EXPLORING THE RELATIONSHIP BETWEEN LEAN LEADERSHIP AND LEAN PRACTICE TO ACHIEVE ORGANISATIONAL LEAN THINKING

By

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Authenticity Declaration

I declare that this thesis is wholly my own work except where I have made explicit reference to the work of others. I have read the DBA guidelines and relevant institutional regulations and hereby declare that this thesis is in line with these requirements. I have discussed, agreed, and complied with whatever confidentiality or anonymity terms of reference were deemed appropriate by those participating in the research and dealt appropriately with any other ethical matters arising.

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John Cheevers Date

Dedication and Acknowledgements

I dedicate this thesis to all those who have helped me in my life long pursuit of knowledge. In particular, I dedicate this study to my wife, Emer, and my three amazing sons, Jack, Canice and John, who never doubted that I would succeed and who are the 'home' that I knew was waiting for me at the end of each day's study. I jointly dedicate this achievement to both my parents, Marie and Jackie, who through their encouragement and belief in me, started me on the road to be the best that I can be.

I acknowledge the following people for their support. To all my generous mentors, who never gave me the answers but patiently showed me how to find them. I especially mention my DBA supervisors, Dr Patrick Lynch and Dr Anne-Marie Ivers for the many early mornings, late nights and nearly six years of support that they have provided to me. Dr Noel Hennessey and Dr Sean Byrne were always there for me also and still remain as willing mentors to this day. I also acknowledge my former manager, John Mehigan, who is the 'real-life' example of what a lean leader can be and a shining example of all that is required to both lead a team and follow a vision. My amazing siblings, Margie, Sharon, Paul, Laura and Julianne, who never tired of asking me about my journey and driving me forward, no matter how slow the pace seemed.

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To echo the sentiment of most lean journeys, it is not the destination but what we have learned along the way and the actions we take, that makes the effort worthwhile.

"*Better done than said*"

(Frank Sonnenberg)

ABSTRACT

It is widely known that the Lean Thinking concept has been a breakthrough business performance enhancer since it was first embraced by the wider global commercial community in the 1990's. Furthermore, when an organisation is able to embed lean thinking holistically throughout their organisation, the positive results can move beyond profit and actually enrich the lives of all the employees who work within its realm. However, there is also an acknowledgement that lean implementation failures are unacceptably high with as little as one in ten organisations being able to sustain their efforts. This has caused consternation for both lean academic and practitioners alike and as a result not everyone is convinced that attempting to achieve organisational lean thinking is a worthy business endeavour. This has also resulted in significant academic unrest and discussion regarding the claims and assumptions made within the organizational lean thinking literature. The main concern is the lack of knowledge on how organisations successfully implement and embed organizational lean thinking in the long term. The origins of lean literature are rooted in positive 'feel-good', practitioner-written vignettes about lean success stories. Even when the discussion is elevated to consider what has been going wrong with lean, it is still limited to positivistic case studies. If and when leadership is discussed as an enabler for sustenance of lean thinking, it tends to focus on listing required leadership traits. There has been little consideration of the complexity of how organisational lean thinking works and the dynamics between lean leadership and lean practice to sustain it. This study has taken an interpretive research approach and utilised a single case-study to explore and fully understand the phenomenon of organisational lean thinking. The findings are rich and have uncovered new knowledge that will help untangle the complexity and provide guidance to lean leaders.

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LIST OF ABBREVIATIONS

CAQDAS	Computer Assisted Qualitative Data Analysis Software
CI	Continuous Improvement
DBA	Doctor of Business Administration
JIT	Just-In-Time
KPI	Key Performance Indicator
LEO	Local Enterprise Office
OLT	Organisational Lean Thinking
PDCA	Plan, Do, Check, Act
SETU	South East Technological University
SOP	Standard Operating Procedure
SMED	Single Minute Exchange of Die
TPM	Total Preventative Maintenance
TPS	Toyota Production System
VS	Value Stream
VSM	Value Stream Manager
WIT	Waterford Institute of Technology

GLOSSARY OF TERMS

5S - At a basic level, this is a workplace organisation process that will improve housekeeping but at a deeper level, 5S is a methodology that focuses on visual management and is the first step towards achieving and embedding a lean mindset. The 5S process is divided into five steps – Sort, Set-In-Order, Shine, Standardise, Sustain (Hines *et al*., 2008).

Agile Manufacturing - Agile manufacturing is a customer focussed manufacturing methodology that places an emphasis on being able to quickly meet changing customer demands, needs or wishes in order to create a competitive advantage through organisational speed, response, and agility. This involves the use of tools, technologies, and training to enable employees to use their expertise to respond to customer requirements while controlling quality and production costs.

Theory of Constraints – Also abbreviated as 'TOC', this is a focus on the process constraints or bottlenecks that are preventing an organisation from reaching their goals or increasing their output (Melendez *et al*., 2018). The theory advocates putting resources behind improving capability at these areas of the process that are constraining the other parts in order to make all process steps equal and thus improve process flow.

Doctor of Business Administration – A part-time programme that focuses on the application of theoretical knowledge to the advancement of management and business practice, and is designed to develop the analytical, conceptual, and critical thinking skills of senior business and management professionals (South East Technological University, 2020).

GEMBA – Also known as 'Genba', this word can be translated as 'the real place'– this lean concept is very simple, in that it works on the premise that if you want to improve something in your process, the leader goes to the place where it is happening, observes what is going on and interacts respectfully with the people involved in the process on a regular (daily) basis (Spear, 2004; Bodek, 2008; Mann, 2015).

Hoshin Kanri – A strategic decision-making process that focuses resources on the critical initiatives that are needed to achieve the organisations overall goals (Hines *et al*., 2008).

This term is used in this thesis in conjunction with discussions on Strategic Organisational Alignment.

Jidoka – This lean principle means automation blended with human interaction-automation with a human touch or 'autonomation', a combination of the words autonomous and automation. The concept of integrating intelligence to machinery makes it easier for a single operator to run multiple machines with minimal effort which can lead to productivity increases (Hines *et al*., 2008).

Kaikaka – This lean process is very similar to the kaizen process which is explained next but it operates at a higher level than kaizen and involves more radical changes that can cause significant disruption in order to achieve major organisational improvements. This lean technique is also known as 'kaizen blitz'.

Kaizen – This is a structured lean improvement process where the leader engages the people working within the process through a coaching and mentoring approach to discuss an opportunity, suggest a path forward and then be involved directly in the changes that are required to improve the particular activity (Liker and Rother, 2011; Mann, 2015).

Kanban – Kanban's are signalling systems that control the manufacture of products or the movement of product so these transactions only occur when there is a signal that is linked to an actual requirement from the customer (Hines *et al*., 2008).

Leader Standard Work – is an effective lean process to sustain lean gains. At a high-level, it is a checklist that governs the leader's behaviour and sets expectations on what the leader must do to prevent any backsliding from previous lean thinking progress. This can often be through consistent focus on the process and not always the results and this standard work should take place at GEMBA.

NVivo – This is the qualitative data analysis software tool being used in this study during the thematic analysis stage. Data from the collection methods are gathered together in this software package either through manual transcription or additional software for analysis through in-built software tools. The version being used in this research is NVivo10.

Sensei – An external lean expert who works with an organisations leadership team to teach, develop and embed their levels of lean thinking to drive quality and productivity improvements (Reke *et al*., 2020).

Six-Sigma – this is a data-driven leadership approach using specific tools and methodologies such as DMAIC that lead to fact-based decision making. This methodology is mainly focussed on reducing defects through stabilisation of process variation and improving the process yield (Gijo *et al*., 2011).

Standard Work – this a lean sustaining technique which means finding the best way to carry out a task and documenting it into a Standard Operating Procedure (S.O.P.) so that everyone performs the same actions to do the same task in the same way (Hines *et al*., 2008).

Section 1

INTRODUCTION & DBA RESEARCH OVERVIEW

1.0 Introduction

Although Ireland is still ranked highly in Europe in regard to its labour productivity (see Zhuang *et al*., 2023), in aggregate terms, Ireland still lags considerably behind other EU and OECD countries in terms of productivity. According to the OECD, Ireland has a large population of very low productive companies that co-exist with large high productive multi-national organisations (OECD, 2022). Ireland's main productivity challenges centre around the costs of doing business and the need for significant investment in future infrastructure along with the need to boost broad based productivity growth and to improve our labour market performance (National Competitiveness and Productivity Council (NCPC, 2022). Consequently, Ireland's competitiveness has not kept pace with its rivals and this is hindering Ireland's ability to achieve sustainable economic growth. Chief amongst its many recommendations to the Government on how to address these challenges is the need to build sustainable growth through controlling costs, increasing business performance, and improving productivity.

As a result, increasing Ireland's productivity remains a primary focus for the Irish government and it have launched several initiatives that centre around the adoption of organisational lean thinking by Irish businesses to achieve a competitive advantage by increasing productivity through lean practices (Local Enterprise Office, 2020). One of these initiatives is the 'Lean Business Offer' which is now being facilitated by the three leading Irish national Agencies - Enterprise Ireland, IDA Ireland and Údarás na Gaeltachta (TCD & Keegan, R., 2016). Ireland invests significant monies in supporting productivity and the overall spend in 2023 by the Irish Government is projected to be in the region of 1.62 billion euros (Department of Public Expenditure, 2023). The aim of this investment is to drive productivity through the introduction and use of lean thinking in Irish industries.

Investing in enterprise excellence and lean initiatives to drive efficiencies and enhance productivity is consistent with the lean literature where there is a widespread belief that lean enhances competitive advantage while embedding a sustainable culture of organisational lean thinking (see Lewis, 2000; Poksinska *et al.*, 2013; Lawal *et al.*, 2014). Indeed, Liker (2004) describes it as a way of "shortening lead time by eliminating waste in every step of a process [which] leads to best quality and lowest cost, while improving safety and morale" (p. 25).

However, despite the widespread endorsement of lean, there is an increasing body of evidence illustrating high failure rates, with as little as one in ten organisations able to implement a sustainable level of lean thinking in their organisations (Bhasin, 2011; Kinder and Burgoyne, 2013; Dombrowski and Mielke, 2014). One of the common assertions as to why lean fails is the over dominant focus on lean tools and processes (Radnor, 2011) and a narrow focus on short-term gains (Kinsman *et al.*, 2014; Lawal *et al.*, 2014) at the expense of embedding lean thinking within an organisation (Mann, 2005). Most lean advocates agree that when an organisation moves beyond simply utilising lean tools to embedding lean practice through lean leadership, it enhances an organisation to sustain lean thinking (Hines *et al*., 2018; Laureani and Antony, 2019).

Others have argued the role of lean leadership is the missing factor in the sustainability of lean implementations (Mann, 2009, Pham and Thomas, 2012). Indeed, there is convergent evidence within the literature that it is the interaction between leadership and the lean practice elements that define a lean organisation (Roth, 2006; Dombrowski and Mielke, 2014; Trenkner, 2016). For Netland *et al*. (2019, p. 548) "if a company is not able to engage front-line management and shop floor employees in the lean activities, it is by definition, not a lean company". Others such as Hines *et al*. (2008) and Laureani and Antony, (2017) have also identified leadership as the main success factor for lean transformations, as well as the primary cause for failed transformations. For Holmemo and Ingvalden (2016), "the failure of lean transformation is often attributed to the lack of management support and commitment" (p. 1333).

Several important observations can be made about the current state of research in the field of lean and organisational lean thinking. For both Aij *et al*. (2015a) and Laureani and Antony, (2017), despite the acknowledgement within the literature as to the importance of lean leadership to the embedment of organisational lean thinking, there is a lack of knowledge about the underlying mechanisms and processes, that are needed from leadership to achieve organisational lean thinking. Another important observation is the scarcity of the literature for more research in this area (Womack and Jones, 1996). While it has almost become a prescription of faith that lean thinking is the desired state for organisations, most research is conceptual (Flynn *et al*., 1990), or practice oriented in nature (Hines *et al*. 2004). If successful organisational lean thinking implementation is scarce, then it implies an impetus to research it even greater as it might provide

organisations with knowledge to sustain all efforts in that pursuit. Therefore, this research contributes significantly to both practice and research.

2.0 The Emergence of the Research Problem: A Personal Reflection

The purpose of this section is to elucidate to the reader how the researcher's experiences and worldview have guided this project's focus. For this reason, I am discarding the usual third person language for this section, as I perceive the first-person usage is more appropriate considering the content of the subject matter.

At the start of my professional career, I worked in several general operative roles in both the pharmaceutical and medical device industries. During this time, I had first-hand experience of what it feels like to work in a team led by good leaders but also how employee engagement is affected by poor leadership. When an opportunity arose for professional development into a leadership role, I quickly realised that in order to be successful at this level, further education was going to be paramount to my progression. I attended and achieved a Bachelor's degree in Business Studies at the then Waterford Institute of Technology (now SETU) and later continued my studies at Dublin City University (DCU) through a Master's degree in Operations Management. The Master's degree was achieved through the completion of a thesis which was heavily rooted in organisational culture, employee engagement and leadership.

Prior to taking up my current position as a Continuous Improvement manager, I have had over twenty-five years' first-hand experience working in various people leader roles, with the last twenty years working in Lean organisations. During this time, I became interested in both the practice and philosophy of Lean and went on a learning path which started with the attainment of both the yellow and green belts in Lean before becoming a licenced Lean six-sigma black belt. What became clear to me during this time was the difficulties in sustaining even straight-forward lean practice elements such as employee lean suggestion schemes and 5S programs. It was my experience that despite enthusiastic beginnings, many of these lean initiatives were not sustained and several re-launches were necessary to establish them into the organisations lean culture. The frustration experienced (not only by me) for all this wasted effort was compounded by a growing sense of apathy amongst the workforce towards lean initiatives. This was a major factor for me when deciding to study and explore why these implementations did not succeed and what could be done better from a practitioner's point-of-view.

Thus, my DBA journey began in late 2018 when I joined the doctoral programme at SETU. Initially, my research was broadly within the context of employee engagement, lean culture and leadership in order to understand how organisational lean thinking could be embedded within an organisation. After several iterations, the research question was refined to 'Understanding the relationship between leadership style and successfully sustainable lean organisations'. When I was assigned two DBA supervisors in January 2020, discussions on the research question were further developed. The initial feedback from the DBA supervisors was that in order to understand the role of leadership in supporting 'successful' and 'sustainable' lean organisations, there was a requirement to break down and define the parts of the research question. This necessitated a journey of discovery into the lean literature to fully understand and appreciate the academic discussion on this topic to date.

In essence, there have been a number of major literature paradigms that have influenced and given direction to my work. Three areas of lean literature have shaped my thinking – the origins of lean and the evolution to lean thinking, the inability of organisations to sustain lean implementations and the possible role of leadership in the reversal of this trend and lastly the concept of organisational lean thinking.

The first body of literature that shaped my thinking was that pertaining to the evolution of lean manufacturing to lean thinking and specifically the works of Womack *et al*., (1990). It was from Womack *et al*.'s research and others (see Spear, 2004; Hines *et al.*, 2004; Kimsey, 2010; Radnor, 2011) that I began to realise that lean manufacturing as a concept can be practiced beyond the shop floor and can add value right across every department in the organisation. The concept of lean as an enterprise-wide endeavour introduced the notion that lean can be beneficial in many other parts of the organisation such as the supply chain, dealing with customers and the overall management of product quality. As a researcher who had previously only a practitioner's viewpoint of lean that was restricted to operations, meant that I underwent a voyage of discovery that led me to the wider organisational concept called 'lean thinking' (Womack and Jones, 1996; Bhasin and Burcher, 2006; Emiliani, 2007). My interest in organisational lean thinking was heightened. My readings of the literature in conjunction with discussions with my DBA mentors allowed me to realise that lean thinking was an attitudinal and behavioural state of being that needs to be supported by a strong lean culture that values learning (Hines *et al*., 2004; Liker and Rother, 2011).

This led to perhaps one of the most influential directional changes in my research journey and was influenced by literature pertaining to lean implementation failures (Baker, 2002; Mann, 2005). Indeed, while the literature was overall positive in relation to lean, the failure rates were exceptionally high at 90%. One dominant theme that emerged from the literature was that there was an over dominant and narrow focus on lean tools – in fact lean tools had almost become the 'de facto' meaning for lean. This pointed to there being something missing in how industries and sectors outside Japan were failing to grasp the holistic aspect of lean as a philosophy (Poksinska *et al*., 2013; Hines *et al*., 2018). As a researcher, I became interested in discovering what was going wrong and this directed me towards literature on the importance of leadership in lean implementations.

Two publications in particular sparked my interest – Mann's 2009 article on leadership being the 'missing link' and Likers and Convis's 2012 exploration on lean leadership as being a separate and 'stand-alone' leadership model. These were pivotal sources of knowledge and the area of leadership's relationship to organisational lean thinking began to take precedence in my thinking. As a result, I began to focus on general leadership theory and what exactly were the ideal leadership attributes to bridge the gap in our understanding of organisational lean thinking and turn the tide on lean implementation failures. Moreover, some of the literature was suggesting that the relationship between the organisational elements of lean leadership and lean practice was the key to understanding how organisational lean thinking could be achieved. However, on review of the literature, I soon discovered that although it had been acknowledged that these elements implies further examination, it had nevertheless been a neglected area in lean theory.

Although most studies tend to acknowledge that the success rates of lean implementations are poor (Ringen and Holtskog, 2011; Pedersen and Huniche, 2011) and that lean leadership is a key factor in the implementation process (Mann, 2009: Pham and Thomas, 2012), there is still a lack of understanding to how lean leadership actually improves and sustains lean implementations. I realised that in order to understand organisational lean thinking, focus must also be directed at understanding and elaborating the relationship between lean leadership and lean practice and this became the focus of my research. While the primary objective of this thesis is in its contribution to practice, it is important nevertheless to highlight that the research will also provide a number of important theoretical contributions as well.

3.0 The Objectives, Sub-objectives and Method

The primary focus of the research is exploring the relationship between lean leadership and lean practice to achieve organisational lean thinking. The motivation for this study is that existing research is incomplete in our understanding of exactly how leadership interacts with lean practice to sustain lean thinking at an organisational level. As this is an exploration, several supporting objectives have been developed to help and evolve the research's understanding of what organisational lean thinking is and then to understand the constructs within this concept. For this purpose, the supporting research objectives are:

- To investigate the concept of organisational lean thinking
- To explore the nature of the relationship between lean leadership and lean practice
- To explore the relationship between lean practice and organisational lean thinking
- To explore the relationship between lean leadership and organisational lean thinking

3.1 Method

Based upon an interpretive philosophical stance, the research strategy is exploratory in its nature as it seeks to *understand* rather than to *measure* (Ritchie and Lewis, 2003). The research utilises a single case-study approach focusing on the dynamics between lean leadership, lean practice and organisational lean thinking. An insider researcher's approach was undertaken and a more thorough account of the underlying philosophy, research process and methodology of the current project will be given in Section 2, specifically papers two and three.

4.0 Definition and Clarification of Key Concepts

This research will explore the many elements of the concept of organisational lean thinking from its origins as lean manufacturing at the Toyota car manufacturing plant in Japan to the constructs of lean practice and how the relationship between lean leadership and lean practice is vital to its sustenance. Given the multidisciplinary use of similar terms

and concepts, the following sections will present the use and meaning of the key concepts in this thesis.

4.1 The Lean organisation

Lean manufacturing originated in the 1950's from the Toyota company's manufacturing method called the 'Toyota Production System' or 'TPS' (Mattos *et al*., 2016). It did not get worldwide traction until the late 1980's when lean publications brought the concept to the outside world (Liker, 2004; Yamamoto *et al*., 2019). The first of these publications is an overview of TPS called 'Toyota Production System: Beyond Large-Scale Production' and this was written in 1988 by the *then* plant manager of Toyota, Taiichi Ohno, who is now regarded as the founder of lean manufacturing. In 1990, a second book called 'The Machine That Changed the World' (Womack *et al.*, 1990) introduced the 'lean production system' (Cusamano, 1994; Spear, 2004; Seddon, 2005; Emiliana, 2007) and the concept of lean found favour outside the Toyota car manufacturing company and was adopted worldwide in many varied industries. Liker (2004) describes the lean process as a way of "shortening lead time by eliminating waste in every step of a process [which] leads to best quality and lowest cost, while improving safety and morale" (p.25). After the introduction of the five principles of lean (Womack and Jones, 1996), lean started to move beyond the production floor to become an enterprise-wide lean system (see Spear, 2004; Hines *et al.*, 2004; Kimsey, 2010; Radnor, 2011; Bicheno and Holweg, 2016).

Lean organisations use a range of tools, operating systems which combine as lean practice, and leadership philosophies to achieve and maintain this goal and everyone in the organisation is included in this effort (Kimsey, 2010, Lawal *et al*., 2014, Goodridge *et al.*, 2015, Maijala *et al*., 2018). This holistic approach to lean and the focus on the leadership aspect of lean (Liker and Convis, 2012), developed into Organisational Lean Thinking (Ries, 2011) and has now evolved from a car manufacturing production system into a globally accepted best practice in most industries (Kimsey, 2010).

4.2 Lean Practice

The term lean practice is a holistic, enterprise-wide process and consists of lean practice elements such as Lean Tools and Processes, Lean Culture and Principles and Strategic Organisational Alignment (see Dombrowski and Mielke, 2014). The most common lean tools and processes are 5S, just-in-time (JIT) standardised work, cellular manufacturing, single minute exchange of dies (SMED), total preventative maintenance (TPM), value-

stream mapping (VSM) and Kaizen (Tasdemir and Gazo, 2018). However, lean practice should not be confined to just lean tools (Netland *et al*., 2019, p. 543).

The organisations lean culture and principles is the area where lean philosophy gets embedded, where the lean principles are reinforced and it provides the foundation for the sustainment of lean in the organisation (Goodridge *et al*., 2015). Mann (2009) describes the lean culture and principles of an organisation as "the way we do things here" (p. 17). Whether or not, a lean implementation is sustained, depends on how developed a lean culture is (Poksinska *et al*., 2013) and without a stable organisational culture, organisational lean thinking will not be sustained (see Dahlgaard *et al*., 2011; Hines *et al*., 2014; Mann, 2015; Aij and Rapsaniotis, 2016; Laureani and Antony, 2016).

An Organisation's Strategy and Alignment provides the holistic element to a lean practice system and ensures that all areas of the organisation are working together to achieve their goals. This element of lean practice is also known by the Japanese term of 'Hoshin Kanri' which can be translated into the 'shining needle' of a compass (Hines *et al*., 2008) and it refers to the deployment of resources and the alignment of strategic priorities within an organisation (see Dombrowski and Mielke, 2014). This strategic alignment is often expressed within an organisation through its planning department, its resource deployment and its vision statement and it is the process used to cascade the high-level objectives of the organisational downwards through-out the various functions so that everyone has the same focus and is working towards the same goals (Liker, 2004).

