have now started an Extended Diagnostic for the next part of the business we are going into. That is a continuous cycle within itself.

That makes sense. Don't know how I capture it on one page but I know exactly what you mean.

How do you personally demonstrate your commitment to the Continuous Improvement program?

I suppose in a number of ways. Physically; so I get involved in activities. I get on my boiler suit and I go and clean and scrub. I painted walls down in our other factory. It's showing the commitment that potentially the management team haven't shown before. It's the old adage of walking the walk.

I get involved in one of our sustainability loops which is the process confirmation. People go and check standards, including operators. An operator will go and check a standard in your area. We have just started, and this is why the cultural change is so important going through it, because having operators going and checking each other's work; what is I find something wrong? Well he just hasn't followed the standard so you make clear to him that he hasn't followed the standard. Its then our job to go round and identify what the actions are out of that. we go checking the checkers if you like in terms of the management team.

Really then it is about providing the continual vision, belief, coaching or people. There are tough times in it, there are good time in it. Basically trying to keep the whole thing on track. I try, yes I go and get involved in activities, but I try not to be too involved in the whole process. It is one of those things when you are stood back from it you can see sometimes what we should be doing.

It is that coaching and support and praise for people as well.

You do have a plan or a roadmap that you are following?

Yes.

And you have said as well that the scale and the pace of the roll out...

....we got it wrong. That is one of the reasons we are at version 8. We underestimated. We set the scope but I think we underestimated significantly the scale of the challenge ahead of us and what we could achieve within the timescales we were looking at. I set exceptionally challenging timescales knowing that we weren't going to achieve them but that if I set lower ones we wouldn't have got as far as we did. Overall, even in terms of how long are our projects going to run for and the level of resource, we have learned a lot. I don't think, even though you have done it before, even sites within the same group have different cultures within them and different challenges within them, different output needs. I think no matter how much you put in here you won't get it right. We are 18 months in and we are on version 8 of that plan. You need to review the plan and

understand where you have been successful and where you haven't. You could have the PDCA cycle right the way along.

You mentioned that the initial assessment and then the design of things took 3 months and 3 months, so you were 6 months without any output? Did you have an activity going on in that period or did you deliberately not?

We didn't stop doing the normal projects etc that we were doing but we changed nothing. We waited and effectively launched because we committed to training almost 300 people through that program. If we didn't plan, I am not saying it was 100% successful, but it was pretty successful in what we set out to do. There wasn't a bad bit of feedback throughout it all that I am aware of. We didn't do things when we were in that initial 6 month phase. It was all about what are we going to do, how are we going to do it, how do we support it?

One of the benefits from working with SMAS is that we personalised anything they were doing. I think that is the other thing you have to up front is understand what is within your capabilities and what is not. For us, delivering the training, whether it is within your skills or not is almost irrelevant, it depends whether or not you can support that. we weren't going to use a consultant group who were going to tell us how to do it, we were going to use support from SMAS to deliver the training and then support the program. Which is different to running the program.

SMAS weren't the first people we went to do that training and support for us but the others weren't looking like the right approach for us.

Understanding if you are going to do it all alone or if you are going to use some external support and what support. That will depend on what the knowledge is with the organisation etc.

I would expect many companies to need at least an element of external support, it is just to what extent.

To what extent and what applications within that program are you going to use it for.

Were the management team educated as part of the roll out?

Yes.

All?

Yes.

To what extent?

Everyone went through that 4 hour session. There were 2 people who didn't. That was our CEO and CAO. I will clarify that because we actually ran a session prior to that which was a 4 hour leadership session. The leadership team including up to the CEO were in that session which was part of us in the very early stages of this decision making process; are we going to do this now? So yes they were exposed to it. We purposely didn't put them in those sessions. We felt it might prevent people who were in the sessions with one of those two fully participating in it. It was a conscious decision to leave them out that part of the training however they had already been through a four hour session.

What was in that leadership session?

Everything down to the types of wastes; the 7/8 types of waste. It was the basics of Lean.

What's your approach to celebrating success, and to reward and recognition?

Different things we use. We have our suggestion scheme 'your ideas matter' and for implemented suggestions, it is almost irrelevant the value of that suggestion, every month if there has been 3 or 4 implemented in that month the steering group select the best one; those nice little things that are making the difference to people and what they do.

We reward them with a voucher, maybe £25. If 5 people did something we might give them a £10 voucher each.