There are two other important enablers for lean practice in a lean organisation – structured learning (Hines *et al*., 2004) and active communication (Van Ruler, 2018). Structured learning is considered as a prerequisite for lean tools and processes and the embedment of lean culture. The lack of active communication is also considered as a barrier for the strategic alignment element of lean practice and is often the reason for the wasting of valuable resources such as the organisations time and money and the lowering of employee engagement (Singh *et al*., 2014). Hines *et al*., (2008) go further and state that an organisation having strategic alignment "is not enough in itself. What you need is a strategy that is fully communicated and deployed throughout the organisation" (p. 9). Thus, in this thesis, lean practice consists of Lean tools and processes, Lean Culture and principles, Strategic organisational alignment, Structured learning and Active communication.

4.3 Lean Leadership

There is a lot of discussion in academic literature about the concept of leadership. As a result, there are many leadership definitions being proposed, however this thesis adopts Yukl's (2006) definition where he defines leadership as "the process of influencing others to understand and agree about what needs to be done and how to do it, and the process of facilitating individual and collective efforts to accomplish shared objectives" (p. 8). A particular focus of this research is the importance of lean leadership in the sustenance of lean implementations. Like Hensley (2017) and others (see Bodek, 2008; Dahlgaard *et al.*, 2011; Pham and Thomas, 2012; Laureani and Antony, 2016), this research sees that effective lean leadership encompasses championing lean principles, offering guidance, and ensuring that lean thinking is being used to optimize the entire organizational system for value delivery. More recent literature expounds that leadership should not be regarded as a 'top-down' force focussed on achieving results through their followers and should encompass development of people to reach their potential and to find their identity and purpose (Bicheno and Hennessey, 2020). The lean organisation's leaders need to fully engage with lean practice to ensure organisational lean thinking is achieved and sustained. For example, leaders need to be at the forefront of communication to underline the organisation's long-term focus and to set and communicate clearly defined expectations (Liker, 2004; Radnor, 2011; Trenkner, 2016; Maijala *et al*., 2018).

4.4 Organisational Lean Thinking

Organisational lean thinking (OLT) is distinct from the lean practice elements and the lean leadership element introduced in the previous sections. It is achieved when these elements are intertwined and integrated together. Organisational Lean Thinking cannot not be viewed as a destination but rather a mindset that needs to be constantly nurtured to be sustained through a cyclical and un-ceasing process (Lewis, 2000).

It is the lean leader's initial actions and interactions with lean practice that ensures lean practice is continuously being actually practiced. The everyday learning from the use of lean tools and processes embedded in the lean culture and principles and overseen by the communication of the organisations strategic alignment program enable organisations to achieve OLT. In order to sustain OLT, there is a feedback loop back from OLT to lean leadership through the 5S methodology, leader standard work and the PDCA cycle to

inform lean leadership to take steps to inject further momentum into Lean Practice when required. In essence, lean leadership is both the driving force and the guardian of OLT.

5.0 Limitations

As with all research, there are several limitations associated with this interpretive study.

This thesis was initiated with a review of the lean literature that was available to the researcher. As there were inherent time constraints within the DBA cycle, it cannot be claimed that the selection of material examined here on lean thinking is all-inclusive and it is inevitable that some academic and practitioner publications will have been missed which include studies not written in English. Also, it is important for the reader to be aware that when conducting a literature review, some degree of arbitrariness in the selection of research papers, articles and materials is inevitable. Indeed, with any synthesis, decisions must be made about what is central to a topic, and so not all reviewed articles are referred to in the paper. Nevertheless, such problems with synthesizing literature were diminished through a thorough and meticulous review process.

The decision to choose an established lean organisation in order to explore the concept of organisational lean thinking could be construed as a limitation in that this organisation is not being compared to another 'non-lean' organisation. However, choosing to explore lean at an organisation in the early embryonic stages of implementing lean would only be looking at the emergence of lean versus an established lean organisation. Therefore, the position adopted for this research was that in order to understand this complex phenomenon, this research requires a case site that has been deemed to have achieved a certain level of organisational lean thinking. Using the 'Shingo Prize' model as a benchmark to identify such organisations is an acceptable choice (see Lowry, 1995; Richey, 1996; Liker, 2004; Burgess and Radnor, 2013; Miller, 2013).

The next limitation relates to acknowledging the complexity of the phenomenon under investigation. Indeed, it is the very nature of studying the relationship between lean leadership, lean practice and organisational lean thinking that makes it so complex. Broadly speaking, depending on the context in which organisational lean thinking occurs, different accounts of what is important in the relationship between lean practice and lean leadership will be constructed and different descriptions, and influences may emerge.

With that in mind, it is important to stress that the focus of this research is not on developing a grand theory for organisational lean thinking but understanding it within the context of this research case study.

Another perceived limitation to this research may be that it is focussed on one case study site only and there may not be enough data available to gather from a sample size so small. As this study is not quantitative or positivistic in its nature, this is not a concern as sample size is irrelevant in interpretive case research as the intent is to gather the type of rich data that larger samples often cannot deliver. Onwuegbuzie and Leech (2007) also advocate that the quality of research does not automatically correspond to the size of the sample and they advise interpretive researchers to move away from the positivistic fixation on data and sample size and return to the main purpose of interpretivism, which is understanding the phenomenon. On the contrary, the use of the case study method provides mitigation to this concern in that this method is very amenable for the incorporation of triangulation that gathers rich data through various data collection methods (Yin, 2009) which will provide validation of the ultimate research results. Both Eisenhardt, (1989) and Yin, (2003) promote that the findings emanating from a case study that utilizes several sources of data collection methods to ensure 'convergence and corroboration' are stronger than research that do not.

As with any research design choice, the risk of researcher bias is always present. In regard to interpretive research, this can be especially prevalent as any findings that are created originate from a combination of the research participants viewpoints, the research material being studied and the researcher's own interpretation of these, so disentangling knowledge from the researchers own philosophical positioning is always a challenge (De and Lowe, 2017). Some mechanisms was utilised to protect the integrity of the study from this potential threat. Firstly, data triangulation was achieved through the use of three separate data collection methods which was helpful to mitigate against bias. Miles *et al*. (2014) argue that such triangulation may bring to the surface information that challenges the findings from the other collection methods and if embraced and investigated by the research can "strengthen the basic findings and protect you from against self-selecting biases and help build a better explanation" (p.301). Member checking was another method utilised used to limit bias where the research participants were afforded the opportunity to view and agree on the research findings so they were in agreement that the findings were a fair and representative account of what was collected (Robson, 2002).

The final limitation relates to the insider's point-of-view utilised in this research, specifically the bias and influence that can be implied through the researcher's role in the organisation (see Dwyer and Buckle, 2009; Trowler, 2011; Unluer, 2012; Fleming, 2018). However, there is a growing realisation within the literature (see Chavez-Reyes, 2008; Greene, 2014) that viewing insider research as a limiting factor is a misnomer as there is no absolute state of 'outsiderness' when the researcher is interacting with the study participants directly to gather the data. Moreover, there are definite advantages to taking an insider research stance such as being in a position of empowerment to obtain a thick description of what it feels like to exist in the research environment (Geertz, 1973: Trowler, 2011). In addition, there is a higher level of trust and acceptance when you are perceived to be one of their own and this can lead to a higher level of openness during data collection (Dwyer and Buckle, 2009).

6.0 The Structure of the Doctoral Business Administration Degree and the Thesis

SETU, the South East Technological University (which was formally known as WIT-Waterford Institute of Technology) run a four-year doctoral degree in Business Administration (DBA). The SETU DBA course is a combination of tutor led workshops, collaboration with fellow DBA students, and the supervised completion of four papers which are examined externally and then locked down to be incorporated into the final thesis. The completed thesis includes four sections.

Section 1 – The first one being, the present introductory section, which introduces the wider context that the research problem relates to and the emergence of the research problem. Also presented are the objectives of the research, the research questions, and chosen methodologies. The chapter ends with a pragmatic discussion on the limitations of the research.

Section 2 – This section contains the four papers that form the cumulative paper series. These are the Conceptual paper (Paper one), the Methodology paper (Paper two), Design and Initial Findings paper (Paper three) and the Findings paper (Paper four). These are written consecutively and are the first phase of the thesis that are examined and frozen to form part of the overall thesis. The reason for the insertion of the preface section before

each of the four cumulative papers is to illustrate the journey and the learning that the researcher has undergone during the development of each of the four papers.

Section 3 – This section contains the conclusion and implications of the study, based upon theoretical and empirical analysis. The chapter concludes with directions for future research and a critical reflection on the research project.

Section 4 – The Reflections section is the last section of the thesis and includes excerpts from the researcher's reflective log.

Section 2

RESEARCH PAPER SERIES

Paper 1

CONCEPTUAL PAPER

Preface to Paper One

Paper one involved a thorough exploration of the lean literature that fitted the research topic. During the review of the literature, the research gap began to emerge that despite the abundance of literature pertaining to the topic, there was still considerable confusion on how to achieve and sustain organisational lean thinking.

The overall research objective and the sub-objectives were developed to disentangle this uncertainty about what actually constitutes organisational lean thinking and how do the lean thinking elements of lean leadership and lean practice interact with each other to achieve this goal.

The first conceptualisation presented in this paper encompasses the model that is drawn from the authors reading and understanding of the literature and reflects the authors thinking on this study topic at that moment in time.

Paper one of the Cumulative Paper Series, the Conceptual Paper, was presented to the DBA Examination Panel in December 2020. The examiners made minor recommendations for improvement of the paper. The paper that is presented in this thesis is the revised and approved paper.

Doctor of Business Administration (DBA)

Participant Name: John Cheevers 20007306

Supervisors: Dr Patrick Lynch and Dr Anne-Marie Ivers

Date: 22 / 12 / 2020

RESEARCH PAPER SERIES

Paper 1:

CONCEPTUAL PAPER

"To explore the relationship between Lean Leadership and Lean practice to achieve Organisational Lean Thinking"

ABSTRACT

Although lean thinking as a concept and lean as a system have been widely commended and adopted by practitioners and governments and applied in various sectors as a concept, the failure rates are unacceptably high. There is significant academic unrest and discussion in regard to the claims and assumptions made within the organisational lean thinking literature and chief among them is the lack of knowledge on how organisations successfully implement and embed organisational lean thinking in the long term. This paper aims to bridge this research gap between academia and practice by investigating the relationship between lean leadership and lean practice to achieve organisational lean thinking. Drawing from an extensive and heterogeneous literature, this paper synthesises and develops a conceptual framework that depicts the inter-relationships between lean leadership and lean practice in relation to organisational lean thinking and in so doing highlights the vital role that lean leadership and leadership style in particular, plays in embedding lean practices to achieve organisational lean thinking.

Paper word count: 9840

1.0 Introduction

Lean can be described as a process of eliminating waste in every step which leads to better quality (Dahlgaard *et al.*, 2011; Aij and Rapsaniotis, 2016) and lower cost, (Holweg, 2007; Kimsey, 2010; Laureani and Antony, 2017), while improving safety and morale (Spear and Bowen, 1999; Spear, 2004; Gupta and Jain, 2013). Lean enhances competitive advantage (Lewis, 2000; Poksinska *et al.*, 2013; Lawal *et al.*, 2014) while ultimately embedding a sustainable culture of organisational lean thinking (Liker, 2004). Lean organisations use a range of tools (Roth, 2006; Mann, 2009), operating systems (Spear, 2004) and leadership philosophies (Bodek, 2008) to achieve and maintain the goal of organisational lean thinking and everyone is included in this effort (Kimsey, 2010; Lawal *et al.*, 2014; Goodridge *et al.*, 2015; Maijala *et al.*, 2018). Much of the literature on lean thinking has been positive (Womack and Jones, 1996; Slack *et al.*, 2015) and generally implies that embedding a culture of organisational lean thinking results in continuous process improvements through problem-solving (Mann, 2015), and consistently delivering customer-driven value (Liker, 2004; Thangarajoo and Smith, 2015).

As a result, lean has become a world-wide phenomenon and is adopted as best practice in most industries (Kimsey, 2010). Moreover, its application to areas such as the 'Lean Start-up' movement has given organisational lean thinking even more validity as a philosophy and methodology (Ries, 2011). In addition, its widespread adoption has been significantly aided by government interventions. For instance, in Ireland, the Department of Business, Enterprise and Innovation has established a national lean ecosystem that brings the national agencies of Enterprise Ireland, IDA Ireland, Údarás na Gaeltachta and the Local Economic Offices together with key stakeholders from industry, academia, and consultancy to create 'Lean Business Ireland' as a central and core repository for all things lean in Ireland (see Local Enterprise Office (LEO) report, 2020). To reinforce the national platform, a regional lean network was established in each region to run knowledge exchange and networking events and activities at a regional level. In addition, through each national agency and their lean business offering, significant funding is available to encourage organisations to adopt organisational lean thinking and lean practices to help them increase productivity and improve overall competitiveness. Consequently, Ireland is a recognised world-leader in lean and operational excellence (LEO, 2020). However, despite its widespread utilisation across several manufacturing

and service industries (see Hines *et al.*, 2004; Proudlove *et al.*, 2008; Mann, 2009; Kinsman *et al.*, 2014), there is a growing realisation amongst academics and practitioners alike that successfully implementing organisational lean thinking is a difficult task (Lewis, 2000; Achanga *et al.*, 2006) and failure rates of organisational lean thinking implementations are regarded by most as been unacceptably high, ranging from 50–90% (see Spear and Bowen, 1999; Emiliani, 2007; Bhasin, 2011; Kinder and Burgoyne, 2013; Dombrowski and Mielke, 2014).

Why some organisational lean thinking implementations fail and others succeed has been the topic of a myriad of research investigations (Roth, 2006; Mann, 2009; Dahlgaard *et al.*, 2011; Kinder and Burgoyne, 2013; Hines *et al.*, 2018), dating as far back as Sohal and Eggleston's 1994 study on Australian organisations. O'Corrbui and Corboy (1999) and others (Baker, 2002; Bhasin and Burcher, 2006) found convergent evidence that as little as 10 per cent or less of organisations succeed at implementing lean. In other studies, Ringen and Holtskog (2011) found that out of every three lean initiatives implemented, two fail and Pedersen and Huniche (2011) reported that up to 70% of all lean implementations failed in their attempt.

Due to this, organisational lean thinking has been labelled in industry and academia as a fad and critiqued for not being applicable beyond mass production (Cooney, 2002). Part of the problem is that lean has emerged from practice, with taken for granted assumptions, been taken for fact without empirical investigation, with the consequence that within the lean literature, the fad cannot be separated from the truth (Crute *et al.*, 2003). Pearse and Pons (2019) agree that while a large body of publications has accumulated on the topic of lean over the last 30 years, the philosophies and methodologies contained within have not been sufficiently challenged.

For both Antony and Gupta (2019) and Pearse and Pons (2019), there is an imbalance in the literature and there is a need to reassess and recalibrate the focus of organisational lean thinking research to readdress inadequacies in the body of knowledge. Previous contributions on lean tended to focus on the lean tools such as 5S, SMED, Kanban and many more (see Mann, 2009; Kimsey, 2010; Liker and Rother, 2011; Radnor, 2011), or on short-term improvements (Kinsman *et al.*, 2014; Lawal *et al.*, 2014). Other writers have focussed on lean culture (Willis *et al.*, 2016) or lean management (Mann, 2015) or an over dominance of reporting individual success stories at the expense of understanding

challenges (Womack and Jones, 1996; Spear 2004; Bodek, 2008; Sisson and Elshennawy, 2015). However, very little attention has been given to how organisations successfully implement and embed organisational lean thinking in the long term (Hines *et al.*, 2018). Indeed, numerous authors (see Sohal and Eggleston, 1994; Bhashin and Burcher, 2006; Dombrowski and Mielke, 2014) have argued that organisational lean thinking implementations fall short of expectations in the long term because they tend to focus on the immediate goal of waste reduction and fail to explore how lean leadership is critical in promoting lean practices and embedding an organisational lean thinking mindset (Roth, 2006; Achanga *et al.*, 2006; Bodek, 2008; Kimsey, 2010; Poksinska *et al.*, 2013; Trenkner 2016; Willis *et al.*, 2016; Aij and Teunissen, 2017). However, while these academic contributions emphasise the relationship between lean leadership, lean practice and successful lean thinking implementation, they are conceptual in nature, often practitioner-led and there is a real lack of empirical investigations into the role of lean leadership in supporting lean practice to implement organisational lean thinking (Hines *et al.*, 2018).

For the author, this apparent contradiction in the literature is an indicator that perhaps a fundamental gap exists between the scientific literature and practice or at the very least the practice of actually developing organisational lean thinking. The paucity of philosophical, theoretical, and empirical research has resulted in significant confusion as to what constitutes successful implementation of organisational lean thinking (Lewis, 2000; Proudlove *et al.*, 2008; Radnor, 2011; Dahlgaard *et al.*, 2011). Without a clearer understanding by academics as to what constitutes and drives organisational lean thinking, a gap may be present between what academics are prescribing and what practitioners are practicing, which can lead to a misapprehension as to what is important in successful organisational lean thinking implementation (Mann, 2009; Kimsey, 2010; Kinder and Burgoyne, 2013). The consequential effect of this knowledge deficit is that the actual effort of implementing organisational lean thinking in practice will be even more difficult to achieve, which is evident in the unacceptable lean implementation high failure rates (Bhasin and Burcher, 2006).

As a people leader in lean organisations for nearly twenty years, I have been on the practitioner side of lean and have witnessed at first hand, varying results in regard to the embedment and sustenance of organisational lean thinking. This coupled with my previous studies into leadership and lean theory has led me to question exactly how lean

leadership can have a positive impact on the attainment of organisational lean thinking and for this reason, this author has chosen this area of research.

Therefore, the purpose of this paper is to explore the relationship between lean leadership, lean practice and successfully implementing organisational lean thinking and ultimately separating what is the 'fad' from what really provides true value to an organisation. Specifically, the overall research aim of this research is

To explore the relationship between lean leadership and lean practice to achieve organisational lean thinking

The supporting research objectives are as follows:

- To investigate the concept of organisational lean thinking
- To explore the relationship between lean leadership and lean practice
- To explore the relationship between lean practice and organisational lean thinking
- To explore the relationship between lean leadership and organisational lean thinking

The rest of the paper will be structured as follows. In the next sections, the paper outlines the literature reviewed (see appendix 1) and presents the most salient aspects of the organisational lean thinking literature that led to this research investigation been presented. Subsequently, this research both synthesises and builds on extant efforts to conceptualise the interrelationships of lean leadership and lean practice in relation to organisational lean thinking. Therefore, the main objective of this research is to bridge the gap in the afore-mentioned scarcity of research in this area, and it is perceived that this study will not only contribute substantially to academic knowledge in this area but will also make a significant contribution to the implementation and sustenance of lean by informing practitioners on the criticality of lean leadership and lean practices in building organisational lean thinking. In the concluding section, leadership and academic implications are explored, and future direction of the research is also discussed.

2.0 Literature Review

2.1 Evolution of lean

While the lean concept is often traced back to the world's first assembly line in ship building in the 16th Century, the Arsenal of Venice (Zambon and Zan, 2007), it was Henry Ford who truly created the first production system called 'mass production' which manufactured large quantities of mass products through a continuous flow production system (Holweg, 2007). This process was very successful and allowed the Ford Motor Company to mass-produce over 15 million 'Model T' cars between 1908 and 1927 and was adopted by the US military during World War II. The problem with Ford's system was not flow but rather his inability to provide variety – 'you can have any colour so long as it's black' (Duncan, 2011).

After studying Ford's production system, Kiichiro Toyoda, Taiichi Ohno and others at the Toyota car manufacturing organisation began to realise that the system could be innovated to incorporate both continuity in process flow and product variety and invented a new manufacturing method called the Toyota Production System (TPS) which allowed Toyota to efficiently and quickly produce products of sound quality, one at a time, that fully satisfied customer requirements (Ohna, 1988; Cusumano, 1994; Hines *et al.*, 2004; Seddon, 2005; Holweg, 2007; Aij and Rapsaniotis, 2016; Aij and Teunisson, 2017). At the heart of TPS is the concept of preventing defects (Jidoka) and only producing just what is needed when it is required (Just in Time - JIT) which is characterised by four broad rules, as illustrated in Table 1 below.

Table 1 - Spear and Bowen's 4 rules

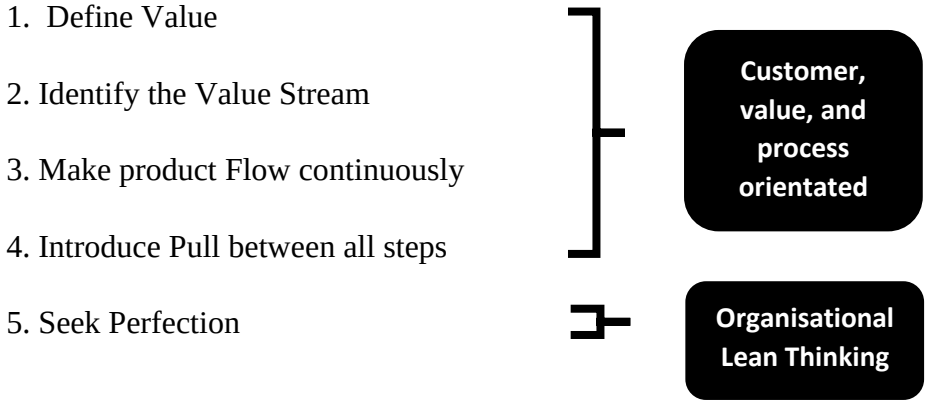
Rule	Toyota Production System
1	All work shall be highly specified as to content, sequence, timing, and outcome
2	Every customer-supplier connection must be direct, and there must be an unambiguous 'yes-or-no' way to send requests and receive responses
3	The pathway for every product and service must be simple and direct
4	Any improvement must be made in accordance with the scientific method, under the guidance of a teacher, at the lowest possible level in the organisation

Source: adapted from Spear and Bowen, (1999)

TPS did not receive worldwide traction until the 1990's when the concept of lean was first introduced by Krafcik (1988). Since then, lean has become the accepted term for this principle-based type of management practice (Aij and Teunisson, 2017). In 1990, the publication of 'The Machine That Changed the World' (Womack *et al.*, 1990) introduced the 'lean production system' (Cusamano, 1994; Spear, 2004; Seddon, 2005; Emiliana, 2007) and was described as the break-through moment (Hines *et al.*, 2018) when "the world manufacturing community discovered lean production" (Liker, 2004, p. 25).

While, initially, lean was rooted in tools and processes and mainly focussed on the elimination of waste in the shop floor process (Bhasin and Burcher, 2006; Dombrowski and Mielke, 2014; Bicheno and Holweg, 2016; Maijala *et al.*, 2018), it soon expanded into an enterprise-wide concept with the introduction of the five lean principles, as shown in Figure 1 below (see Spear, 2004; Hines *et al.*, 2004; Kimsey, 2010; Radnor, 2011; Bicheno and Holweg, 2016).

Figure 1 – Lean Principles



Source: adapted from Womack and Jones, (1996)

The defining of 'value' and the identification of the 'value stream' principles are concerned with targeting the removal of waste from the process. The inclusion of the next two principles 'flow' and 'pull' focused on building process efficiencies (Liker, 2004). However, for Thangarajoo and Smith (2015, p. 1), it is the fifth principle – 'seek perfection' that introduces the concept of organisational lean thinking and started to extend "the concept of lean manufacturing from the manufacturing floor to business operation level". For Knoll *et al.*, (2019), the order in which the principles are illustrated are important as they provide a roadmap and hierarchical evolution towards organisational lean thinking. Liker (2004) embedded organisational lean thinking with

the introduction of the 4P model (philosophy, process, people and problem solving) which led to an increased focus on the role of lean leadership (Trenkner, 2016) and lean organisations becoming learning organisations (see Liker, 2004; Spear, 2004; Roth, 2006; Mann, 2009; Goodridge *et al.*, 2015; Sisson and Elshennawy, 2015; Maijala *et al.*, 2018).

For Hines *et al.*, (2004) this enabled the evolution of organisational lean thinking from being just a production toolkit to a strategic value proposition and consequently moving from single-loop learning where assumptions are taken for granted to a 'thinking organisation', where there is questioning and challenging of existing organisational practises (double-loop learning). Indeed, there is a general agreement in the literature (see Spear, 2004; Roth, 2006; Goodridge *et al.*, 2015; Maijala *et al.*, 2018) that in order to reach the level of organisational lean thinking, there is a requirement for an organisation to be able to learn and continuously improve (Bhasin and Burcher, 2006; Manos, 2007; Mann, 2009; Pettersen, 2009; Dahlgaard *et al.*, 2011; Liker and Rother, 2011; Bicheno and Holweg, 2016).

To summarise, this section has provided an outline of the evolution of lean from an assembly line focused production tool to a holistic way of thinking and a uniformed approach to solving problems at all levels in the organisation. The next part of this paper will investigate the concept of organisational lean thinking in more depth.

2.2 Organisational Lean Thinking

The term organisational lean thinking was first introduced by Womack and Jones (1996) as a way of thinking about a process activity and the waste generated from how it is organised. The basic tenet of organisational lean thinking is to create a lean organisation whereby the concepts of value, value streams and flow are embedded in the working practices of every employee, so that waste is eliminated and performance improved (Melton, 2005; Robinson and Schroeder, 2009). Nevertheless, despite the attention organisational lean thinking receives, the term itself lacks clarity (Thirkell and Ashman, 2014). For Samual *et al.*, (2015) and for Holmemo *et al.*, (2018), there are varying conceptualisations and definitions because organisational lean thinking is in a constant state of evolution and as such, is "poly-morphic, meaning different things to different people, at different moments in time" (Samual *et al.*, 2015, p. 1388).

Both Spear (2004) and Liker (2004) consider that an important element of organisational lean thinking is to train every employee in problem solving which provides the

organisation with the ability to utilise all the available lean tools as second nature. Hines *et al.*, (2004) regard organisational lean thinking as the capacity to go beyond the normal lean tools and processes and utilise solution methods from other sources such as six-sigma and financial management techniques. For Liker and Rother (2011), it is this consistent use of problem solving that starts to build organisational lean thinking where employees focus on their ability to develop solutions rather on the outcome of the problem-solving process itself, which they describe as "learning a new way of thinking and acting" (p.2). It is this employee participation along with learning, rather than the use of lean tools and processes that support organisational lean thinking (Holmemo *et al.*, 2018).

Indeed, numerous authors see organisational learning as a fundamental part of achieving organisational lean thinking (see Spear, 2004; Roth, 2006; Mann, 2009; Goodridge *et al.*, 2015; Sisson and Elshennawy, 2015; Maijala *et al.*, 2018). Hines *et al.*, (2004) notes that organisational lean thinking is where learning is taking place at all levels of the organisation and there is widespread use of double-loop learning and organisational deutero-learning, which is second-order learning or the ability to 'learn how to learn'. For Spear (2004), this ability to learn and problem solve is driven by deep thinking at an organisational level.

Kimsey (2010) sees organisational lean thinking as embedded in the culture of the organisation and appreciated by everyone as part of their daily work. Likewise, Liker (2004) describes organisational lean thinking as a deep appreciation of lean where everyone in the organisation understands the lean concepts and can apply them in daily processes at some level. Both Proudlove *et al.*, (2008) and Radnor (2011) argue that this deeper appreciation of lean leads to organisational lean thinking and that dealing with problems and opportunities leads to an organisational lean thinking mindset.

Mann (2009) relates organisational lean thinking to a natural organisational approach and mindset to handle all challenges and is incorporated in the organisations vision and future-state plans – 'the way we do things here'. Dombrowski and Mielke (2014) and Pettersen (2009) believe that organisational lean thinking is a clear move away from the performative and practical 'toolbox lean' to a philosophical and continuous improvement lean mind-set.

A key aspect of organisational lean thinking is sustainability through embedding it within the organisation. Hensley (2017) argued that organisational lean thinking needs to start at

the leadership level, so all employees understand how all the parts of the lean system interact with each other. Similarly, Mann (2009) suggests that leadership is the gap between successful and un-unsuccessful organisational lean thinking implementations. Both Womack and Jones (1996) and Liker and Convis (2012) promote the same logic when they argue that leaders must provide employees with a 'True North' vision of where the organisation is going and the long-term strategies to enable this, in order for lean thinking to be embedded and practiced effectively within the organisation.

Whilst at first glance, there appears to be little consensus in the literature as to how organisational lean thinking is defined, there are nevertheless underlining commonalities and components - explicitly, problem solving, organisational learning, culture, and mindset.

Therefore, based upon the foregoing, a unified definition of organisational lean thinking can be presented:

Organisational lean thinking is strongly orientated towards sophisticated problem solving at all organisational levels based on building knowledge through learning and is the manifestation of a deeper appreciation of lean, it is this mindset that supports lasting improvements and lean sustainability.

In summary, there is significant convergent evidence in the literature (Hines *et al.,* 2004; Liker, 2004; Liker and Rother, 2011) that organisational lean thinking evolves when lean leadership promotes and drives problem-solving, which in turn creates a deep appreciation of the lean tools and processes coupled with an embedded culture of learning. In the next section, this paper will explore the relationship between lean leadership and organisational lean thinking.

2.3 Lean Leadership and Organisational Lean Thinking

The discussion so far has highlighted that lean production started out as a set of tools (Radnor, 2011) but evolved with the introduction of the lean principles to organisational lean thinking (see Womack and Jones, 1996; Lewis, 2000; Proudlove *et al.*, 2008). For Hensley (2017) and others (see Bodek, 2008; Dahlgaard *et al.*, 2011; Pham and Thomas, 2012; Laureani and Antony, 2017), in order for organisational lean thinking to be truly effective, it needs effective lean leadership to champion lean principles, offer guidance,

and ensure that lean thinking is being used to optimize the entire organizational system for value delivery.

According to Jaques and Clement (1991), leadership in general can be described as "the process by which one person sets the purpose or direction for one or more other persons and gets them to move along with him or her and with each other in that direction with competence and full commitment" (p. 4). Both Goodridge *et al.*, (2015) and Aij and Rapsaniotis, (2016), say that there are differences and similarities between leadership theories, but these are often difficult to fully clarify as leadership is made up of many parts. In essence, the differences between leaders is significant and so lean leadership cannot be reduced to a set formula (Liker and Convis, 2012). This is further compounded by the lack of empirical evidence linking consistent leadership attributes of lean leaders with leadership styles (Dombrowski and Mielke, 2014; Aij *et al*., 2015b).

With that in mind, the following sections will explore and identify the main attributes of effective lean leadership and align these attributes to various leadership theories in existence in order to understand the relationship between lean leadership and organisational lean thinking.

2.3.1 Lean leadership attributes

Poksinska *et al.*, (2013) describe lean leadership attributes as managerial practices in lean organisations. Similarity, Aij *et al.*, (2015a) describe them as necessary competencies to implement lean management successfully. For the purpose of this paper, a lean leadership attribute will be defined as a leadership requirement or leadership trait that is considered important in achieving organisational lean thinking (Dombrowski and Mielke, 2014; Aij *et al.*, 2015b).

Based upon this clarification and a detailed analysis of the literature (see Table 2), this research identified six leadership attributes of a lean leader explicitly (i) the ability to coach and mentor (ii) the leaders own detailed understanding of the process and commitment to self-development (iii) passion to involve and encourage team members to solve problems due to their task knowledge (iv) the leaders development of their team members (v) the facility to provide a vision and (vi) their capacity to enable and foster change. Each attribute will now be discussed in turn.

Table 2 - Lean leadership attributes

Lean Leadership Attribute	1988	1990	1996	1999	2004	2006	2008	2009	2010	2011	2013	2014	2015	2016	2017	2018	2019	Count
Coach & Mentor			1	1	2	1	1			1	2	1	1	2	1	1	1	16
Knowledge and Self-Training	1	1		1	1				1		3		3	1			1	13
Problem-solving			1	1	1	1			1		1	1	1			1		9
People development					1	1	1			1	1		2		1	1		9
Vision					1	1	1			1	1	1	1	1				8
Enable & Foster change						1			1				1			1		4

Source: compiled from literature review (date range 1998-2019)

Coaching and Mentoring:

For Womack and Jones, (1996), a leadership attribute required for organisational lean thinking is a coaching-focused orientation because this lean leadership attribute is a catalyst for a successful and sustainable lean implementation. Post Womack and Jones (1996), Liker, (2004) and Spear (2004) are two of the earliest commentators to link organisational lean thinking with lean leadership and recommended a strong coaching leadership attribute where lean leaders do not just solve problems themselves but mentor employees to find their own solutions. Kinsman *et al.*, (2014) notes that this 'coach and not fix' lean leadership attribute enables people to become lean thinkers and practitioners. Similarly, Goodridge *et al.*, (2015) insists that a coaching and mentoring style is a critical element of lean leadership because it develops leadership capacity by enabling people to reach their potential, thus optimizing their own performance and the value they add to the organisation.

Leader Knowledge and Self-development:

In the words of Dombrowski and Mielke, (2014, p. 566), self-development needs "to occur on a daily basis at all levels of the organisation including leadership and a leader's passion for their own self-development should be used to set an example for their employees". The need for self-development is based on the individual's awareness that the transition to effective lean leadership demands acquiring new leadership skills (Aij *et al.*, 2015a). Mann (2009) points out that lean leaders are role models and in order to be able to coach and mentor employees, they need to commit themselves to self-development. Poksinska *et al.*, (2013), also argues that leaders cannot promote people development if they do not demonstrate a commitment to self-development before they

adopt responsibility for teaching others. This is supported by numerous other authors (see Liker, 2004; Spear, 2004; Mann, 2009) who advocate that leaders should focus on their own self-development and knowledge first and then teach and enable their own employees' development. In essence, the lean leader needs to have an in-depth knowledge about lean concepts and practices as they have a vital support role as teacher and mentor (sensei) for the employees of lean organisations (Liker and Convis, 2012; Aij *et al.*, 2015a).

Problem Solving:

For Mann (2015), the advocation of problem-solving is important and lean leaders are expected to develop inclusive approaches that both inform and seek input from all team members, thus creating a culture in which it is safe for any staff member to speak up about problems or offer solutions. The difference with this approach is that unlike the 'typical response' of just working around problems, a root-cause analysis takes place to systematically determine the origin of the problem and to eliminate it from the process (Enterprise Ireland, 2020). Liker and Rother (2011) also found that lean leaders develop a routine approach to making continuous improvements and thus embed a problem-solving culture across the organisation. Kimsey (2010) extends this notion and proposes that lean leaders must enable problem solving, have respect for people and be able to foster and enable change. Mann (2009) asserts that lean leaders are also expected to adopt and ensure a 'no blame' culture in response to mistakes - people need to feel safe about speaking up when things go wrong so that it is not repeated in the future.

People Development:

In addition to their own self-development, Achanga *et al.*, (2006) promotes the need for lean leadership to encourage effective skills and knowledge enhancement amongst its workforce. The lean leader's ability to develop the team is a fundamental element of achieving organisational lean thinking as unlike other organisations, problem-solving and root-cause analysis must occur where the problems are observed so that all members are able to participate in identifying, root-causing and eliminating variation in the process (Mann, 2015). Trenkner (2016) believed that there is a close relationship between this lean leadership attribute of people development and the leader's own requirement for self-development as it is "necessary to take care of one's leadership skills, to inspire and support one's subordinates so that they develop and improve" (p.129). Liker and Rother

(2011) concluded that "leaders develop people so that desired results can be achieved, again and again" (p.4). Likewise, Dombrowski & Mielke, (2014) proposed that the core of lean leadership is people development because it facilitates the long-term continuous learning and development of employees.

Vision:

Leaders must lead by example, both modelling what is expected and encouraging the same behaviour by staff (Mackenzie *et al.*, 2001). Mann (2015) arrived at the same conclusion when he argued that organisational lean thinking implementations had a higher likelihood of success when leaders sponsored lean activities by motivating others, establishing goals, delegating duties and being involved in the management of activities as appropriate. Aij *et al.*, (2015a) also discuss the importance role of leadership in creating commitment to the organisation's vision. Mackenzie *et al.*, (2001), note that leadership commitment to the provision of a vision about organisational lean thinking are pivotal for staff to understanding the benefits of lean for themselves or for the whole organisation. Dombrowski and Mielke (2014) use the term 'long-term thinking' when they discuss the requirement for a lean leader to have a vision. As referenced earlier, Liker and Convis (2012) describe this lean leadership requirement to provide a vision as providing 'True North' for employees.

Enable and Foster Change:

For Kimsey (2010), the role of the lean leader in fostering change is being able to 'tap into' the collective knowledge of the team and to let the employees see the need for change themselves. Goodridge *et al.* (2015) link the achievement of organisational lean thinking with the ability to enable changes in leadership practices and the willingness of senior leadership to foster and accept these changes. Roth (2006) utilises the Japanese term 'kaikaku' to describe the need for change at an enterprise level – "a shift in the fundamental logic and layout of organisations" to achieve organisational lean thinking (p.15). Roth states that this change needs to happen first in the heads of the leadership before it can be fostered in the organisation. Aij and Tuenissen (2017) promote that lean leaders must commonly demonstrate a high level of commitment to ensuring the success of organisational lean thinking implementation particularly with regards to removing barriers to quality improvement initiatives and providing resources that enable change to happen. Finally, Maijala *et al.* (2018) associate the attainment of organisational lean

thinking with the lean leadership's ability to "make change occur", overcome resistance to this change and to understand the "complexities of the changes" (p.4).

The next section will now utilise these leadership attributes and apply them across the leadership theory spectrum, in order to understand the relationship between lean leadership and organisational lean thinking.

2.3.2 Lean leadership theories

Leadership theories have a long lineage (Komives *et al.*, 2011; Dinh *et al.*, 2014) and can be effectively utilised to explain how a leader can influence individuals to achieve a set of common goals (Northouse, 1996). Convis and Liker (2012) acknowledge the suitability of several leadership theories as a fit for lean leadership but emphasise that it is the execution of the leadership style that enables the achievement of organisational lean thinking.

The following sections of this paper will discuss five of the main leadership theories and their relevance to the already identified lean leadership attributes.

Transformational Leadership

This theory originated from James Mac Gregor Burns, who argues that "the transforming leader looks for potential motives in followers, seeks to satisfy higher needs, and engages the full person of the follower" (Burns,1978, p.4).

The theory was developed further by Bass (1985;1990) when he started to apply the theory to organisational settings. Bass redefines "the process of transformational leadership in terms of a leader's ability to achieve follower performance beyond ordinary limits" (Hoch *et al.*, 2016, p.4). Bass lists four attributes of typical transformational leaders – charisma, inspiration, intellectual stimulation, and individualised consideration, which are responsible for the exertion of extra employee effort "on behalf of managers who are transformational leaders" (p.22). According to Roth (2006), these attributes find resonance in lean leaders' behaviours because they enable the leader to Foster Change through People Development and Problem-Solving.

Hoch *et al.*, (2016, p.2) state that there is evidence that the transformational leadership theory "has high overall validity and is significantly related to a variety of employee and organisational criteria, such as commitment, trust, satisfaction, and performance" and that

numerous empirical studies have supported a relationship between transformational leadership and leadership effectiveness in terms of follower attitudinal outcomes. For Bhasin and Burcher (2006), this theory is very advantageous for lean because it allows the leader to make and embed the required changes for organisational lean thinking. Indeed, for many authors (see Emiliani, 2003; Poksinska *et al.*, 2013; Zhang *et al.*, 2015), the transformational leadership theory is considered a good match for leadership in lean organisations as it contains several of the identified lean leadership attributes. For instance, Seidel *et al.*, (2019) asserts that four of the six identified lean leadership attributes are evident within the transformational leadership theory as their paper discussed the influencing power of the transformational leader, being able to articulate a clear Vision, and to Develop their employees to be able to Problem-Solve and Change to a higher level of performance. In addition, Poksinska *et al.*, (2013), states that this leadership model fulfils both the Coaching and Mentoring and the People Development requirements of the lean leadership model because of the techniques applied by the transformational leader to achieve the required goals.

However, there are shortcomings. Bass (1985) believes that the initial conceptualisation by Burns (1978) did not consider or include the need to specify an ethical or moral dimension in the characteristics of the transformational leader which could lead to inauthentic transformational leadership. Another criticism proposed by Anderson and Sun (2017), is that the transformational leadership type may be more effective in certain work environments versus others, and that there may be gender limitations in how effective this leadership style is executed. Lastly, as this leadership model is built upon the 'charisma' of the leader, it is in direct contrast to the requirements of a typical lean leader, who according to Trenkner (2016) is an ordinary and modest person willing to work in a team and open to learning.

Servant Leadership

This theory originated from a concept that was developed by Robert K. Greenleaf (1970) and states that "Servant-Leadership is a process, a way of 'being' rather than an activity. It is primarily about the field of leadership [where the] servant leader is servant first. It begins with the natural feeling that one wants to serve, to serve first. Then conscious choice brings one to aspire to lead" (p.6). Another supporter of this style of leadership was Spears (1996), who advocated servant leadership as being the perfect antidote for the

traditional and transactional leadership style which he described as “I am the boss and it is my job to tell you what to do and it is your job to do it” (Lloyd, 1996, p. 29).

This leadership theory is referenced by several authors in relation to its compatibility with lean leadership (see Liker and Convis, 2012; Poksinska *et al.*, 2013; Trenkner, 2016 and Aij and Rapsaniotis, 2016). Indeed, Aij and Rapsaniotis’s investigation into the attributes of the servant leadership model found that this leadership model encompassed Coaching and Mentoring, providing a Vision, Self-development, People Development, and the ability to foster Change. In regard to problem-solving, their study is less clear and asserts that the servant leadership model is focussed more on behaviours rather than the use of exact problem-solving tools. Nevertheless, Trenkner (2016) found that the ability to use the lean organisations thinking approach and the ability to creatively prevent the sources of problems as two of the core leadership attributes of this theory. According to Poksinska *et al.*, (2013), the servant leadership model satisfies both the Coaching and Mentoring and the People Development attribute requirements of the lean leadership model because the servant leader develops employees through a Coaching and Mentoring process to realise the organisational goals. While the literature indicates a strong correlation between lean leadership and that of servant leadership, it should be noted that there are concerns that the research on servant leadership lacks sufficient scientific evidence to justify its acceptance (Russell and Stone, 2002; Aij and Rapsaniotis, 2016) and is anecdotal in nature (Northhouse, 1996). Moreover, one of the perceived disadvantages of this leadership style is the use of the word ‘servant’ and the ‘historic baggage’ associated with the word – (Spears, 1996).

Empowering Leadership

This theory originated in a 1982 publication (Peters and Waterman) which “was influential in helping lay the foundations for the modern empowerment movement” (Wilkinson, 1998, p.42). The empowering leadership theory is defined by Sharma and Kirkman (2015) as “leaders behaviours directed at individuals or entire teams and consisting of delegating authority to employees, promoting their self-directed and autonomous decision making, coaching, sharing of information, and asking for input” (p.194). According to Wilkinson (1998), there are five aspects to the empowerment leadership theory – “information sharing, upward problem solving, task autonomy, attitudinal shaping, and self-management” (p.47). For Sharma and Kirkman (2015, p.194)

"organisations and teams that use empowering initiatives outperform their counterparts that rely more so on traditional hierarchical structures". The leadership empowerment theory implies that the role of leaders "changes from holders of expert power to facilitators" (Wilkinson, 1998, p.52).

Within the lean leadership literature, there is a strong advocacy for the theory of empowerment leadership such as Carroll (2001) and Aij *et al.*, (2015a). According to Carroll (2001), the need for continuous improvement and the requirement to share tasks and responsibilities in lean organisations requires empowerment leadership. Aij *et al.*, (2015a) promotes the empowerment leadership as being a good fit with leadership in lean organisations in regard to the leader developing employees to be autonomous through their own ability to Problem Solve to make the necessary changes to ensure organisational success.

In summary, the literature reviewed indicates that the empowerment leadership model covers most of the six identified lean leadership attributes, which are Coaching and Mentoring (Sharma and Kirkman, 2015), Problem Solving and People Development (Carroll, 2001) and the ability to provide a Vision and to Foster Change (Wilkinson, 1998). However, there are several criticisms. For instance, Sharma and Kirkman (2015) assert that not all lean leaders are able to truly empower their employees and that not all employees react positively to empowering strategies due to the associated responsibility. Also, both Roth (2006) and Mann (2009) clearly advocate that delegation of leadership responsibilities is not suitable in the lean organisation because lean leaders need to exemplify lean themselves and 'walk the talk'.

Distributed Leadership

Yukl (2010) is regarded as the seminal writer on distributed leadership and describes this leadership model as a process of dynamic influence amongst both informal and formal leaders in group settings designated by shared expertise and knowledge with shared responsibilities and goals. This influence is not confined within formal leadership structures and can move upwards as well as downwards depending on the level of expertise and is characterised as 'bidirectional influence' (leaders-followers-leaders) and is deemed as relevant to lean organisations because formal leaders will receive feedback from their followers as well as give feedback to their followers which will in turn promote a continuous improvement in their performance (Poksinska *et al.*, 2013).

Anderson and Sun (2017) use the term ‘shared leadership’ to describe distributed leadership and recommend it’s use where there are self-managed teams that need a certain amount of leadership trust and supportive coaching to be in place first before an organisation moves to this leadership style.

Several authors advocate this leadership model to be a suitable match for lean leadership. Liker (2004) believes the requirement for a skilled workforce in lean organisations is a fit for this leadership model because the employees themselves need to have the ability to execute their own Problem-Solving. Roth (2006) regards the distributed leadership model’s ability to recognize the interdependency of roles as a vital precursor to achieving organisational lean thinking. Anderson and Sun (2017) link the Coaching aspect of lean leadership to distributed leadership model. Yukl’s (2010) studies into this leadership model indicates that this leadership style is compatible to the requirements of a lean leadership model as several of the required attributes are contained in the distributed leadership style. Roth (2006) also advocates this style of leadership as necessary for organisational learning and the organisational change that is required for organisational lean thinking to be implemented. According to Roth, several of the required lean leadership attributes are delivered with this style of leadership because if an organisation wants to Foster real Change, it needs to occur within the workforce through People Development and the employee’s ability to Problem-Solve. As with other leadership models, there are criticisms. Both Anderson and Sun (2017) and Roth (2006) have pointed out that the distributed leadership model is not clearly defined and that the shared leadership model is not suitable in all organisations that implement lean because of its informal nature and because it operates outside of the structured leadership hierarchy.