For the teams that are running, they are just about to finish next week, and we are going to give them some branded mugs or something. Give the team something for achieving their target. It might be small but it is more about the recognition.

We don't have this if you save an amount of money you get this %.

It's how can we get creative in terms of recognition? One individual didn't want his voucher so he asked if we could give it to a charity. No problem. We won't force anything on anyone. We want to recognise what they have done and offer, if they don't want that is fine.

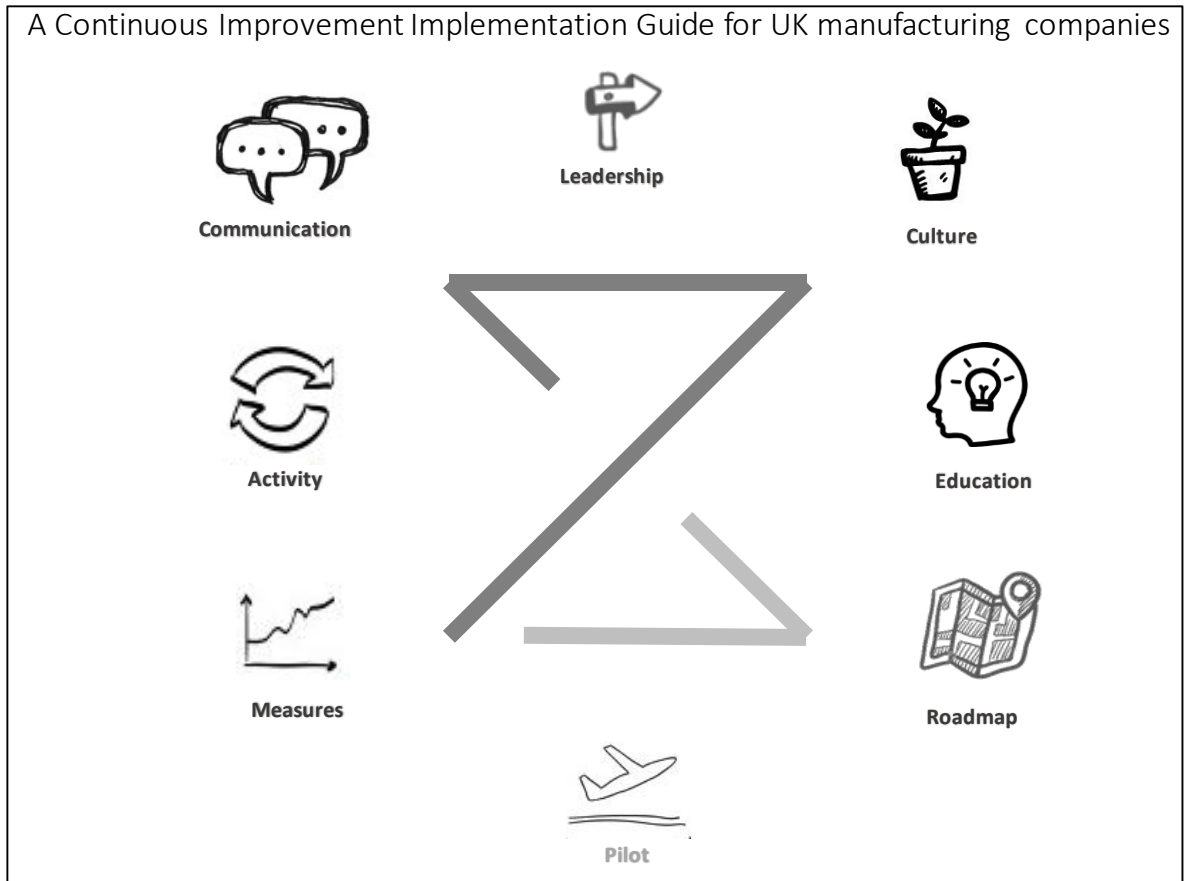
On some of the events when people have come here the teams have presented to those people. The teams are starting to present to customers when they come in the factory. That is a form of recognition that I get to show off to somebody.

That's everything from me unless you have got any final thoughts?