Situational Leadership

Hersey and Blanchard (1969) describe Situational Leadership theory as a flexible leadership style that can be altered for any event or situation depending on the maturity of expertise in the employees being led. A leader can be task orientated or relations orientated and must be aware of the particular leadership style requirements before selecting which type of governance is needed. Liker and Convis (2012) describe situational leadership as “using the right way of leading in the right situation” (p.234). According to Seidel *et al.*, (2019) situational leadership theory is the use of different leadership styles, which fluctuates from a directing style all the way to a leadership style

of delegation depending on what each situation warrants there is no 'one size fits all' approach to this type of leadership style.

Many publications (see Liker and Convis, 2012; Poksinska *et al.*, 2013; Tortorella and Fogliatto, 2017) link situational leadership to lean leadership as the preferred leadership theory to use in a lean organisation because it is not rigid and can change according to the leadership requirement from situation to situation. Their research indicates that the lean leadership style should move from transformational to empowerment as the lean system moves from implementation phase to the embedment state of organisational lean thinking and highlights that the situational leadership style matches the lean leadership attributes in being able to provide a Vision, Foster Change, Problem-Solving and People Development. Others identified Coaching and Mentoring (Sharma and Kirkman, 2015), Problem-solving, People development (Carroll, 2001), providing a Vision and the ability to Foster Change (Wilkinson, 1998) as key lean attributes embedded in this leadership style. Nevertheless, even though Tortorella and Fogliatto (2017) endorse the situational leadership style as the best fit for lean leadership, there is an acknowledgement that lean leaders may be unable to adopt multiple leadership styles depending on the situation and that they will revert to a single leadership style. Based upon the foregoing, Table 3 presents the five leadership models and the associated lean leadership attributes.

Table 3 – Leadership Theories

Leadership Theory	Description	Lean Leadership Attributes	Advocated in lean research
Transformational leadership style	Has four dimensions, charisma, inspirational motivation, intellectual stimulation and individualised consideration, used to have a transforming effect on employees	**Coach and Mentoring**, Provide a **Vision**, foster **Change**, **Problem-solving** and **People development**	Emiliani, 2003; Poksinska *et al.,* 2013; Li *et al.,* 2015; Seidel *et al*., 2019
Servant leadership style	A leadership style that focuses on the growth of its followers	**Coaching and mentoring,** providing a **vision, Self-development, People development, Problem-solving** and the ability to foster **Change**.	Liker and Convis, 2012; Poksinska *et al.,* 2013; Trenkner, 2016; Aij and Rapsaniotis, 2016
Empowerment leadership style	The delegation of authority to employees to promote their self-directed and autonomous decision making	**Coach and mentoring, Problem-solving**, **People development**, provide a **Vision**, foster **Change**	Carroll, 2001; Aij *et al.,* 2015a
Distributed or Shared leadership style	A leadership style that facilitated a separate decision making process for different departments or sectors within the organisation	**Problem-solving**, **People development** and the ability to foster **Change** and **Coaching and Mentoring**.	Liker, 2004; Roth, 2006; Poksinska, 2013
Situational leadership style	A leadership style that alternates between transformational and enpowerment leadership model depending on situation at hand	**Coaching and mentoring,** providing a **vision, Self-development, People development** and the ability to foster **Change** and **Problem-solving**	Liker and Convis, 2012; Poksinska *et al.,* 2013; Tortorella and Fogliatto 2017

Source: adapted from references contained within section 2.3.2

The review of the research of the leadership theories indicates that there is strong correlation between lean leadership attributes and several of the leadership models. The servant and situational leadership models would appear to contain all six identified lean leadership attributes and could potentially be considered a good leadership theory match for lean leadership. However, even though many authors have alluded to the fact that lean leadership is vital for the attainment of organisational lean thinking and the sustainability of lean (Lewis, 2000; Achanga *et al.*, 2006; Bodek, 2008; Mann, 2009), the lean leadership research is still very fragmented and poorly supported on widely deemed leadership theories (Poksinska *et al.*, 2013; Tortorella and Fogliatto 2017; Van Dun *et al.*, 2016). Moreover, due to the lack of theoretical approach to lean leadership, literature reviews on this topic are very scarce. There is an over dominance within the literature to focus on leadership attributes which are not usually based on any leadership theoretical lens and tend to rely on more practitioner - oriented literature (see Seidel *et al.*, 2019). Even when theories are used, there is an over reliance on transformational leadership (Poksinska *et al.*, 2013; Zhang *et al.*, 2015) or situational leadership theories (Tortorella and Fogliatto, 2017) while others are discarded without argument.

For Seidel *et al.*, (2019) the risk is that assumptions will be made on the influence lean leadership has on organisational lean thinking without investigating exactly how the leader interacts with lean practice to achieve organisational lean thinking. Liker and Convis (2012) in essence make the same argument that lean leadership cannot directly lead to the attainment of organisational lean thinking, but it is the relationship and interaction with lean practice that ultimately provides the path forward to this goal.

The next part of this paper will explore the relationship between Lean Leadership and Lean practice to achieve Organisational lean thinking.

2.4 Lean Practice

Lean Practice is about actual implementation of tools, cultural practices and strategic activities for optimising the people, resources, effort, and energy of the organisation toward organisational lean thinking and creating value for the customer (Bhasin and Burcher, 2006; Dombrowski and Mielke, 2014; Bicheno and Holweg, 2016; Maijala *et al.*, 2018). As illustrated in Table 4, Lean Practice consists of three components, explicitly Lean Processes and Tools, Lean Culture and Principles and Strategic Organisational

Alignment and each will be discussed in turn and their relationship to lean leadership and organisational lean thinking.

Table 4 - The components of lean practice

Lean practice component	Also known as	Lean practice references
Lean Processes and Tools	Methods, Procedures, Techniques	Spear, 2004; Hines et al, 2004; Pham & Thomas, 2012; Piercy & Rich, 2015; Knoll, 2019; Womack et al, 1990; Manos, 2007; Lewis, 2000; Alves & Alves, 2015; Maijala et al, 2018; Garza-Reyes et al, 2018; Aij & Teunissen, 2017; Sisson & Elshennawy, 2013; Liker and Rothar, 2011; Mann, 2009; Achanga et al, 2006
Lean Culture and Principles	Human factors, Involvement and motivation, Improvement Kata, Coaching Kata, Employee behauvior, Common core of worker engagement, Approach to work, Culture, Human resources, Engagement	Spear, 2004; Hines et al, 2004; Pham & Thomas, 2012; Mann, 2015; Piercy & Rich, 2015; Knoll, 2019; Dahlgaard et al, 2011; Manos, 2007; Proudlove et al, 2008; Liker, 2004; Conference board of Canada; Lewis, 2000; Gaiardelli et al, 2019; Garza-Reyes et al, 2018; Aij & Teunissen, 2017; Goodridge et al, 2015; Dombrowski & Mielke, 2014; Liker and Rothar, 2011
Strategic Organisational Alignment	Principles, Managing the combined enterprise, Hoshin Kanri, Effective monitoring of outcomes and impact, Focus, Operating philsophies, Planning and control, Deployment, Lean management system	Hines et al, 2004; Pham & Thomas, 2012; Mann, 2015; Knoll, 2019; Womack et al, 1990; Dahlgaard et al, 2011; Proudlove et al, 2008; Liker, 2004; Conference board of Canada; Lewis, 2000; Alves & Alves, 2015; Maijala et al, 2018; Garza-Reyes et al, 2018; Aij & Teunissen, 2017; Goodridge et al, 2015; Sisson & Elshennawy, 2013; Kinsman et al, 2014; Kimsey, 2010; Mann, 2009; Achanga et al, 2006; Spear, 2004

Source: adapted from references contained within section 2.4.1 to 2.4.3

2.4.1 Lean Processes and Tools

Lean processes and tools are comprised of a set of tools and techniques that are used by employees and leadership to track and visually manage the lean process (Mann, 2015). It is important to note that although these tools can differ according to the application at hand, they nevertheless have the same underlying principle: the elimination of all non-value-adding activities and waste from the business (Hines *et al.*, 2004).

The most common lean tools are Kanban, which is a visual signal to support flow and to control inventory by only having inventory which is needed (Enterprise Ireland, 2020). This is an important part of the 'pull' philosophy of lean where the 'customer' pulls what is needed and then this is replenished. 5S (Sort, Set-in-order, Shine, Standardise, Sustain) is another common lean tool used to organise the workplace to the point that waste is easily identifiable (Melton, 2005; Dombrowski and Mielke, 2014). The 5S and Kanban lean tools form part of an overall visual management process that makes the status of a process highly visible to allow corrective action to be taken (Manos, 2007). Two other

commonly used lean tools are 'poke yoke' which is an 'error-proofing' technique (Melton, 2005) and SMED (single minute exchange of dies) which is a changeover reduction process to speed up product transfers and eliminate wasted resources (Dombrowski and Mielke, 2014). Lastly, process mapping is another common lean tool that is used. This is the development of a simple flow chart that displays all the steps, sub-processes, and activities for a process so waste can easily be identified (Enterprise Ireland, 2020).

While these lean tools and processes are enablers to achieve results (Dahlgaard *et al.*, 2011), it is lean leadership that provides the support for their utilisation that leads to sustainable lean implementation (Roth, 2006; Dombrowski *et al.*, 2014; Mann, 2015; Trenkner, 2016). For instance, lean leaders must promote the use of tools amongst employees because their continued use will enable the development of a behaviour of continuous improvement. For both Manos (2007) and Liker and Rother (2011) leaders need to support employees not just to develop solutions but rather HOW to develop solutions. In order to reach this organisational state of perpetual learning, leaders need to ensure the use of problem-solving tools is part of an employee's everyday work (see Womack *et al.*, 1990; Spear, 2004; Dombrowski and Mielke, 2014; Nesensohn *et al.*, 2014; Kinsman *et al.*, 2014; Goodridge *et al.*, 2015; Aij and Teunissen, 2017). This 'learning how to learn' mentality is reinforced by leadership through coaching and mentoring (Liker, 2004; Spear, 2004; Kinsman *et al.*, 2014; Goodridge *et al.*, 2015; Aij and Rapsaniotis, 2016).

Critical interactions between leadership and lean processes is the utilisation of Gemba, Kaizen and Leader Standard Work (Bicheno and Holweg, 2016). Gemba can by translated as 'the real place'– this lean process is very simple, if you want to improve something in your process, the leader goes to the place where it is happening, observes what is going on and speaks to the people involved in the process on a regular (daily) basis (Spear, 2004; Bodek, 2008; Mann, 2015). Kaizen is a structured lean improvement process where the leader engages the people working within the value stream to improve both the effectiveness and efficiency of the activity (Mann, 2015). What is important in this lean process is that the leader never offers the solution but rather asks the right questions so that employees can develop their own solutions (Liker and Rother, 2011). This lean tool pulls employees away from the 'just-know' trap into the 'investigate and analyse' mindset of organisational lean thinking (Kimsey, 2010). Leader standard work is an effective lean

process to sustain lean gains as it can prevent ‘back-sliding’ by consistent focus on the process and not the results and to “take care of the process and your process will take care of you and deliver the results you expect” (Mann, 2015, p. 231).

Even though the general consensus is that lean production is about more than tools and processes (see Gaiardelli *et al.,* 2019), they are still a very important part of the conversation when discussing the progression to organisational lean thinking. Hines *et al.,* (2004) asserts that there is correlation between the type of lean tools and processes utilised by an organisation and its progress to achieving a state of organisational lean thinking. Organisations that have implemented and sustained lean still approach challenges from a lean perspective but have moved beyond a complete reliance on lean tools and processes and seek solutions from a more diverse range of tools such as six-sigma, agile manufacturing and constraint theory (Manos, 2007). For Aij *et al.,* (2015b) the enhancement of problem-solving abilities at an organisational level driven by lean leadership is an enabler for lasting organisational lean thinking.

2.4.2 Lean Culture and Principles

For Alves & Alves (2015) – “Organisational Culture comprises of a set of values, norms, beliefs, habits and customs that are shared collectively” (p. 2). Willis *et al.,* (2016) describes cultural sustainability as the “long-term and deeply embedded changes in the values, beliefs and assumptions of people with shared organisational membership” (p. 4). Mann (2009) provides a simpler definition when he describes lean culture as “the way we do things here” and he says it is the leadership reinforcement of behaviours, practices and the lean principles that inform that necessary changes in lean culture to sustain lean conversions (p. 17). The importance of the reinforcement of lean principles (see Figure 2) in lean culture is underlined by Goodridge *et al.,* (2015) when they are described it as the foundation for lean philosophy.

The progression to organisational lean thinking requires the development of a lean culture (Poksinska *et al.,* 2013). Without a stable organisational culture, organisational lean thinking will not be sustained (Dahlgaard *et al.,* 2011; Laureani and Antony, 2017). Lean culture is what enables the organisation to sustain its lean structures and processes even when key lean advocates or leaders have left the organisation (Feldman and Pentland, 2003; Alves and Alves, 2015). For numerous authors, (Hines *et al.,* 2004; Mann, 2015; Aij and Rapsaniotis, 2016), being able to instil the correct lean culture is critical to

successful organisational lean thinking implementation. The challenge therefore is how does the lean leader embed this personally held lean culture into the organisation in a way that it can be sustained. For many (see Roth, 2006; Bodek, 2008; Mann, 2009; Rother and Liker, 2011; Miller, 2013; Willis *et al.*, 2016), lean leadership is the key to embedding lean cultural practices in the organisation to ensure their long-term sustainability. For Dahlgaard *et al.*, (2011), lean leadership is an important component of the lean organisation as it supports both the culture and performance of an organisation. Changing an organisations culture is not easy, therefore leadership need the ability to foster change (Kimsey, 2010) and lead by example, acting as role models for others in the organisation (Alves and Alves, 2015; Aij and Rapsaniotis, 2016; Laureani and Antony, 2017). If a cultural change is required by an organisation to support and improve the organisational in its lean endeavours, then it is important that employees know what needs to change but more importantly, WHY the culture needs to change (Dahlgaard *et al.*, 2011) and this is where lean leadership can add value by understanding their part in building this culture (Miller, 2013). Organisational lean thinking will not be achieved just by the implementation of lean tools and processes or by embedment of a lean culture, holistic strategic alignment and cultural change are required as well to promote the use of these lean methods by the employees (Laureani and Antony, 2016; Hensley, 2017; Maijala *et al.*, 2018). Indeed, the lean processes and tools and the lean culture and principals need to be aligned with the overall organisation strategic position (Dahlgaard *et al.*, 2011).

2.4.3 Organisational Strategic Alignment

Within lean practice, a core principle is Hoshin Kanri which refers to the organisational deployment and alignment of strategic priorities and works on a top-down, bottom-up approach across the whole organisation from the individual, team and organisational levels (see Dombrowski and Mielke, 2014). Organisational Strategic Alignment is the process used to take the high-level objectives of organisational lean thinking and cascade these downwards through-out the various functions so that all employees are working towards the same goals and are focussed on the same goals (Liker, 2004). It is about pulling the whole organisation in the same direction. It takes all the important elements of a lean system and brings them together into a system (Bicheno and Holweg, 2016), which allows the organisation to align lean thinking goals on all levels (Mann, 2015). For Bicheno and Holweg (2016), it is this holistic system view that promotes the roles of employees working together to deliver value to customers which improves organisational

performance. However, sustainable lean requires the leadership to adopt a holistic approach (Pham and Thomas, 2012) that links the lean tools and processes with the organisations strategic goals and embeds them in the organisational culture (Aij and Rapsaniotis, 2016, Willis *et al.*, 2016).

For Dahlgaard *et al.*, (2011) leadership with the right attributes is the foundation for building organisational strategic alignment. Leadership supports organisational alignment through their own discipline and accountability (Mann, 2009; Nesensohn *et al.*, 2014; Aij and Tuenissen, 2017), their long-term focus and their ability to set and communicate clearly defined expectations (Liker, 2004; Radnor, 2011; Trenkner, 2016; Maijala *et al.*, 2018). Lean leadership must build a lean thinking culture into the organisation by a continuous re-enforcement of the lean tools and processes and the organisational strategic alignment so as to sustain organisational lean thinking (Bicheno and Holweg, 2016).

3.0 Conceptual Framework

The embracing of organisational lean thinking has been heralded as a critical success factor for organisations which has resulted in an evolutionary step within the lean literature from being just a production toolkit to a strategic value proposition that combines lean production with an enterprise-wide approach, (see Holmemo *et al.*, 2018). However, there is a significant research gap in our understanding of how organisational lean thinking is achieved (Hines *et al.*, 2018). Previous research tends to focus on lean practice (see Mann, 2009; Kimsey, 2010; Liker and Rother, 2011; Radnor, 2011) but with scant attention to the role of lean leadership in the pursuit of organisational lean thinking. This paper attempts to close that gap by presenting a conceptual framework for understanding how lean leadership drives lean practice to achieve organisational lean thinking and Figure 2 depicts the interrelationships between these components.

The attainment of organisational lean thinking is considered to be the goal to ensure sustained implementation of lean. The driving force behind the realisation of a state of organisational lean thinking is lean leadership. It is generally acknowledged in the literature that lean leadership is the catalyst to achieve organisational lean thinking and is the "critical transition as you move your organisation through the lean transformation, a point when managers must become coaches rather than tyrants and employees become proactive. This transition is the key to a self-sustaining organisation" (Womack and Jones,

1996, p. 69). The model highlights that lean practice is the bridge between lean leadership and organisational lean thinking and consists of lean tools and processes, lean culture and principles and organisational strategic alignment. The literature reviewed highlighted that lean leadership has a critical impact on embedding lean practices within the organisation. For instance, through consistent self-development and training (Mann, 2015), a lean leaders' use of coaching and mentoring (Spear, 2004) and the advocation of problem-solving (Liker and Rother, 2011) enhances the utilisation of the organisation's lean tools and processes (Bicheno and Holweg, 2016). Through re-enforcement of people development and embedment of the leader's own lean thinking, leadership utilises the lean culture and principles to enable and foster change (Garza-Reyes *et al.*, 2018). Lastly, by taking a holistic single enterprise approach, lean leadership can provide a vision (Liker, 2004) and align all the organisations activities in a shared set of goals (Dombrowski and Mielke, 2014) for strategic organisational alignment.

In essence, what is been proposed here is that leadership drives lean practice which in turn supports and enhances organisational lean thinking by utilising a diverse range of tools and processes, which is embedded in the lean culture to ensure long-term and sustainable organisation lean thinking and through a unified single lean system approach, an organisational state of lean thinking is achieved. Inherent in this argument is that organisational lean thinking is a shared organisational mindset which consists of a deeper appreciation of lean achieved through sophisticated problem-solving and built through a cycle of continuous learning.

Figure 2-Conceptual framework

4.0 Conclusion

Several important observations can be made about the current state of research in the field of lean and organisational lean thinking. Important amongst these is the scarcity of the literature, post the call in 1996 by Womack and Jones for more research in this area. Indeed, their seminal legacy of ideas still requires much research. While it has almost become a prescription of faith that lean thinking is the desired state for organisations, there is a significant paucity of academic research and most research is conceptual, or practice oriented in nature. Despite the claims of many authors, practitioners, and governments that the organisational lean thinking concept would transform and improve organisation performance and productivity, the disturbing evidence clearly shows an unacceptable high implementation failure rate. If successful organisational lean thinking implementation is scarce, then it implies an impetus to research it even greater as it might provide organisations with knowledge to sustain all efforts in that pursuit and in that vein of thought, this research contributes significantly to both practice and research. Therefore, the main objective of this paper is to bridge the gap in the afore-mentioned scarcity of research in this area and that this study will make a significant contribution to both the theories of lean and lean leadership by identifying and defining the concept of organisational lean thinking and how the relationship between lean leadership and the lean practice components is critical to achieving this state of organisational lean thinking embedment. Based upon the extant literature, a conceptual model is presented which depicts this interrelationship between lean leadership and lean practice in relation to organisational lean thinking. The model highlights that in order for organisational lean thinking to be sustainable, lean leadership has a vital role in supporting an organisation to reach a state of organisational lean thinking. This is achieved by lean leadership's interaction with the lean practice components – lean processes and tools, lean culture and principles and organisational strategic alignment to achieve organisational lean thinking.

The research will also make a significant practical contribution to the implementation and sustenance of lean by informing practitioners on the criticality of lean leadership and lean practices in building organisational lean thinking. From a practice point-of-view, the understanding of what lean leaders actually do to promote, embed and sustain lean is limited. Indeed, for Aij *et al.* (2015b, p. 120) – "Lean does not provide a template for leadership". It is hoped that this research will start to address this knowledge gap for

practitioners and provide a deeper understanding of the leadership practices and interactions required to embed and sustain lean at an organisational level.

For the literature to move forward and to be of use, research efforts must be directed towards addressing some of the key issues addressed in this paper. Over the last thirty years we have learned a lot about organisational lean thinking, however, a lot more work needs to be done. Finally, in terms of next steps, the author will explore methodological choice in terms of investigating the conceptual framework.

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Appendices

Appendix 1a: The Literature Reviewed

In order to scope the parameters of the study, the author carried out a wide and extensive review of the literature which covered a wide range of journals, books, and working papers. Even though there was obvious variation in quality between the literature reviewed, the key consideration was whether the study contributed to the stock of knowledge on understanding the organisational lean thinking concept.

In addition, it is also important for the reader to be aware that when conducting a literature review, some degree of uncertainty in the selection of materials is inevitable. Indeed, with any synthesis, decisions must be made about what is central to a topic, and so not all reviewed articles are referred to in the paper. Nevertheless, such problems with synthesizing literature were diminished through a thorough and meticulous review process. It is not the intention to claim that the selection of material examined here on organisational lean thinking is all-inclusive. Indeed, there will be both academic and practitioner publications missed (e.g., studies not written in English).

Furthermore, at all times and to the best of the authors knowledge; concepts, quotes, and propositions or hypothesis extracted from articles and books were used in their proper context. In addition, support material was referenced in order to ensure that this authors interpretation of other researcher's work is appropriate and accurate.

The literature review encompassed empirical research and conceptualisations reported by researchers published in 62 journal titles from a wide variety of specialisations encompassing 48 journal titles, covering the period from 1970 to 2020. The studies eventually presented for review were selected after conducting an exhaustive search of business, management, operations related databases (for example: ABI/Inform, Business Source Premier, Emerald Full text, and Science Direct) using key-related words and consulting the referenced literature of each piece of work in order to move through the relevant pieces of literature.

In total, 62 journals articles, 19 books, two conference papers and three institute publications, were accessed for this literature review – Appendix table 1 outlines this data.

Appendix 1b – Literature review overview

Journals	Articles
Accounting History Review	1
Administrative Science Quarterly	1
AORN Journal	1
BMC Health Services Research	1
European Management Journal	1
Financial Accountability & Management	1
Frontiers of Health Services Management	1
Group & Organization Management	1
Harvard Business Review	2
Healthcare Quarterly	1
Industrial Engineering & Management	1
International Journal of Computer Integrated Manufacturing	1
International Journal of Industrial Engineering and Management	1
International Journal of Lean Six Sigma	4
International Journal of Management Reviews	1
International Journal of Management Science and Engineering Management	1
International Journal of Operations & Production Management	5
International Journal of Production Research	1
International Journal of Productivity and Performance Management	1
International Journal of Public Sector Management	1
International Journal of Technology Assessment in Health Care	1
Journal of Global Economics, Management and Business Research	1
Journal of Health Organisation and Management	2
Journal of healthcare leadership	1
Journal of Management	1
Journal of Manufacturing Technology Management	3
Journal of Operations & Production Management	1
Journal of Operations Management	1
Journal of the Academy of Marketing Science	1
Leadership & Organization Development Journal	2
Leadership in Health Services	1
Lean Manufacturing	1
Management	1
Management Accounting	1
Organizational Dynamics	1
Production Planning and Control	1
Public Money & Management	1
Quality Progress	1
Reflections	1
School of Management	1
Sloan Management Review	1
Systematic Review Protocol	1
Technovation	1
The Total Quality Management Journal	1
Total Quality Management	2
Total Quality Management & Business Excellence	2
Training & Development Journal	1
Works Management	1
Books	
Leadership and performance beyond expectations	
The Lean Toolbox: A Handbook for Lean Transformation	
Leadership	
Japanese technology management: innovations, transferability and the limitations of "lean" production	
Better thinking, better results - case study and analysis of an enterprise-wide lean transformation	
The servant as leader	
Lean Misconceptions: Why Many Lean Initiatives Fail and How You Can Avoid the Mistakes	
Executive Leadership, a Practical Guide to Managing Complexity	
The Toyota way to Lean Leadership: Achieving and sustaining excellence through leadership development	
The Toyota Way	
Creating A Lean Culture: Tools to Sustain Lean Conversions	
Toyota Production System – Beyond Large-scale Production	
In Search of Excellence	
The lean start up	
Freedom from Command and Control: Rethinking management for lean service	
Operations and process management: principles and practice for strategic impact	
The Machine that Changed the World	
Lean thinking: Banish Waste and Create Wealth in Your Corporation	
Leadership in Organisations	
Conference paper	
Lean leadership – 15 rules for a sustainable lean implementation	
Assessing Lean Construction Maturity	
Institute publications	
Lean implementation in micro & small enterprises; Book of cases	
Why lean programs fail	
A continuing Lean Journey: The Shingo Prize at 25 - Discovering the power of principles in cultural change	

Paper 2

RESEARCH METHODOLOGY PAPER

Preface to Paper Two

Paper two introduces the planned research approach to the study and also sets out and discusses the philosophical positioning of the researcher and accordingly, the research study. Based on this, the research adopts an interpretive research strategy and a single site case-study to further the research. This research approach is deemed appropriate given the over-dominance of the positivistic methods already existent within this research field.

Also noteworthy in this paper is the evolution of thinking in regard to a more recursive relationship between lean leadership and organisational lean thinking. This is emphasised more prominently in the paper's presentation of the conceptual model and is indicative of the authors greater depth in the understanding of the research topic.

Paper two of the Cumulative Paper Series, the Methodology Paper, was presented to the DBA Examination Panel in May 2021. The examiners made minor recommendations for improvement of the paper. The paper that is presented in this thesis is the revised and approved paper.

Doctor of Business Administration (DBA)

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Date: 06 / 05 / 2021

RESEARCH PAPER SERIES

Paper 2:

METHODOLOGY PAPER

"To explore the relationship between Lean leadership and Lean practice to achieve Organisational Lean thinking"

ABSTRACT

Amongst Lean scholars, positivistic case studies have become the dominant method and most report only success stories about the utilisation of techniques to improve operational performance, despite convergent evidence suggesting only 10% of implementations succeed. Part of the problem is that Lean has emerged from practice, and taken for granted assumptions, have been taken for fact and built upon through empirical investigation. The consequence is that within the lean literature, fad cannot be separated from truth. Additionally, Lean has been heavily criticised for neglecting the 'human factor' in its research approaches and has been equated to a Marxist perspective of de-humanising by focusing on instrumental techniques for improving performance. This paper aims to bridge this research gap between academia and practice by using an interpretive case study research approach to explore the relationship between lean leadership and lean practice to achieve organisational lean thinking. This paper encompasses the methodology choice and the philosophical and research area factors that supported this decision, and including the proposed conceptual framework, available data sources, proposed sample selection, choice of data collection methods, an initial outline of the data analysis method, the ethical implications of the research and the limitations of the chosen approach.

Paper word count: 8487

1.0 Introduction

The paper will set out the primary research strategy and approach to explore the relationship between lean leadership and lean practice to achieve organisational lean thinking. The paper will be structured as follows - in the next section, the research objectives, the concepts being researched and the conceptual model are presented. Subsequently, the philosophical positioning of this study and a research methodology strategy is then presented. This will be followed by detailed discussion on the selected research approach and design whilst also acknowledging limitations. Next, the ethical implications and the legitimization of the research will be considered, and the paper concludes with an outline of the next steps.

2.0 Research Gap and Aim

The literature analysis in paper one identified that despite the importance attributed to lean, the failure rates of lean implementations are unacceptably high, ranging from 50% to 90% (Ringen and Holtskog, 2011; Pedersen and Huniche, 2011). While it would be erroneous to attribute successful lean implementation to any single factor, evidence does suggest (Roth, 2006; Achanga *et al.*, 2006; Bodek, 2008; Kimsey, 2010) that lean leadership is the missing link in the process (Mann, 2009: Pham and Thomas, 2012). Numerous other authors offer convergent evidence that lean leadership is the driving force behind both the implementation and sustainability of organisational lean thinking (Poksinska *et al.*, 2013; Trenkner 2016; Willis *et al.*, 2016; Aij and Teunissen, 2017).

Indeed, for both Trenkner, (2016) and Aij and Teunissen, (2017), lean leadership is critical in promoting lean practices and embedding an organisational lean thinking mind-set within an organisation. However, while most of these contributions emphasise the relationship between lean leadership, lean practices and successful lean thinking implementation, they are conceptual in nature, often practitioner-led and there is a real lack of empirical investigations and evidence (Hines *et al.*, 2018). Considering the critical role of lean implementations in organisations, more research is needed in these environments in order to understand the inter-relationships between lean leadership and lean practice in relation to organisational lean thinking and in particular the role that lean leadership plays in embedding lean practices to achieve organisational lean thinking. Therefore, to close this research gap in our understanding, the purpose of this research is

to explore the relationship between lean leadership and lean practice to achieve organisational lean thinking.

Based upon the foregoing literature, Figure 1 presents a conceptual model (See the detailed description in paper one: section 3, p. 29) that proposes that lean leadership drives lean practice which in turn supports and enhances organisational lean thinking. This thought process is very much aligned with previous authors who have discussed the role of the leader in lean literature (see Mann, 2009; Poksinska *et al.*, 2013; Aij *et al.*, 2015b; Goodridge *et al.*, 2015; Tortorella and Fogliatto, 2017; Laureani and Antony, 2018). For instance, Mann (2009) proposes that in order to embed lean thinking, leaders must support the application of lean practices. Both Trenkner (2016) and Aij and Teunissen (2017) also discuss how leadership and in particular, leadership style is critical in promoting lean practices and embedding an organisational lean thinking mindset.

The conceptual model also shows that lean leadership utilises a diverse range of tools and processes (see Liker and Rother, 2011 and Bicheno and Holweg, 2016), which are then embedded in the lean culture and principles of the organisation (Mann, 2009). Lean Practice consists of three components, explicitly Lean Processes and Tools, Lean Culture and Principles and Strategic Organisational Alignment and is about the actual implementation of these components to optimise the people, resources, effort, and energy of the organisation towards achieving organisational lean thinking and creating value for the customer (Bhasin and Burcher, 2006; Dombrowski and Mielke, 2014; Bicheno and Holweg, 2016; Maijala *et al.*, 2018).

This embeddedness ensures a long-term and sustainable organisation lean thinking and through a unified single lean system approach (Dombrowski and Mielke, 2014), an organisational state of lean thinking is achieved (Hines *et al.*, 2018).

This organisational lean thinking is achieved when everyone in the organisation understands the lean concepts and can apply them in daily processes at some level (Liker, 2004). It is through the use of these lean concepts when dealing with problems and opportunities that leads to a shared organisational mindset which consists of a deeper appreciation of lean which is achieved through sophisticated problem-solving and built through a cycle of continuous learning (Proudlove *et al.*, 2008; Radnor, 2011). Although, not exclusively included in the literature review in paper one, it is acknowledged that the presence of a recursive relationship between lean leadership and organisational lean

thinking may emerge during the exploration of these topics during research particularly in the context of the cyclical nature of continuous learning.

Figure 1-Conceptual Framework

The supporting research objectives are as follows:

<u>To investigate the concept of organisational lean thinking</u>

Even though the concept of organisational lean thinking was introduced by Womack and Jones in 1996 and discussed widely by numerous other authors since then (see Spear, 2004; Liker 2004; Roth, 2006; Mann, 2009; Liker and Convis, 2012; Dombrowski and Mielke, 2014; Goodridge *et al.*, 2015; Sisson and Elshennawy, 2015; Hensley, 2017; Maijala *et al.*, 2018), a comprehensive definition of organisational lean thinking has not been provided. This research will explore what organisational lean thinking actually means to organisations and their employees and whether the identified components of problem solving (Liker, 2004), organisational learning (Hines *et al.*, 2004), culture and mindset (Mann, 2009) exist in the practical world of organisations, who have sustained lean implementation.

<u>To explore the nature of the relationship between lean leadership and lean practice</u>

Secondly, this study will investigate the key elements of lean practice such as the lean tools and processes, lean culture and principles and organisational strategic alignment. A

core focus will be to explore the interactions between the lean leadership of these organisations and the lean practice elements and how proactive a role (if any) lean leadership (Pham and Thomas, 2012) takes in championing and supporting these lean practice elements (Mann, 2009; Nesensohn *et al.*, 2014; Aij and Teunissen, 2017). This research will look for specific examples of lean leadership contact, involvement and advocation of the lean tools and processes, lean culture and principles and organisational strategic alignment in the organisation.

To explore the relationship between lean practice and organisational lean thinking

Thirdly, the study will attempt to explore what effect the organisation's key lean practice elements have on achieving and sustaining organisational lean thinking (Liker and Rother, 2011). The research will attempt to explore from the point-of-view of the people working in the lean organisation, how lean practice contributes to embedding lean thinking at every level of the lean organisation (Liker, 2004; Bicheno and Holweg, 2016).

To explore the relationship between lean leadership and organisational lean thinking

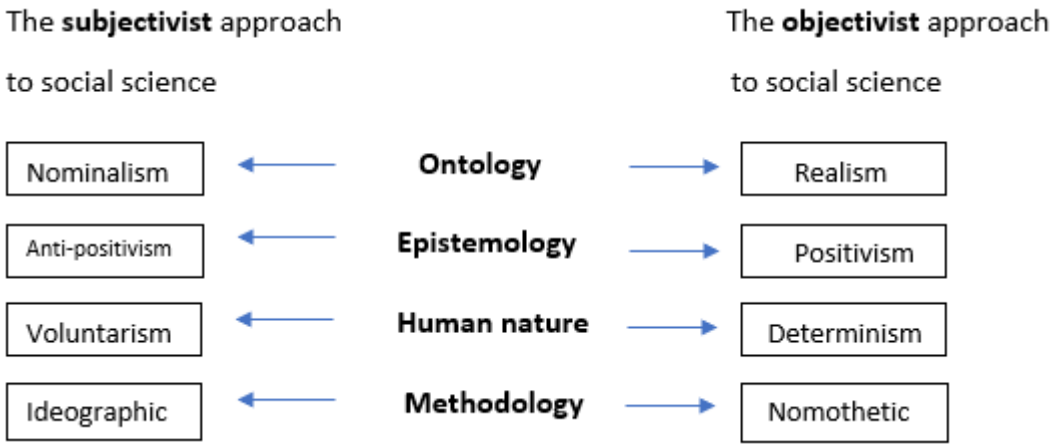
Finally, this study will probe how lean leadership is being practiced or at least being advocated in the organisation, what lean leadership attributes are being promoted and how do they compare with the already identified lean leadership attributes. In the literature review, these attributes were identified as self-development and training (Mann, 2015), coaching and mentoring (Spear, 2004), problem-solving (Liker and Rother, 2011), people development, providing a vision and being able to foster change (Garza-Reyes *et al.*, 2018). Other lean researchers have underlined the importance that lean leadership has to organisational lean thinking (Liker, 2004; Mann, 2009; Liker and Convis, 2012; Dombrowski and Mielke, 2014) but few, if any, have explored the detail of this relationship. This research will explore exactly how this relationship works in the practical setting of a lean organisation.

3.0 Philosophical positioning of this study

According to Burrell and Morgan, "all theories of organisation are based upon a philosophy of science and a theory of society" [and the authors propose] "that it is convenient to conceptualise social science in terms of four sets of assumptions related to

ontology, epistemology, human nature and methodology" (p. 1, 1979). Researchers of social science need to be explicit when stating the ontological and epistemological assumptions that underlie their research (Adcroft and Willis, 2008, Bansal *et al.*, 2018). Figure 2 below illustrates these assumptions.

Figure 2 -The subjective – objective dimension



Source: adapted from Burrell and Morgan, 1979, p.3)

This paper will now discuss the philosophical position regarding these four assumptions:

Ontology is concerned about the nature of reality itself (Holden and Lynch, 2004), whether it is a real thing that exists independently - "whether reality is of an objective nature" or whether reality is simply a product or a perception on the behalf of the individual-"the product of one's mind" (Burrell and Morgan, 1979, p. 1). How the researcher perceives reality is important and has implications for both the epistemological stance and the methodology employed (Holden and Lynch, 2004). This researcher is of the viewpoint that reality is fundamentally subjective – "important reality is what people perceive it to be" (Kvale, 1996, p. 52) and therefore will adopt a nominalist position which is aligned with the very nature of qualitative research which seeks to understand. This is very much in contrast to the quantitative research emphasis of the measurement of differences (Ritchie and Lewis, 2003). Justification for this viewpoint lies in the research objective of this study which is exploring the relationships and inter-dependencies in a lean setting and will be an exploration rather than a measurement. It will entail collecting and understanding different individual's viewpoints, opinions and perceptions of the subject matter being studied.

Moreover, a full immersion into the research subject matter will be required to gather the required data in order to answer the research objectives. Evered and Louis (1981) describe this technique as "inquiry from the inside" and it is consistent with the "the assumption that the researcher can best come to know the reality of an organisation by being there: by becoming immersed in the stream of events and activities, by becoming part of the phenomena of study" (p.388-389). This nominalist standpoint is supported by other authors such as Klein and Myers (1999) when they cite Orlikowski and Baroudi (1991), who say "People are active makers of their physical and social reality" (p. 73).

Epistemology is concerned with how the researcher regards human knowledge. For both Burrell and Morgan (1979) and Kvale (1996) epistemology concerns the questioning of what exactly is knowledge in the first place, what is "true" and what is "false" and then to dig deeper and question what "true" knowledge means. As to the question of whether knowledge is a "hard" and "tangible" thing or something "softer and more subjective" (Burrell and Morgan, 1979, p.1), this research will be consistent with the nominalist stance taken on the ontology question and express a viewpoint that knowledge is subjective, and the possibility exists of differing realities (Robson, 2002). Klein and Myers (1999) suggest that in social research, data is not just waiting to be collected, like 'rocks on the seashore' but actual knowledge is a product of the social interaction between the participants and the researcher.

Flyvbjerg (2004), who is an advocator of this viewpoint, also asserts that only a context dependent epistemology is appropriate in the study of social sciences. This stance is further supported by Castleberry and Nolen (2018), who state that the main aim of qualitative research is to achieve a better understanding of the research subject matter through the first-hand experiences of those who have experienced it. From an epistemological perspective, this approach to the research will develop deeper and richer knowledge through learnings from the experiences of the research subjects and the interpretation of their responses and also suggests that the objective nature of a positivist philosophical approach would be limited for this study (Kvale, 1996).

Human Nature is concerned with whether or not people are controlled by their environment – this research supports the voluntarism argument that people actually have a "free-will" to do what they want and are not always forced to react to what is thrown at them (determinism) – "man is regarded as creator of his environment, the controller as

opposed to the controlled" (Burrell and Morgan, 1979, p. 3). Since this research is exploring the relationship between lean leadership and lean practice to achieve organisational lean thinking, it will adopt a voluntarist position because it implies that people have a level of autonomy to do what they want.

Based upon the foregoing assumptions that reality is socially constructed, that knowledge is a subjective entity and that people have independence of thought to react to the constructs of this social reality, this research adopts an interpretive philosophical position to understand and explore the research topic further (Robson, 2002). Finally, the subscription of this study to the outlined interpretive assumptions on ontology, epistemology, and models of human nature, have guided the realisation that for the research aim of to explore the relationship between lean leadership and lean practice to achieve organisational lean thinking, an interpretivist methodology is better suited. The following sections justify this position and the methodological assumptions of the present study.

4.0 Overall Research Strategy

It is generally acknowledged in the literature that a research strategy needs to take into account both the research topic that is to be studied and the philosophical positioning of the researcher (Morgan and Smircich, 1980; Holden and Lynch, 2004; Ponterotto, 2005). Based upon both the philosophical stance and the exploratory nature of the study, the research strategy will be exploratory and interpretive in its nature as it seeks to understand rather than to measure (Ritchie and Lewis, 2003).

Moreover, in order to address the research objectives of this study and understand the complexity inherent within the relationship of lean leadership, lean practices and lean organisational thinking, it will be necessary to adopt a subjective exploration of the thoughts and viewpoints of people working in the lean organisation as to what constitutes organisational lean thinking and what relationships exist. Therefore, based upon the foregoing, the research strategy adopted will be interpretive in nature which "is informed by a concern to understand the world as it is, to understand the fundamental nature of the social world at the level of subjective experience" (Burrell and Morgan, 1979, p. 28).

5.0 Interpretive Research Approach

Whilst there are several types of relevant interpretivist approaches available such as the ethnographical, action and case study approaches, a research decision was made that in order to understand the relationship between lean leadership and lean practice to achieve organisational lean thinking, the present study will adopt a case study research method. The ethnographic approach was not chosen due to the length of time required in the field to complete this type of study (Yin, 2009) and action research was deemed not suitable because it implies the study of the application of change in the field as opposed to exploration (Heller, 2004).

In addition, other considerations guided the decision for adopting the case study approach. First, the exploratory nature of the research aim of this study demands that the research approach facilitate the researcher to untangle a web of inter-related and complicated group of elements (Flyvbjerg, 2004; Crowe *et al.*, 2011; Bansal *et al.*, 2018). The second factor influencing methodological choice are practical constraints – "research design is always a matter of informed compromise" (Bechhofer and Paterson, 2000, p. 71). The constraints to be considered are time limitations, geographical practicalities and actually gaining adequate access (Kvale, 1996; Ritchie and Lewis, 2003; Yin, 2009) to organisations deemed to illustrate best practice in lean. Even without the present global pandemic situation, in regard to travel and access restrictions, these factors need to be given full consideration.

Finally, because the researcher will encounter an existing set of events that are outside the control of the investigator, incorporating triangulation into the research approach is required and the case-study method is an ideal study vehicle to accommodate this (Yin, 2009).

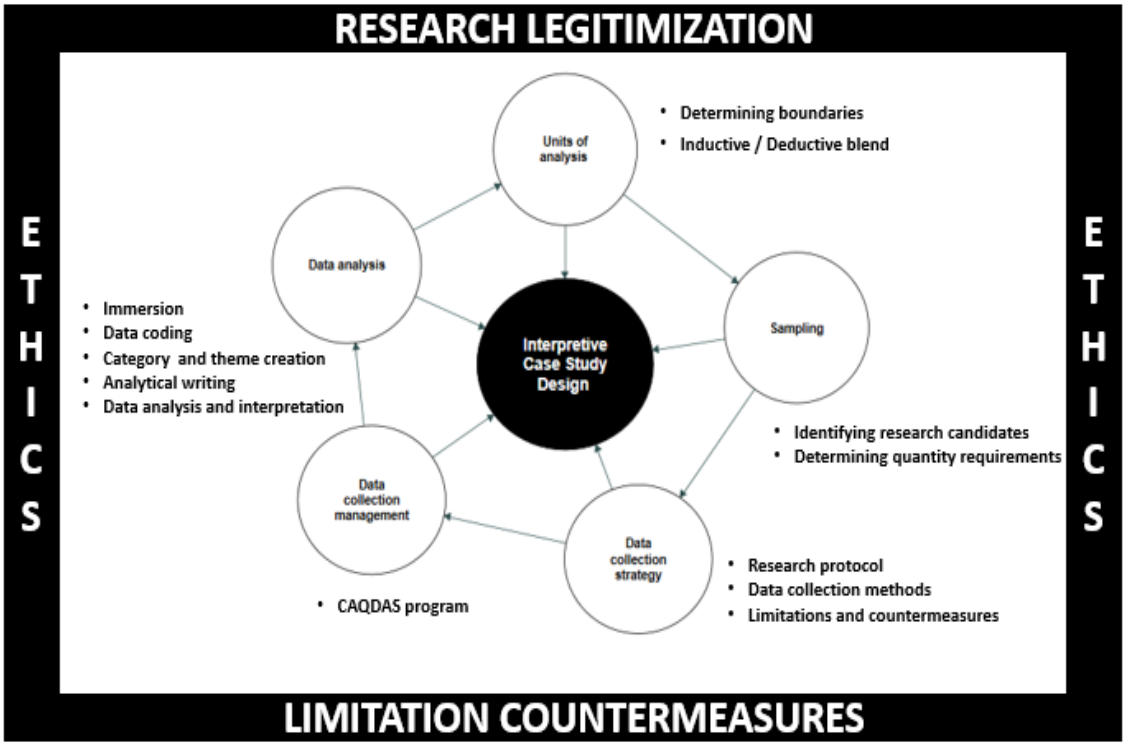
5.1 Interpretive Case Study Research Design

Kvale (1996) uses the analogy of social research as a journey when he endorses the need to have a pre-determined research method and he draws our attention to the original Greek meaning of 'method' which is a "route that leads to a goal" (p. 4). For Yin "a research design is the logic that links the data to be collected and the conclusions to be drawn to the initial questions of study" (2009, p. 24). More than any other type of research, an interpretive case study requires careful attention to research design, because while case

studies can deliver rich and insightful results, they are often criticised in terms of validity, reliability, and generalisability often due to the absence of research designs (Mason, 1996; Flyvbjerg, 2004). While this researcher agrees that interpretive case research should not prescribe to a mechanistic, pre-determined process for conducting research and that every attempt should be made to maintain the richness and heterogeneity contained in interpretive research case studies, this does not imply that there can be no standardised practices by which researchers can follow. The recommendation being presented here is that all researchers need to make accountable their decisions on the unit of analysis, sampling, a strategy for data collection, data management and analysis and most importantly why the researcher is conducting the research in the planned manner. Like Klein and Myers, this researcher believes that "it is better to have some principles than none at all, since the absence of any criteria increases the risk that interpretive work will continue to be judged inappropriately" (1999, p. 68).

Thus, this paper is motivated to address this issue by emphasising the conceptual and practical aspects of conducting an interpretive case study and presents a more formalised case research design as illustrated in Figure 3.