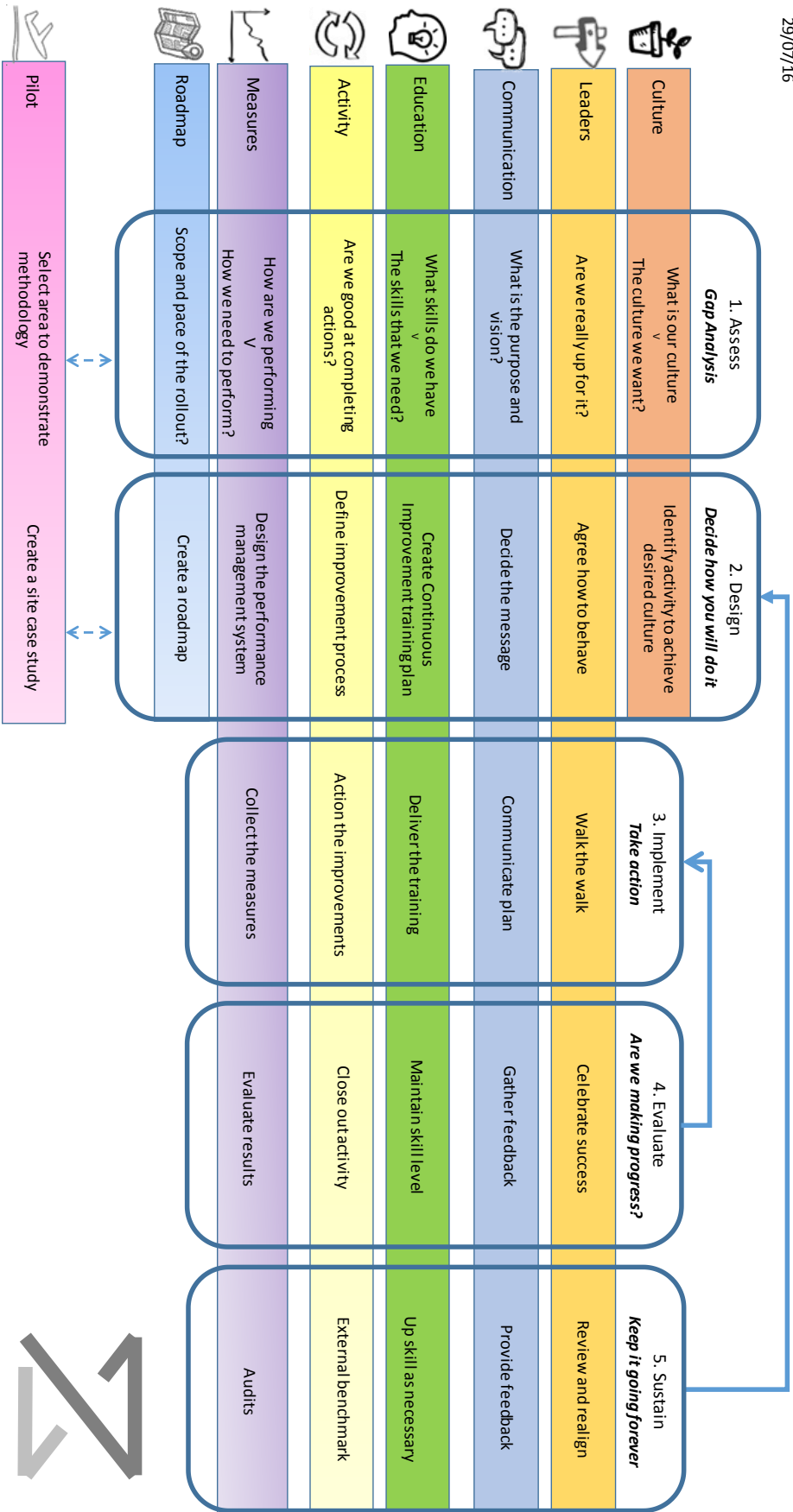
No.

Thank you very much for your time. It is much appreciated.

Appendix J – Top layer of final framework



Continuous Improvement Implementation Framework for UK Manufacturing companies: Management Overview



Appendix K – Middle layer of final framework

Appendix L – Focus Group Questionnaire

Q1: What are your first impressions of the framework?

Q2: How user friendly do you find the framework?

Q3: How useful would you find the framework?

Q4: Is there any content you find surprising?

Q5: Are there any specific parts of the implementation process you think would be particularly challenging?

Q6: From your experience, does it seem like there is anything missing?

Q7: Any other comments or questions?

Q8: Would you use the framework?