Figure 3 - Case research design overview



Source: adapted from Kvale, 1996; Yin, 2009; Miles *et al.*, 2014, Castleberry and Nolen, 2018

Unit of analysis

One of the most difficult processes in conducting case research is answering the questions what the case is and where the case leaves off (Miles and Huberman, 1994; Mason, 1996). Yin particularly highlights this difficulty in his definition of a case study research as "an empirical enquiry that investigates contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (1994, p. 13). To overcome this difficulty, Miles and Huberman (1994) advise researchers to think about the heart of the study and then build outward towards the indeterminate boundary that defines the edge of the case by concentrating on what is not being studied. Noteworthy here is the phrase 'indeterminate boundary'. Interpretive researchers have to be aware that initial case boundaries are "never quite as solid as a rationalist might hope" (Miles and Huberman, 1994, p. 27). As it is with other facets of research design, discoveries during data collection may result in revising earlier decisions. However, in saying that, it is also true that defining a case as early as possible adds clarity and direction for the researcher (Mason, 1996). For Yin (2003), the appropriate unit of analysis occurs when the researcher accurately specifies their research questions. He argues that if a researcher is finding the defining of a unit of analysis confusing, it means that the research questions are probably too obscure or too numerous. For Miles and Huberman (1994), a case study can be defined into several categories, explicitly the nature and size of the social unit, temporally or spatially. For this research the unit of analysis will be defined as the lean leadership team who are responsible for promoting and embedding organisational lean thinking into the lean organisation. The research investigation will also encompass a sample of people reporting into the lean leadership team to understand their perception of lean leadership and impact (Yin, 2009).

Sampling

After the overall boundaries of the chosen research case have been defined, the next important step to consider is that of sampling and it is critical to acknowledge that the logic driving the sampling decisions will not be driven by statistical and numerical scientific probability (Yin, 2009). Indeed, interpretive research demands the logic of theoretical or purposeful sampling. Unlike statistical sampling where the emphasis is on having a representative sample that is used to substantiate findings to the wider environment, theoretical sampling from an interpretive perspective is concerned with

constructing a non-representative sample with the aim of developing theoretical propositions or explanations. In general terms, this form of sampling consists of the "procedures used to identify, choose, and gain access to relevant units which will be used for data generation by any method" (Mason, 1996, p. 83).

This leads to the first sampling issue - how many cases are needed. The logic of theoretical sampling means that you select a number of cases that will help the researcher answer their research questions and thus understand the phenomenon rather than to statistically provide a representation of a population (Mason, 1996). For Mintzberg (1979) sample size is irrelevant in interpretive case research and that interpretive researchers should not have to apologize for gathering rich data, something large samples often cannot do. Onwuegbuzie and Leech, (2007) are also alert to this point and argue that the quality of research does not automatically correspond to the size of the sample, especially when the primary aim of the research is not to extend or go beyond the case in point. They advise interpretive researchers to move away from the positivistic fixation on data and sample size and return to the main purpose of interpretivism, which is understanding the phenomenon. Based upon the foregoing, it is the belief of this researcher that there are no restrictions for sample size and the decision remains with the researcher as long as the rationale and decision can be justified. This research will be adopting a single in-depth case study in order to gather rich and deep insights into lean leadership, lean practices and organisational lean thinking.

The selection of cases represents the next important element of the sampling process. The literature provides a wide range of sampling strategies that researchers could utilise to select their cases (see Patton, 1990; Miles and Huberman, 1994), however, regardless of whichever selection strategy is used, "the underlying principle that is common to all these strategies is selecting information rich cases", that will allow the researcher to develop theory (Patton, 1990, p. 181). In order to understand the phenomenon at hand, this research requires a case site that has achieved organisational lean thinking. It is generally accepted in academia and industry that the 'Shingo Prize' model (see Tanner and Roncarti, 1994; Lowry, 1995; Richey, 1996; Liker, 2004; Schonberger, 2007; Spear, 2008; Burgess and Radnor, 2013 and Miller, 2013) is an acceptable standard for use as a benchmark to identify organisations that has been deemed to have achieved organisational lean thinking, "the greatest advantage of the Shingo Prize model is that it is a comprehensive and proven assessment method" (Bicheno and Holweg, 2016, p. 7).

It is proposed that this research targets the lean leadership at an organisation that has achieved Shingo accreditation. At present, there are twelve organisations in Ireland that have received a Shingo award, as represented by Table 1.

Table 1 - Irish Shingo Award Holders

Year Awarded	Level	Company Name & Plant	State	Industry
2020	Silver	Boston Scientific Clonmel	Clonmel	Medical
2019	Silver	Analog Devices International	Limerick	Electronic
2018	Shingo Prize	AbbVie Ballytivnan	Sligo	Pharmaceutical
2018	Bronze	Forest Tosara	Dublin	Pharmaceutical
2017	Shingo Prize	Abbott Nutrition Supply Chain	Sligo	Nutrition
2016	Silver	Meda Rottapharm Ltd	Dublin	Pharmaceutical
2016	Shingo Prize	Boston Scientific Cork	Cork	Medical
2015	Bronze	Lake Region Medical	New Ross	Medical
2015	Shingo Prize	Abbott Diagnostics Longford	Longford	Medical
2014	Shingo Prize	Abbott Vascular	Clonmel	Medical
2014	Shingo Prize	DePuy Synthes	Cork	Medical
2012	Bronze	Lake Region Medical	New Ross	Medical

Source: Shingo Institute Organisation (Available at https://shingo.org/awards)

Data collection strategy

The discussion thus far has focused on clarifying, what is it that the researcher wants to find out, from whom and why. As Miles and Huberman (1994) state “knowing what you want to find out, at least initially leads inexorably to the question of how you will get that information” (p. 34). To ensure that this question is answered properly, it is advisable to generate and develop a research protocol prior to going out into the field because it structures the researchers thinking on decisions relating to how that information is going to be gathered and so from the outset sharpens sampling decisions (Miles and Huberman, 1994). The research protocol is a vital part of any research as it is the blueprint that outlines and challenges the design of the research methods; without a proper design in place, inaccurate research results can be yielded (Denzin, 1989). This “fore-shadowing” of problems (Delamont, 2004, p. 224) can be useful to identify possible obstacles and the mitigations that are required to circumvent them. Also, there is another more practical reason to support the requirement of a detailed protocol. That is, in today’s global situation and economy, people’s time is valuable and in the researcher’s practical experience as a people leader in the lean manufacturing industry, most organisations want to know, in advance of entry to the site exactly what the project is about? What research

instruments are going to be used? Will participant's information be confidential? What is the approximate investigation time span? These questions are in essence the basis of research protocol or instrumentation. Moreover, it could be argued that even if such a research protocol is not requested by potential respondents, it should nevertheless be supplied because it can be an extremely useful mechanism for clarifying any misunderstandings that may exist prior to site entry and facilitate ethical discussions on the ground rules for the study and the access to the site.

Table 2 provides an overview of this study's research protocol and a full and detailed protocol is contained in Appendix 1.

Table 2 - Overview of research protocol

Researcher	John Cheevers
Study Title	To explore the relationship between Lean leadership and Lean practice to achieve Organisational Lean thinking
Purpose of the research	Understand organisation dynamics, explore component relationships, generate new knowledge.
Study Design	Interpretive research-Single case study - Interviews, document analysis and direct participant observation.
Study Participants	Focussed on the people leadership and their direct reports.
Planned Sample Size	This study will aim for 20 to 25 interviewees.
Planned Study Period	Four to Six months.

Data Collection Methods

The benefit of using case research is the potential use of many different sources of evidence, commonly known as triangulation (Yin, 1994). Indeed, it is generally accepted by most, that findings emanating from a case study will utilize several sources of data collection methods to ensure 'convergence and corroboration' (Eisenhardt, 1989; Yin, 2003). Following good practice depicted by Yin (2003), the researcher generated a table (see Table 3) of (i) possible research methods, (ii) data source options, (iii) method justification, (iv) practicalities (such as resources, skills, whether you can gain access to the data sources), and (v) ethical issues. This chart necessitated the researcher to ask himself how the method and sources will address the research questions and in essence determine the appropriateness of the method for this study.

Table 3 - Data Collection Considerations

Research objective	Research questions	Data sources	Data collection methods	Justification	Practicalities (e.g. resources, access, skills)	Ethical issues
To explore the relationship between lean leadership and lean practice to achieve organisational lean thinking	1. To explore the concept of organisational lean thinking 2. To explore the nature of the relationship between lean leadership and lean practice 3. To explore the relationship between lean practice and organisational lean thinking 4. To study the relationship between lean leadership and organisational lean thinking	Members of Lean Leadership team with more than 5 people reporting to them at an establsihed lean organisation	**Documentation:** This type of information can take many forms such as letters and other communiqués such as e-mails; agendas, reports, minutes of meetings; Formal studies; rough notes, progress reports, newspaper clippings, pictures and other internal records.	Documents are unobtrusive in that they are not created as a result of the case study Document can provide the formal expression of the interaction that is occurring between the lean components Documents have a long span of time, covering many events and many settings Documents could verify or contradict evidence from other sources Documents are exact and stable	May not be lacking in bias Access to full documentation may prove difficult or even be blocked. Thus retrievability may be low May not always be accurate	There are several ethical issues to be considered with all of these data collection options **Impose no harm** – firstly, the researcher must take every available precaution or step so as not to cause any damage, intentional or unintentional, to the research subjects or research organisations **Consent** – need to focus on the disclosure of research intent and informed consent prior and post-research and the right to withdraw at any point in the process **Confidentiality** – need to ensure that the research candidates have the right to confidentiality and privacy Need to take reasonable precautions before publishing to ensure the anonymity of the participants **Trust** – the need to ensure ethical conduct is present throughout the research process to maintain a trustful relationship between the present parties involved and all future research relationships
			Interviews: consist of direct face to face communication with the targeted audience	The focus is specifically targeted to the problem at hand Interviews with lean leadership members should provide insight into the dynamics of their organisation. The researcher can probe further. The interviews should also clarify issues emerging from other sources	Time constraint - Interviews to be recorded and transcribed Scheduling may be problematic May not always be accurate due to poor recall and reflexivity	
			Participant observation: demands first hand or direct involvement in the phenomenon under investigation	Events occur in real time Would provide insight in to inter-personal behaviours and motives of the participants	Problems in getting candidate organisation to agree to access may Issues of bias due to investigators manipulation of events Events may occur differently because it is being observed	
			Reflexive practices: consists of the participant engaging in a reflective practice about the interactions that they have experienced with each other. It is in essence an inside-out approach.	It would provide insight into the thinking, the concerns, the assumptions, the uncertainty, the expectations of the participants It makes respondents question their own actions and how they might have influenced the other interactant	It is a time intensive process for the respondent Respondents may feel that it is too personal, ambiguous or unstructured	
			Literature review: A thorough review of the existing literature on the topic at hand	Literature review completed in tandem with case research should allow the researcher to see the theory emerging from the data	Access to literature is paramount Researcher must expend the time and effort on accomplishing the task	

Source: adapted from Mason, 1996; Kvale, 1996; Pettigrew, 1997; Thorne, 1998; Robson, 2002; Ritchie and Lewis, 2003; Yin, 2003; Ryen, 2004; Qu and Dumay, 2011; Miles et al., 2014

As illustrated in Table 3, based upon this assessment for practicality and operational reasons, this study research design will utilise in-depth interviews, document analysis and participant observation (Jørgensen, 1989; Ritchie and Lewis, 2003; Bowen, 2009). Table 4 provides an overview of the indicative data collection process. Each method will now be discussed in turn.

Table 4 - Data Collection Overview

Research elements	Detail	Quantity	Specification
Unit of Analysis	Lean leadership team	10 -12 leaders & 7 - 8 team	Lean leaders and team member groups
Sampling	Shingo Award organisation	1 organisation	One Irish organisation that holds a Shingo award
Data collection	In-depth Interview	20 - 25	1 - 2 interviews per leader and team members to probe and clarify themes
	Participant observation	4 occasions	Examples include meetings, employee problem solving, induction and recognition events
	Document Analysis	6 types	Shingo achievement report, SOP's, HR policies, training manuals, Vision statement, Organisation Values
Data management	CAQDAS program	1	Nvivo 10 program
Data Analysis	Thematic analysis	1	Transcriptions from interviews, observation field notes and documents

In-depth Interview

For Kvale, "if you want to know how people understand their world and their life, why not talk to them?...the qualitative research interview attempts to understand the world from the subjects' point of view, to unfold the meaning of peoples' experiences, to uncover their lived world prior to scientific explanations" (1996, p. 1). The in-depth interview has been described as holding the central position as a resource in the engagement process between the contemporary social science and it's research into topics of concern (Atkinson and Silverman (1997). Rapley (2004) describes the in-depth interview as "social encounters where speakers collaborate in producing retrospective (and prospective) accounts or versions of their past (or future) actions, experiences, feelings and thoughts" (p. 16). He states that the in-depth interview process facilitates interviewees to provide "thick descriptions" of events, and "textured and authentic accounts" to the interviewer (p. 15).

Taking the nominalist epistemological viewpoint, the utilisation of the in-depth interview to gather data is aligned to the interpretivist nature of this research study where it is proposed that deeper knowledge will be gained by eliciting the viewpoints and insight provided by the research candidates (Kvale, 1996; Robson, 2002). According to Castleberry and Nolen (2018), the main objective of interpretive research should be to achieve a better understanding of the research subject matter through the first-hand experiences of those who have experienced it. There are obvious advantages of the in-depth interview technique as a data collection method. Because the author is both the person conducting the interviews and the person carrying out the data analysis, any concerns about data familiarisation (Green *et al.*, 2007; Nowell *et al.*, 2017) will be avoided as the researcher is both the data gatherer and the person completing the data analysis. Both Hakim (2000) and Robson (2002) believe that the legitimisation of the data collected in interviews is reinforced by the opportunity afforded to the interviewer to probe the interviewee sufficiently to gather sufficient detail and also to explore thoroughly the participant motivations in this interview setting.

As to the subject of the required number of interviews, Kvale (1996) provides a simple answer to this question – "as many interviews as required to understand what you need to know – too many subjects prevent you from making any concrete interpretations of the data gathered but too few stop you obtaining generalizability…bottom line is that the purpose of the study dictates the number required" (p. 102). Even though this research will not attempt to obtain research generalization, there is still sound logic to Kvale's assertions. From the researcher's first-hand experience of large lean organisations with approximately 1000 employees, it is anticipated that the organisation will have approximately 40 lean leaders with employees reporting to them. A reasonable expectation would be to get interview access to at least 10 to 12 of these lean leaders and some of their team members to carry out an interview to probe and clarify their thoughts on the research topic. This research study will aim for between 20 and 25 interviewees however the researcher will be mindful that there may be a point in the data collection and data analysis that data saturation has been reached and the proposed interviewee target will not be required (Fusch and Ness, 2015). Finally, as part of the research design, an interview guide was developed (see Appendix 2) to support interview structure.

Document Analysis

According to Denzin (1989), document analysis can be used in tandem with other qualitative research methods to provide research rigour in the form of triangulation, which he describes as "the combination of methodologies in the study of the same phenomenon" (p. 291). This viewpoint is also supported by Robson (2002) when he advocates that document analysis can provide valuable cross validation of other data collection strategies.

"Documents are situated products and as such can take many forms" (Prior, 2004, p. 375). It is incorrect to consider that documents are 'peripheral' as a source of research data and inferior to research methodology that directly interacts with research targets (Prior, 2004). Documentation serves not only a source of information but also is an integral part of the process itself (Lynch, 1985, p. 153), documents are not 'inert' items but rather an active part of social transactions - "active agents in schemes of human interaction" (Prior, 2004, p. 388). Indeed, documentation will be a key source of data in this research project because they will provide meaning and generate understanding and knowledge of the lean structures and environment in the case site (Corbin & Strauss, 2008). Similar to other qualitative data inquiry methods, document analysis will enable the researcher to organise and probe the data, find common threads amongst the content and categorise and amalgamate information to develop themes and explore and interpret meanings (Robson, 2002; Labuschagne, 2003).

One of the main advantages of document analysis for this research is that unlike other data collection strategies such as interviewing, there is a level of impartiality and it is a non-obtrusive measure and non-reactive and not affected by the researcher's interaction with it (Robson, 2002). It is proposed that this research requests access to a variety of documents such as the Shingo achievement report, Standard Operating Procedures (S.O.P's), HR policies, Training manuals, Vision statement and Organisation Values in order to determine the current level of lean thinking in the candidate organisation.

Participant observation

According to Jørgensen, (1989), the methodology of participant observation is both appropriate and incomparable for social studies involving processes and exploring relationships and organisational structure especially if there is a gap in knowledge about the research area or phenomenon. For the purpose of this lean study, the researcher will

be the observer, which is the research instrument, “the primary data are the interpretations by the observer of what is going on around him” (Robson, 2002, p. 314). Participant observation does not require actual participation in the process or phenomenon being studied but does require the researcher to spend a sufficient amount of time being close enough to the participants to observe and understand their experiences while the process is taking place – this could be regarded as partial immersion (Delamont, 2004).

Participant observation requires the generation of a ‘thick description’ of the research environment and its participants, that is rich enough to allow a reader to visualise the setting (Geertz and Darton, 2017). In order to accomplish this, the researcher must observe everything, take in-depth notes, constantly ask questions, and reflect on the data away from the research environment as soon as possible after the observation (Wolcott, 2009). For this research, it is proposed that direct participant observation takes place in at least four different work settings and examples of these settings are meetings, employee problem solving, employee induction and recognition events, although other suitable work settings could present themselves as the research progresses. This has a number of advantages. It will allow the research to have direct access and to simply observe what they do and listen to what they say (Robson, 2002). As a form of triangulation between other data collection methods, participant observation can support or reject the information gathered in a formal structure, i.e. in-depth interviews or document analysis (Robson, 2002). Nevertheless, there are limitations to this data collection method that could impede upon the current study. Indeed, the researcher will have to find a balance between being fully detached which can come across as being anti-social and being overly involved which would compromise their role as observer (Robson, 2002). The researcher has also to be aware that participants may not present an accurate observation of what really happens – they may display what they believe the researcher wants to observe or conceal thoughts or actions to protect themselves or their privacy (Delamont, 2004). Finally, Table 5 presents the positives and the limitations of the proposed collection strategies.

Table 5 - Strengths and Weaknesses of data collection methods

Source of evidence	Strengths	Weaknesses
In-depth Interviews	Targeted – focuses directly on case study topics	Bias due to poorly articulated questions Response Bias
	Insightful – provides perceived causal inferences and explanations	Reflexivity – interviewee says what they think the interviewer wants to hear
		Inaccuracies due to poor recall
Document Analysis	Stable – can be reviewed repeatedly	Retrievability – can be difficult to find
	Unobtrusive – documents not created as a result of the case study	Biased selectivity if collection is incomplete
	Exact – contains exact names, references, and details of an event	Reporting bias – reflects (unknown) bias of author
	Broad coverage – long span of time, many events, and many settings	Access – may be deliberately withheld
Participant Observation	Reality – covers events in real time	Time-consuming
	Contextual – covers context of case	Selectivity – extensive coverage could be problematic for a single observer
	Insightful into interpersonal behaviour and motives	Reflexivity – event may proceed differently because it is being observed
		Cost – hours needed by human observers
		Bias due to manipulation of scenario by observer

Source: adapted from Kvale (1996), Robson, (2002) and Yin (2009)

6.0 Ethical considerations

The responsibility of the researcher to treat the research participants fairly and ethically cannot be overshadowed by the perceived benefits of the research study or the time and effort expended on the research (Robson, 2002). "We cannot focus only on the quality of the knowledge we are producing, as if its truth were all that counts. We must also consider the potential wrongness of our actions as qualitative researchers in relation to the people whose lives we are studying" (Miles *et al.*, 2014, p. 56). The need to ensure proper maintenance of ethics is not just a 'fieldwork' exercise but should be a goal throughout the whole research process right up to the point of final submission (Kvale, 1996).

The literature has identified four dominant ethical issues that should be considered:

Impose no harm – firstly, the researcher must take every available precaution or step so as not to cause any damage, intentional or unintentional, to the research subjects or research organisations (Thorne, 1998; Robson, 2002; Ritchie and Lewis, 2003; Qu and Dumay, 2011, Miles *et al.*, 2014).

Consent – this ethical issue is focused on the disclosure of research intent (Pettigrew, 1997; Qu and Dumay, 2011) and informed consent (Kvale, 1996; Richie and Lewis, 2003; Miles *et al.*, 2014) before and after the research and the right to withdraw from the research process (Ryen, 2004).

Confidentiality – the research candidates have the right to confidentiality and privacy (Kvale, 1996; Pettigrew, 1997; Ryen, 2004; Qu and Dumay, 2011; Miles *et al.*, 2014) and that both direct or indirect attribution to comments or viewpoints held by participant's must be avoided (Ritchie and Lewis, 2003).There is an onus on the researcher to take reasonable precautions before publishing to ensure the anonymity of the participants (Robson, 2002; Ritchie and Lewis, 2003).

Trust – the need to ensure ethical conduct is present throughout the research process to maintain a trustful relationship between the present parties involved and all future research relationships (Fine, 1993; Ryen, 2004).

As mitigation for all the identified ethical issues, an 'Interview information sheet and informed consent form' (Appendix 3) has also been developed for circulation and completion prior to the data collection. It is envisaged that the vast majority of proposed

ethical mitigations (Figure 4) will be covered by the generation and circulation of these documents. This will ensure that participants are aware of the confidentiality proposals and the research objectives and have been afforded informed consent to their participation in this research. The participant is also made aware that they can withdraw from the research. It is hoped that obtaining prior and proper consent from participants in advance of their involvement and the assurance of confidentiality in the study will negate any concerns that may arise from organisation employee unions or other such employee representative groups.

Ethical approval for this research has been received from the college's ethical Committee.

Figure 4 - Ethical consideration mitigations

Ethical consideration	*Proposed Mitigations*		
Impose no harm	**Aversive action** - consider how the study may be harmful to participants and take steps to remove this danger	**Prior knowledge** - participants should be given notice if topics for discussion are sensitive or could make them uncomfortable	**Balanced approach** - find the right balance between maintaining confidentiality and taking action if there is a perceived harm to the participant that needs to be reported and be upfront on this policy to the participants
Consent	**Informed consent** - provide participants with full details of the study purpose, who are involved in the research, what data will be used and what is required of them	**Voluntary understanding** - participants need to be made aware that their participation is completely voluntary irregardless of any relationships stuctures that are in place	**Appropiate authority** - even though consent may be granted via the management of the organisation, the actual participants need to give their individual consent also
Confidentiality	**Attribution** to comments, viewpoints or information shared by participants needs to be avoided. In order to find a balance between providing contextual data and avoiding direct association with partcipants, a coding mechanism for partcipants can be used	**Anonymity** - in cases where the access to participants by the organisational leadership, participants need to be informed of who will be aware of their participation	**Data Storage** - The researcher must be careful not to store non-anonymised information with identifying information and to take appropiate precautions when labelling files. Prior consent needs to be obtained from participants if information is to be stored and archived
Trust	**Participant's voice** - ensure that the voice of the participant is accurately reflected in the research	**Member checking** - The participants of the research are given the opportunity to validate the data analysis findings	**Transparency** - participants are made aware of the research methods including analysis prior to engagement

Source: Ryen, 1993; Fine, 1993; Ritchie & Lewis, 2003; Leech & Onwuegbuzie, 2008; Castleberry & Nolen, 2018

7.0 Planned Data Analysis

This research will utilise thematic analysis to build explanations. Thematic Analysis is concerned with identifying certain coding that reflects repetitive words and phrases that can then be utilised to distinguish and generate a theory or a set of themes (Leech and Onwuegbuzie, 2008). Boyatzis (1998) describes thematic analysis as a process for translation of qualitative data which requires the data to be explicitly encoded to reveal themes within the data that support the analysis of this data. An examination of these themes or patterns of meaning that emerge within the data can then be used to explore both the obvious and implied meanings within this data. It is through the iterative process of deduction and induction during data analysis where the real creative part of research takes place and the categories, concepts, themes, trends or dimensions of information emerge (Green *et al.*, 2007). Part of this process of emergent categories or themes is the essential feature of going back and over between theory and data, iterating toward a theory that closely fits the data (Eisenhardt, 1989). Boyatzis (1998) depicts themes as patterns within the data that can describe and organise observations or even explain parts of the theory being researched. Castleberry and Nolen (2018) make an important point when they state that "the importance of the theme is not dependent upon how often it appears or how much data is contained within the theme. Rather, the importance is related to whether it captures something important in relation to the overall research questions" (p. 812). Green *et al.* (2007) assert that rigorous research will link categories to other social theories to identify themes from the research findings and this practice enables the research to be valuable to other research and provide superior evidence to support conclusions. There are many advantages of thematic analysis. It is a highly adaptable method that can be used in a variety of studies that provides a detailed and complex representation of the data (Braun and Clarke, 2006). It can be used to summarise key findings in large data sets due to the structured approach to data handling that is required to provide a clear and concise final report (King, 2004). Thematic analysis is very accessible to the researcher as it is easily understood as a method and does not require in-depth theoretical or technological knowledge to utilise (Braun & Clarke, 2006). Lastly, thematic data analysis is suitable to provide an understanding of the different research participant's perspectives and allows the researcher to compare similarities and differences and provide unanticipated insights into the data (King, 2004, Braun and Clarke, 2006). The qualitative data analysis software tool, NVivo, will be used during the

thematic analysis stage (Robson, 2002). Whilst this paper acknowledges the endorsement of several authors (see Robson, 2002; Kelle, 2004; Miles *et al.*, 2014) on the use of CAQDAS (Computer Assisted Qualitative Data Analysis Software), it should be noted that this software should not be relied on to complete the analysis directly but rather used as a support to manage the data gathered and support the researcher to complete their own data analysis (Yin, 2009). As with all research materials and data generated through the analysis process, including the transcription process, this researcher will be cognisant of the ethical obligations pertaining to research participant confidentiality and will take all appropriate precautions including relevant password protections, use of pseudonyms, and all other associated protections to ensure the identities of the research partners remain un-disclosed.

8.0 Research Legitimization

For Lincoln and Guba (1985), the departure from using accepted criteria such as internal and external validity, reliability and objectivity for evaluating research generated by naturalistic design is encapsulated in Morgan's (1983) statement that "attempts in much social science debate to judge the utility of different research strategies in terms of universal criteria based on the importance of generalizability, predictability and control, explanation of variance, meaningful understanding or whatever are inevitably flawed…different research perspectives make different kinds of knowledge claims, and the criteria as to what counts as significant vary from one to another" (Morgan, 1983, p.114-115). The authors argued that using positivistic standards to judge interpretive criteria is unfair because "they seek a different kind of insight, adopt different methodologies, and favour different criteria for judging their knowledge claims" (Morgan, 1983, p. 396). Thus, based on the assertions of Morgan (1983), Lincoln and Guba (1985) proposed four evaluative criteria for interpretive research, explicitly credibility, transferability, dependability, and conformability. These four concepts are the equivalence of the positivistic concepts of internal validity, external validity, reliability, and objectivity. These four concepts will now be discussed in relation to the legitimisation of this research project.

Credibility: it is the responsibility of the interpretive researcher to put forward credible explanations why the research has come up with certain interpretations of the data. For

Lincoln and Guba (1985), determining credibility of findings and interpretations can be achieved through several strategies.

First, the researcher will ensure that sufficient time is spent on fieldwork in order to detect any data distortions that might happen over time. By allocating adequate field time to the study, the researcher can observe how contextual elements influences the phenomenon under study. Second, whenever it is possible, multiple sources of data collection will be in place as it will allow for the triangulation or convergence of evidence on one meaning. In this research, the study will utilise in-depth interviews, document analysis and participant observation to achieve triangulation. This researcher will adopt the viewpoint expressed by Miles *et al*. (2014) that triangulation may uncover information that appears not to corroborate or is in conflict with other findings however these outliers will be embraced if they emerge as 'they can test or strengthen the basic findings and protect you from against self-selecting biases and help build a better explanation (p. 301).

Another useful approach to determine credibility is to submit interpretations and conclusions to those from whom the data was originally collected (see Leech and Onwuegbuzie, 2008; Castleberry and Nolen, 2018). As part of the candidate 'Interview information and informed consent sheets' (Appendix 3), all participants of the interview process will be given the opportunity to view their own interview transcripts. This strategy is also called member checking (Robson, 2002) and can serve as a mitigation against researcher bias as well as demonstrating that every attempt is being made to present a fair and credible account of the participants contributions to the research. The researcher will also present and discuss the research findings with a disinterested peer in a manner paralleling an analytical inquiry, where the researcher is probed on philosophical, theoretical and methodological matters, meanings and basis of interpretations. The power of the disinterested peer strategy is that the researcher can harness the opinions of others willing to provide an objective assessment of their research (Pouris, 1988). For instance, the researcher has already submitted two methodological papers for presentation at National and International conferences. In addition, the researcher will utilise both my DBA supervisors and a peer on the DBA course for this purpose. Robson (2002) recommends peer debriefing as a strategy to ensure findings are credible but also as a form of support to the researcher during the study. Finally, the researcher will provide a rich contextualisation of the case study as this allows others to assess the researcher's interpretation of the data (Nowell *et al.*, 2017).

Transferability: This is analogue to the function of assessing external validity. However, from the outset it is important to realise that for the interpretivist researcher, generalisability of findings to the whole population is not a concern, nor in the strictest sense, is it possible (Lincoln and Guba, 1985). In contrast to a positivistic study where it is expected of the researcher to make statistical generalisation, the interpretive researcher can only set out working propositions embedded in a thick description of the time and context in which they were located (Hirschman, 1986). The issue of whether the theoretical findings in one case will be relevant or transferable to another case, will depend on the degree of similarity between contexts (Hillebrand *et al*., 2001). To "assess the transferability of an interpretation, one must know not only the specifics of the context in which the interpretation was generated, but also the specifics of the context to which the interpretation is to be applied. However, to comprehend the specifics of the second context, one must first construct an interpretation of it" (Hirschman, 1986, p. 245). Thus, transferability to a second case setting is only knowable after the event, where interpretations from the two contexts are compared. The researcher cannot claim external validity prior to the construction of that comparative analysis of interpretation. Nevertheless, the researcher can provide a thick description that will enable one to reach a conclusion on whether transfer can be contemplated as a possibility (Lincoln and Guba, 1985).

Dependability: In function, dependability is roughly analogous to the notion of reliability, which is an assessment of the consistency and stability of the process of enquiry (Brown, 2004). A number of techniques will be employed in this study to establish dependability. Firstly, and already discussed in the credibility part of this section, the dependability of the case will be addressed by requiring multiple sources of evidence to triangulate on the same finding (Eisenhardt, 1989; Yin, 1994). This triangulation of evidence produces a wider scope of coverage and should produce a more comprehensive picture of the phenomenon under investigation than would have been achieved with a single source (Bonoma, 1985). Also, the variety of data collection techniques should allow for a greater possibility of discrepancies or anomalies to be noted in research data and should compensate for any limitations in individual collection techniques (Gallivan, 1997). Triangulation addresses potential validity concerns in relation to theory development because multiple lines of enquiry converge towards a particular proposition or conclusion (Yin, 2003). The second tactic for establishing dependability is the audit trail which will

detail the research documentation including field notes, methodological diaries and other supporting evidence to confirm or disconfirm that the conclusions derived at flow from the information gathered (Hirschman, 1986). This research will be complimented with a full and thorough set of memos and notes both through the NVivo software and the reflective log sections.

Confirmability: This addresses the issue of whether or not the interpretations drawn from the data are rational and logical (Hirschman, 1986). For Lincoln and Guba (1985), this task is also accomplished through the audit trail. Thus, a single audit, properly managed and implemented can be utilised to determine both dependability of the enquiry and credibility of the interpretations. This is achieved when the three previous components are present and when readers can easily determine that the researcher's observations and conclusions are clearly derived from the data and the use of signposting is recommended to achieve this goal (Dey, 1993; Miles and Huberman, 1994). In addition, the presence of audit trails encompassing reflexivity should be present – the use of the sign-posting technique allows the research to become auditable as it provides clear rationale for the researcher's interpretations and conclusions. These conclusions should allow another researcher to reach the same or similar conclusions (Miles *et al.*, 2014). It is both the authors recommendation and this researcher's intention that a reflective log on the researchers internal and external thoughts will be a key component to support an audit trail.

9.0 Paper Conclusion

This paper details the methodological approach for exploring the relationship between lean leadership and lean practice to achieve organisational lean thinking. The study adopts an interpretive philosophical position because it enables an investigation into the subjective experiences and exploration of the thinking and views of people in lean thinking organisations. The logic for the application of a single interpretivist case study was presented, along with the justification for the data collection methods of in-depth interviews, observation and documentation.

The next steps in this study are presented below:

- Engagement with identified candidate organisations and securing of the case site.
- Interview protocols will be refined prior to engagement in the field

- Implementation of the research design and method

The next paper in this series will detail the actual process of research, how it progressed and present some initial findings for discussion.

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Appendices

Appendix 1: Research Protocol

Researcher	John Cheevers DBA Candidate Department of Management and Organisation at Waterford Institute of Technology Phone: 051 396977 20007306@mail.wit.ie
Supervisors	Dr. Patrick Lynch PhD & Dr Anne-Marie Ivers PhD Department of Management and Organisation at Waterford Institute of Technology Phone: 051 845642 PLYNCH@wit.ie AIvers@wit.ie
Study Title	To explore the relationship between Lean leadership and Lean practice to achieve Organisational Lean thinking
Purpose of the research	Understand organisation dynamics, explore component relationships, generate new knowledge.
Study Design	Interpretive research: Single case study Interviews (main method) Documents Observations
Study Participants	Leadership and Employees at [Candidate Organisation]
Planned Sample Size	A sample of one
Planned Study Period	To be conducted intermittently over a period of between four to six months

Introduction

[Candidate Organisation] is being asked to be a case organisation in a research study.

The purpose of the study is to explore the relationship between lean leadership and lean practice to achieve organisational lean thinking.

[Candidate Organisation] was selected as a case because of its prolific and recognised presence in the Irish lean community. The findings of this research forms part of a DBA thesis and aspects of the research will be published as part of a book, presented at conferences and as research papers.

[Candidate Organisation] have the right to ask questions about this research study and to have those questions answered by me before, during or after the research. If [Candidate Organisation] have any further questions about the study, please feel free to contact me at 20007306@mail.wit.ie or by telephone at 051 396977 or 087 2136655. I ask that [Candidate Organisation] read this Case Study Protocol and ask any questions before agreeing to participate in the study. Please return a signed copy of this Case Study Protocol as confirmation of [Candidate Organisation] prior consent.

The study investigators

Name	Phone	Email	Association	Study Role
John Cheevers	051 396977	20007306@mail.wit.ie	Waterford Institute of Technology	DBA Candidate and Principal
Dr. Patrick Lynch	051 845642	plynch@wit.ie	Waterford Institute of Technology	Researcher DBA Supervisor
Dr. Anne-Marie Ivers	051 845642	AIvers@wit.ie	Waterford Institute of Technology	DBA Supervisor

The Aim and objectives of the Study

The main objective of the study is to explore the relationship between lean leadership and lean practice to achieve organisational lean thinking.

The most significant aspect of this study is the exploration of the best practices that can be used to implement, embed, align and ultimately sustain an organisation's lean efforts and the role and inter-relationships between lean leadership and the lean practices to achieve this goal.

The findings of the case study will facilitate a novel theory to be developed. This will contribute significantly to the development of new knowledge for all. The outcome of the research may result in a revisit to the choice of lean leadership and this has important implications for embedding Lean, and the ultimate output will be publication of the research.

The Study Design

The study is a single in-depth case study. The researchers recognise the importance of not interfering with the working environment and the research method is designed to cause as little disruption to work and the research schedule will be designed around what best suits the case company.

Is it estimated that this study will be conducted intermittently over a period of between four to six months but more time may be required to complete the research.

A conceptual Framework has been developed and preconceptions are based on a thorough literature review of lean discussion and lean leadership theory. The conceptual framework will be developed further by learnings from the case company [Candidate Organisation].

The methodology for this qualitative work is based on an interpretive, inductive, qualitative research strategy. This approach is deemed appropriate for the development of theory. The data acquired will be used to refine, clarify, and combine the research prerequisites that have derived from the literature.

The case company [Candidate Organisation] will be asked to support the understanding of the following research questions:

- To investigate the concept of organisational lean thinking

- To explore the relationship between lean leadership and lean practice

- To explore the relationship between lean practice and organisational lean thinking

- To explore the relationship between lean leadership and organisational lean thinking

The Study Data

The nature of this research requires multiple sources of evidence. The data for the study will include the following:

1. In-depth interviews (main method)
2. Follow up interviews or contact for clarification
3. Company documentation and archival records
4. Participant observation on-site
5. Reflective Practices

Data will be stored and used in line with the provisions of the Data Protection Act 1998 and 2003. Under this Act the data collected may only be used for the purpose of this research project and subsequent publications. All of the data collected will maintained in WIT for the duration of the project (approx. 4 years), after which it will be transferred to the 'Digital Repository of Ireland'. The Digital Repository of Ireland is a research organisation with staff members from a wide variety of backgrounds, including software engineers, designers, digital archivists and librarians, data curators, digital imaging experts, policy and requirements specialists, educators, programme and project managers, social scientists and humanities scholars – full details of this research support organisation including implications for data transfer are available at https://www.dri.ie/about-dri. Consenting to participation in this study implies that the participant has consented to this transfer of information.

Data records will be stored securely and will only be accessed by the researcher and research supervisors in WIT.

The benefits to the case company

The findings and learnings from the single case research may prove beneficial to your company. The outcome of the case study is that a novel theory will be developed. This will contribute significantly to the development of new knowledge for all.

The risks to the case company

There are no reasonably foreseeable (or expected) risks. There may be unknown risks.

Company Confidentiality

Waterford Institute of Technology places a confidentiality agreement on its research students. The records of this study will be kept confidential. Research records will be kept in a locked file, and all electronic information will be coded and secured using a password protected file.

The researcher expects to publish the research in various formats including books, research papers and conferences. The identity of [candidate organisation] will not be included in any report we may publish that would make it possible to identify the organisation. However [candidate organisation] can choose to waive this right and allow their identity to be disclosed in the material that is published. In this regard an additional Waiver of Confidentiality is included at the end of this document.

Payment

[Candidate Organisation] will not receive any payment or reimbursement for participating in the study.

Number of participants

Due to the nature of inductive and interpretive research, it is not possible for the researcher to estimate exactly the number of participants that will be required, the number will depend on how the research evolves. However, the total number of interviewees selected is not expected to exceed 25 and every effort will be on the researchers' behalf not to exceed this interview amount.

Inclusion Criteria

The criteria for participant's inclusion are:

Be willing and able to give informed consent for participation in the study

Male or Female

Aged 18 years or above

Participant's privacy and confidentiality

[Candidate Organisation] will not have access to the participants' interviews.

The names of the participants will not be disclosed in the publications. For reporting purposed the interviewees name will be anonymous and real names will not be used at any stage of the research process.

Informed consent of participants

Participation in the research is completely voluntary and participants have the right to decline or withdraw from the process.

Prior to the in-depth interviews the research participants will be provided with an information and consent sheet. This document provides participant with details of the research along with the researchers' obligations to the participants and rights of the participants. The participants will be given sufficient time to read the document prior to commencement of the interview. It is anticipated on most occasions the consent will be given just prior to the interview however on occasion consent will be requested in advance.

[Candidate Organisation] consent to participate

[Candidate Organisation] confirm that they understand the risks involved in participating in this study and by signing this document and hereby give consent to participate.

Signed (Company)……..….

Date……..….

Signed (Researcher)……..….

Date……..….

Additional Waiver of Confidentiality

[Candidate Organisation] identity may be disclosed in the material that is published.

Signed (Company)……..….

Date……..….

Signed (Researcher)……..….

Date……..….

Appendix 2: Interview guide

Interview guide

Date		Time	
Interviewee:			

[Discuss purpose of research – "To explore the relationship between lean leadership and lean practice to achieve organisational lean thinking"]

[Stress that respondents' perceptions are being sought and contribution highly valued]

[Outline confidentiality guarantees and request consent to record interview]

A. Background information

This section of the interview will be to gather context about the interviewee's position in the organisation and their previous interactions with lean

What is your job title? _____

Could you very briefly describe your job? _____

Do you lead employees in the organisation, if so, how many? _____

How long have you been with the company? _____

How long has your company practiced lean? _____

B. Theme A.....Organisational Lean Thinking

This section of the interview will determine what the interviewee considers are the important elements that constitute organisational lean thinking-a list of possible prompts are available to support the conversation

What does organisational lean thinking mean to you?....

What are the important elements that constitute organisational lean thinking?...

PROMPT BOX	
Word prompt 1	Problem Solving
Word prompt 2	Organisational Learning
Word prompt 3	Culture
Word prompt 4	Mindset
Word prompt 5	Enterprise-wide

Other prompts: ask for examples and explanations e.g. *why is that*?

C. Theme B.....Lean Practice

This section is to gather information on what elements of lean practise are present and known to the interviewee and then later to determine what relationship exists between the leadership and these elements

What are the important elements of lean practice evident in your company?.....
Prompts: Could you give me an example of that? Elaborate? Why is this important?

How do you or leadership in general interact with each of these lean practice elements?

Prompts: Could you give me an exact example of that? Could you elaborate? Why is that important? How often does that take place?

D. Theme C.....Lean Practice and Organisational Lean Thinking

This section is to explore the impact of the lean practise elements on the organisational lean thinking

How does each of these important lean elements contribute to achieving organisational lean thinking?.....

Prompts: Which lean practice element contributes to which organisational lean thinking element? How is this done? Why is this important?

Can you give me real examples of these contributions and how are these measured and controlled? …...

Prompts: Are these audited? Reported? By Whom? To Whom?

E. Theme D….Leadership

The last section is to explore the leadership style that is present in the organisation and what impact the interviewee believes the leadership have on overall organisational lean thinking.

Is there a particular style being advocated by the company?

Why is this style being promoted?

Is this leadership style consistently practiced by the leadership group?

What are the important attributes of a lean leader?

Why is this?

How do these attributes support lean practice?

How do these leadership attributes support organisational lean thinking?

F. Interview close-out

Is there anything else that you perceive as important in relation to leadership and the support of organisational lean thinking……?

[Thank you for your time]

[Reassurance of confidentiality]

Appendix 3: Interview information and informed consent forms

Information Sheet

Researcher's name: John Cheevers

Project title: "To explore the relationship between lean leadership and lean practice to achieve organisational lean thinking"

What is the purpose of this research: This study aims to bridge a perceived gap in academic knowledge in this area.

Why am I being asked to participate: As this study seeks to understand what are the important lean practice elements that support organisational lean thinking and how lean leadership can be a driver for lean practice. Your insights, as an employee in a lean organisation which is recognised as having established organisational lean thinking, will be critical in the research of this topic.

Do I have to participate: No, participation is entirely voluntary. If you choose to participate you will be asked to sign an informed consent form (see below).

What would participation in the study mean for me: Participating in the study would require you to make yourself available for one or more interviews and consent would be requested to have the interview recorded.

What are the benefits of participating: The study seeks to gain a better understanding and to explore the relationship between lean leadership and lean practice to achieve organisational lean thinking. While no financial incentives are available, you would be contributing to an enhanced understanding of this phenomenon which is hoped would have both a practical and academic impact.

What are the risks associated with participating: There are no reasonably foreseeable (or expected) risks. There may be unknown risks.

Can I withdraw from this research: Yes, you may withdraw at any point up to the commencement of data analysis when your data has been merged with other participants data. Prior to this point, you may request a transcript of your interview and make a decision on whether you want to remain part of the study or to withdraw and have any data you provided destroyed.

How will data gathered be managed and used in the study: Data will be gathered either through manual transcription or software that will transform the recording of the interview(s) into transcripted material and later through subsequent data analysis using NVivo software. All research material, analysis and storage of data including the use of transcription software will be kept confidential with relevant password protections, use of pseudonyms, and all other associated protections. This research will be fully compliant with both the current GDPR and the Data Protection Act (Ireland) 1988 & 2003 implications e.g. handling of personal data, destruction of data after five years of completion of the study.

Consent Form

I have read and understood the information sheet provided and by choosing to give consent:

(please tick the box)

I am voluntarily participating in this study. ☐

I grant permission to record my interview. ☐

I understand that I can withdraw from the study. ☐

I understand that my own details will be anonymised. ☐

I understand that the anonymised data will be cited in the project/thesis and other publications. ☐

Signatures

Participant _____ Date _____

Researcher _____ Date _____

Paper 3

DESIGN AND INITIAL FINDINGS PAPER

Paper Three Preface

There are two items worthy of mention that should be highlighted in paper three.

Firstly, the research has advanced significantly in that a suitable case study site has been identified and access to research there has been granted. As a result, data collection has started and provisional data analysis is in progress.

Secondly, the research design has also evolved and an insider researcher's approach has been adopted to carry out the search. Due to this privileged access, this approach has led to the uncovering of rich data that may not have available otherwise.

Paper 3 of the Cumulative Paper Series, the Design and Initial Findings, was presented to the DBA Examination Panel in September 2021. The examiners made minor recommendations for improvement of the paper. The paper that is presented in this thesis is the revised and approved paper.

Doctor of Business Administration (DBA)

Participant Name: John Cheevers 20007306

Supervisors: Dr Patrick Lynch and Dr Anne-Marie Ivers

Date: 27 / 09 / 2021

RESEARCH PAPER SERIES

Paper 3:

DESIGN / INITIAL FINDINGS PAPER

"To explore the relationship between Lean Leadership and Lean practice to achieve Organisational Lean thinking"

ABSTRACT

Although organisational lean thinking has been widely commended and adopted by practitioners in various sectors, the failure rates are unacceptably high. There is a lot of academic unrest and discussion in regard to the claims and assumptions made within the lean thinking literature and it has sometimes been labelled in industry and academia as a fad. Amongst Lean scholars, even when case study is used as a research method in lean studies, it has not been a thorough exploration but rather a passionate 'vignette' about a successful lean implementation or an empirical review of previous lean literature and both approaches tend to steer towards reporting a positive success story. This approach does not account for the high implementation failure rates. There have been exceptions in recent years in regard to identifying which elements of lean practice, such as 'lean tools and processes' and 'lean culture and principles' are important and a new focus on understanding and appreciating the role of lean leadership in achieving organisational lean thinking has also emerged, but this discussion and research needs to be supported and continued. In paper one, this research has reviewed the lean literature and developed a conceptual framework that proposes to explore the relationships between lean leadership and lean practice that help achieve organisational lean thinking. In order to carry out primary research, paper two developed a research strategy which was based on the researcher's philosophical beliefs. The strategy included a discussion on units of analysis, sampling, data collection and data analysis whilst also taking into consideration the ethical and legitimisation considerations of carrying out this research. This paper aims to bridge this research gap between academia and practice by demonstrating the actual primary research in action and will also present some emerging findings.

Paper word count: 7990

1.0 Introduction

Despite the widespread acceptance of lean in industry and academia (see Womack and Jones, 1996; Spear, 2004; Bodek, 2008; Sisson and Elshennawy, 2015), the failure rate for lean implementations is unacceptably high, ranging from 50% to 90% (Ringen and Holtskog, 2011; Pedersen and Huniche, 2011). Why this happens has been a topic in lean literature for over thirty years and evidence suggests that lean leadership is the missing link in the process (Roth, 2006; Achanga *et al.,* 2006; Bodek, 2008; Kimsey, 2010). Indeed, the literature reviewed to date consistently highlights the importance of lean leadership as the driving force behind both the implementation and sustainability of organisational lean thinking (Poksinska *et al*., 2013; Trenkner, 2016; Willis *et al*., 2016; Aij and Teunissen, 2017). Numerous studies emphasise that lean leadership is critical in promoting lean practices and embedding an organisational lean thinking mind-set within an organisation (see Mann, 2009, Pham and Thomas, 2012). However, most of these studies are conceptual in nature and most often are practitioner-led, with little or no empirical investigation or evidence supporting their claims (Hines *et al*., 2018). This has led to organisational lean thinking been criticised in both industry and academia as a *fad* and not being applicable beyond mass production (Cooney, 2002). For both Crute *et al*. (2003) and Pearse and Pons (2019), the main issue is that lean has originated from practice, with *taken for granted* assumptions, been *taken for fact* without empirical investigation, with the consequence that within the organisational lean thinking literature, the fad cannot be separated from truth (Crute *et al.*, 2003).

Despite the numerous calls for more research to understand the interrelationships between lean leadership and lean practice in relation to organisational lean thinking (Mann, 2009, Pham and Thomas, 2012), there is a paucity of empirical research investigating the phenomenon and in particular the role that lean leadership plays in embedding lean practices to achieve organisational lean thinking (see Lewis, 2000; Proudlove *et al.,* 2008; Radnor, 2011; Dahlgaard *et al.,* 2011). Against this backdrop, this research proposes to address this research gap in our understanding, by *exploring the relationship between lean leadership and lean practice to achieve organisational lean thinking*. Specifically, the study seeks to research the following,

- To investigate the concept of organisational lean thinking

- To explore the nature of the relationship between lean leadership and lean practice
- To explore the relationship between lean practice and organisational lean thinking
- To explore the relationship between lean leadership and organisational lean thinking

To address these research questions, paper two outlined in detail the employment of an interpretivist research which is case study based and the specific methods of research that will translate the approach into practice (Jørgensen, 1989; Ritchie and Lewis, 2003; Bowen, 2009). The case study approach was chosen as it allows the researcher to carry out a subjective exploration of the thoughts and viewpoints of people working in the lean organisation as to what constitutes organisational lean thinking and what relationships exist and to understand the complexity inherent within the relationship of lean leadership, lean practices, and lean organisational thinking (Burrell and Morgan, 1979).

In-depth interviewing, document analysis and participant observation have been selected as data collection instruments in a single case study. NVivo is the analytic software being used. Paper two also detailed how this interpretive research study will be conducted in an ethical manner, while also ensuring the data collected is legitimate in terms of credibility, transferability, dependability, and conformability (Lincoln and Guba, 1985).

Paper three builds on the work of paper two by carrying out the defined methodology on a specific company relevant to the study objectives. The data collection to date consists of 21 in-depth interviews, 17 documents analysed and on-going participant observation over a 6-month period. From the outset, it is important to realise that data collection and data analysis is still ongoing and while this paper will present preliminary findings, it is the intention of the researcher to bring these initial insights forward to the next stage of data analysis and interpretation (Spencer *et al*., 2003).

This paper will firstly present the researcher's relationship to the research organisation and the role of 'insider researcher' will be discussed. Following this, the planning and implementation of the data collection methods and data analysis strategy are presented. Next, the initial case findings are presented and discussed under a framework of organisational lean thinking themes evidenced in the data analysis. Finally, the implications of the case study and next steps for the research project are discussed.

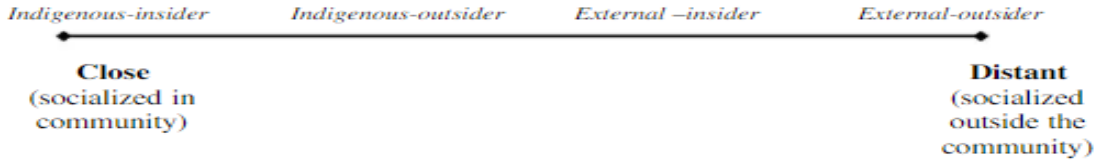
2.0 Case Study Implementation Plan

2.1 Researcher Relationship to Case Site: An Insider Perspective

As discussed in paper two, this research utilises a single case site that has demonstrated organisational lean thinking with the benchmark of having achieved a Shingo award being used to source this organisation. As presented in paper one, there are eleven organisations in Ireland that have received a Shingo award and the chosen organisation for this research is contained within this group. For the purpose of clarity and transparency, the researcher has recently accepted a position in the research case organisation and is currently employed within the continuous improvement department as a Continuous Improvement Coach (CI Coach) and has received permission to use the organisation as a research case site. Due to this change in circumstances, it is the belief of this author that this research may now be deemed 'insider research' in that it is being "conducted within a social group, organisation, or culture of which the researcher is also a member (Greene, 2014, p. 1).

Indeed, there has been a lot of discussion on the merits and shortcomings of being an insider researcher versus an outsider researcher (see Chavez-Reyes, 2008; Dwyer and Buckle, 2009; Trowler, 2011; Unluer, 2012; Greene, 2014; Fleming, 2018). Some authors (Chavez-Reyes, 2008; Greene, 2014) even contend that there is no absolute state of 'outsiderness' when a researcher is interacting with study participants due to the internal bias of the researcher and the different competing positions and stances they hold, that may make them overly sympathetic to the viewpoints of the participants. Chavez-Reyes (2008) refers to this concept of the researcher's positionality as 'polyvocality' and rather than rely on absolutes such as 'inside research' or 'outsider research', advocates that a researcher's relationship to their research community should be viewed as being on a "continuum based on intellectual, cultural, and social distance to indigenous community" (p. 476), that they are researching – see figure 1.

Figure 1 - Insider-Outsider Researcher Continuum



Source: Chavez-Reyes, 2008, p.476

Given the fact that this researcher had already worked for the research organisation, albeit fifteen years ago, there was a degree of familiarity with the work environment and culture, so taking the stance of being an 'external outsider' was not an option.

According to Fleming (2018), there are distinct advantages to a researcher being involved in a study of the same organisation that they are working at – namely, having a "unique perspective of the history and culture" (p. 311) of the organisation and also being in a position of empowerment (Trowler, 2011) to obtain a thick description (Geertz, 1973) of what it feels like to exist in the research environment. As discussed by Unluer (2012), this was certainly the case when this research entered the data collection and data analysis phase as the researcher not only knew the work environment from previous employment but also has un-hindered access to documents once the proper protocols around access to research participants and documents were agreed and signed. Another advantage of being an insider researcher is the level of acceptance and trust from the research participants which can lead to a higher level of openness during data collection (Dwyer and Buckle, 2009). This proved to be this researcher's experience during the in-depth interviews where there was very little hesitancy on behalf of the interviewees to share their experiences.

Despite the benefits that were discussed, there are also challenges to being an insider researcher. Given that the researcher is employed directly by the research case site, the researcher is aware that this raises the question of objectivity and bias (Fleming, 2018). It should also be noted when discussing bias that the researcher's role in the organisation is to promote organisational lean thinking and this may allow an opportunity for bias to emerge. In order to prevent this, all discussions with the participants during the in-depth interviews focused on historical events and associated perceptions when the researcher was not an employee of the research organisation. In addition, interviews were planned to be completed as early as possible in this researcher's employment tenure before any significant work relationships have been established. Any documents that are analysed will be historical and all participant observations will be events where the researcher is not directly involved or part of the situation been observed.

In regard to this discussion on insider research, it is prudent to note in relation to their position on the insider-outsider researcher continuum (Figure 1) that this researcher did experience a "shift throughout the process of conducting research" as alluded to by

Greene, 2014, p. 2). Whereas this researcher may have viewed themselves as being an 'external-insider' on the continuum at the start of the research, there was an experience of being pulled to the left towards a position of 'indigenous-insider' as the months of research passed and the researcher became more embedded in the organisations culture. Being aware of this helped the researcher take precautionary steps, as will be discussed now, to ensure the highest levels of objectivity. It is also important to note that the researcher only took up the work position in the research organisation in late March of 2021, which was two and a half years into the researcher's four-year DBA study so any potential bias from this employment did not form part of the researcher's investigation up to this point. Furthermore, as this employment is relatively new, the researcher has not built up any significant relationships that may taint the research. Nevertheless, given that the role of insider researcher is not clear-cut (Trowler, 2011), there are a few important challenges that need to be acknowledged and addressed when a researcher finds themselves in the role of 'insider researcher' such as:

- Mitigating against any potential coercion of the participants (Fleming, 2018).
- To be aware of the possible bias to present a favourable outcome (Kvale, 1996; Robson, 2002; Yin, 2009).
- Negating against the willingness to accept certain organisational processes as being the norm (Trowler, 2011).

To clarify any doubt about participant coercion, it should be noted that the researcher does not have any employees reporting to him in his role nor could his position be classed as a leadership role so no positional power was exerted against any participant to take part in the study. All participants volunteered to be part of the research and signed consent forms after reviewing the research information sheet which explained their involvement and their rights in regard to withdrawing from the research process.

For both Robson (2002) and Yin (2009) when a researcher is carrying out a study in their own organisation, reflexivity bias must be considered as the interviewee could say what they think the interviewer wants to hear. To overcome the "reflexivity" factor, which is also called impression management – "how people want others, including the researcher, to see them" (Miles *et al*., 2014, p.11), the questions asked during the in-depth interviews were carefully developed and interviews were conducted in a relaxed and friendly manner (Yin, 2009). Following good practice depicted by Kvale (1996), the researcher remained

objective and was careful not to 'pollute' or contaminate the information or shared experiences from the interview participants. In addition, time was given to interviewees to reflect and expand on their answers and the interviewer was mindful not to allow pre-conceived ideas interfere with the process and not to ask leading questions during the interviews (Robson, 2002).

The last consideration for an insider researcher is to be able to mitigate against the willingness to accept certain organisational processes as being the norm due to the researcher's closeness to the research (Chavez-Reyes, 2008; Trowler, 2011). The researcher is aware of this and is actively taking mitigating steps such as reflective journaling (Miles *et al*., 2014), creating an audit trail (Hirschman, 1986), and using the 'dis-interested peer' technique to combat and minimise bias (Pouris, 1988). In addition, researcher bias has also been mitigated through the use of triangulation and capturing multiple perspectives from different levels and different work-streams and using several different data collection methods (Denzin, 1970; Lincoln and Guba, 1985; Leech and Onwuegbuzie, 2008). This ensures that the interpretation of the data and findings from this case study will contain a high level of 'convergence and corroboration' (Eisenhardt, 1989; Yin, 2003).

2.2. Profile of the research organisation

The researcher has negotiated access to a large medical device organisation which is based in Ireland with a strong history of lean implementation. The research organisation[1] which will be called ABC, has practised lean for over fifteen years and has been recognised as a leader in lean manufacturing by several awards. Organisation ABC is part of a corporation which is one of the largest medical devices outsource (MDO) manufacturers in the world serving the cardiac, neuromodulation, vascular and portable medical markets. The corporation provides innovative, high-quality medical technologies that enhance the lives of patients worldwide. The company provides a wide range of products for various medical applications. The site has nearly 1000 employees and has received Shingo accreditation and has a strong continuous improvement culture which bases itself on the philosophies of lean. In addition, the company has been recognised nationally as a centre of excellence in the Irish Medical Technological industry.

[1] For confidentiality reasons, the name of the organisation, industry and products have been altered

In all further discussion on the research organisation, it will be referenced as Organisation ABC. Table 1 is a summary of the organisation's profile.

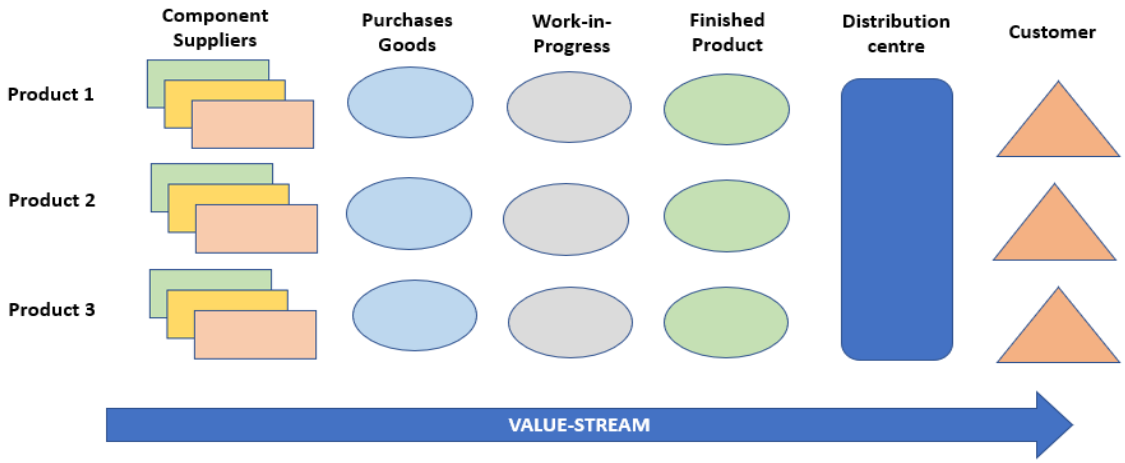
Table 1 - Research Organisation Profile

Industry • Medical Device	**Products** • Medical applications
Company Age • 23 years	**Lean Standard** • Shingo Accredited
Company Size • Large multinational employing 945 people	**Lean Recognition** • Recognised nationally as a centre of excellence in the Irish Medical Technological industry
Markets • Cardiac, neuromodulation, vascular and portable medical markets, energy, military, and environmental markets.	**Lean Practice** • Practised lean for over fifteen years and has been recognised as a leader in lean manufacturing by several awards
Locations • Multinational cooperation with multiple locations including Ireland	**Value Stream** • Three families of products and have organised itself into three value-streams.

In tandem with lean thinking philosophies (Womack *et al*., 1990; Hines *et al*., 2004), the manufacturing operation is organised into three distinct value-streams. In essence, a value stream can be considered an overview of all the activities that add customer focussed value to the product from the purchase of the raw materials (components) to the actual work required to manufacture the product into the finished good before distribution to the customer (Hines and Rich, 1997; Ramesh and Kodali, 2012). The concept of the use of value-streams in lean organisations was first introduced by Womack and Jones in 1996 as part of the five lean principles as a way of aligning all the activities associated with producing a product or service, so that waste is eliminated and performance improved (Melton, 2005; Robinson and Schroeder, 2009). At a very high level, Organisation ABC produces three families of products and has organised itself into three value-streams (see

Figure 2). The sites employees (both direct and support staff) are split approximately into three groups to serve these value-streams with the exception of shared services such as finance and human resources. This research will treat each of these value-streams as a unit of observation to explore differences and comparisons amongst the perceptions of its groupings. It is intended to target eight participants from each of the three value streams.

Figure 2 - Value-stream Map



Source: Illustration of value streams in case organisation

2.3 Recruitment of Participants

In order to secure participants, the researcher spoke on a one-to-one basis with each value stream (VS) leader and explained the reason behind the research, using the information sheet and research protocol as a basis for the discussion. All three leaders were agreeable to allow their value stream to take part in the research and also agreed themselves to be interviewed for this purpose also.

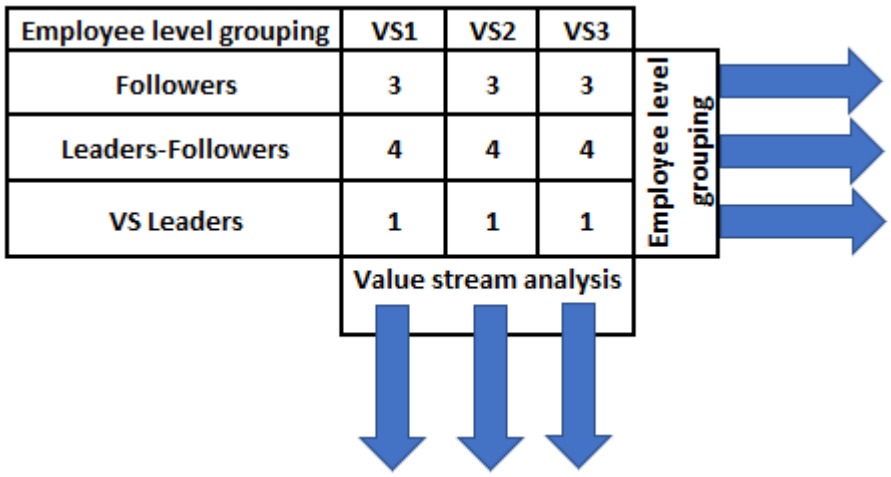
After this, the researcher invited each of the mid-level leaders within each value stream to take part in a research interview. In total, eighteen mid-level leaders were invited. Each potential participant received an information sheet which outlined research details, participation conditions including the right to withdraw from the study and how the information gathered will be stored and used while highlighting the fact that participation was on a voluntary basis. Each participant was also able to ask any questions or raise concerns to the researcher before committing to participate. This group of mid-level leaders consisted of production supervisors, team leaders and line leaders. Not all invitees from this group accepted the opportunity to participate in the research but sufficient

candidates' numbers were achieved from those who did and twelve mid-level leaders were recruited for the study. This group of mid-level leaders are categorised as 'leader-followers' in the research document as they are both followers of the VS leader whilst also having followers reporting into them.

The last group of participants are referred to as 'followers' and are the people reporting into the leader-followers group. This group were recruited in an organic manner through their involvement with lean tools such as 5S and other continuous improvement initiatives. Again, not all employees who were approached by the researcher agreed to become participants. In total, nine employees agreed to participate.

Regarding the overall unit of analysis, the research is still targeting the lean leadership of a lean organisation who have people reporting to them and their followers. However, in line with the iterative nature of interpretive research, especially during data analysis (see Green *et al*., 2007), it was realised that this research may be best served by pursuing an embedded approach to the unit of analysis (Yin, 2009) and explore more than one unit of observation from the study for comparison purposes (Ritchie *et al*., 2003). In addition to dividing the case study into three value streams, a second division within the value-streams of the different employee levels (leaders, leader-followers, followers) will be undertaken to provide rich and deep insights and should also enable comparisons across the value stream. Figure 3 illustrates this approach of data collection and details the proposed number of participants targeted in each group with the downward arrows reflecting observations between the participants from the three value-streams. The horizontal arrows indicate the three separate groupings within the value-stream.

Figure 3 - Participants Interview and Data Collection Overview



3.0 Data collection

3.1 Pilot Interviews & Refinement

Given the critical importance of the in-depth interview in capturing rich data from the research participants, this data collection instrument was refined through a series of pilot interviews. Janghorban *et al*., (2014) state that the benefit of using pilot testing is that it affords the researcher the prior experience of carrying out this type of qualitative research. In total, three candidates with experience of working in a lean setting were chosen. The first two candidates were from outside the research organisation and served to test the in-depth interview data collection instrument. These two candidates were interviewed before the researcher's employment began with organisation ABC. The third candidate is an employee of the research organisation but outside of the three value streams under exploration. This pilot interview was utilised to determine whether the proposed interview guide document is a good fit for the research organisation. Overall, the pilot interviews provided an opportunity to review the interviews and to assess the acceptability of the interview protocol to the candidates (Janghorban *et al*., 2014). After the pilot interviews, it was deemed that the interview guide was adequate, but the interviewer must be prepared to elaborate on the question or area being discussed especially if the terminology is not immediately familiar to the interviewee. This pre-learned strategy became very useful during the actual data collection.

3.2 Data Collection

In-depth Interviews

Data collection started at the research organisation in May 2021 with interviews and is still on-going during the production of this paper. In total, 21 of the 24 targeted interviews are undertaken, the remaining three candidates have been identified and have given their consent. 20 of the 21 interviews have been transcribed and inputted into NVivo. It is envisaged that there will be a need for follow-up interviews with a portion of the interviewees for clarification purposes once initial data collection has been completed and data analysis has progressed to an advanced stage of theme and category creation. Allowances were made to accommodate a duration of 50 to 55 minutes for each interview however the average interview duration is currently 30 minutes. Individual interviews were concluded once data saturation was achieved or when interviewee has unable to add

anything else to the research areas in the interview despite attempts to reword question. In such cases, it was explained to the interviewees that the researcher had received enough information to conclude the interviews and they were thanked for their contribution. In total, eight participants from each of the three value streams will be interviewed and there is a good mixture of participants tenure across all three value streams ensuring that there is depth and breadth to lean knowledge in the organisation.

Table 2 gives an overview of the progress of the in-depth interviews conducted.

Table 2 - In-depth Interview Data Collection Progress

Date	Participant Code	Value-Stream	Employee level grouping	Tenure	Gender	Transcribed
01-Sep-21	VS1a	VS1	Leader/Follower	3 years	F	Yes
11-Aug-21	VS1b	VS1	Leader/Follower	2 years	M	No
13-Aug-21	VS1c	VS1	Leader/Follower	15 years	M	Yes
12-Aug-21	VS1d	VS1	Follower	4 years	M	Yes
17-May-21	VS1e	VS1	Leader/Follower	7 years	M	Yes
TBC	VS1f	VS1	Follower	5 years	F	No
TBC	VS1g	VS1	Follower	6 years	F	No
26-Aug-21	VS3h	VS3	Snr Leader	<1 year	M	Yes
19-May-21	VS2a	VS2	Leader/Follower	15 years	M	Yes
19-May-21	VS2b	VS2	Leader/Follower	16 years	F	Yes
24-May-21	VS2c	VS2	Leader/Follower	16 years	F	Yes
25-May-21	VS2d	VS2	Leader/Follower	16 years	F	Yes
02-Jun-21	VS2e	VS2	Follower	4 years	M	Yes
17-Jun-21	VS2f	VS2	Follower	5 years	M	Yes
02-Jul-21	VS2g	VS2	Follower	6 years	M	Yes
07-Sep-21	VS2h	VS2	Snr Leader	5 years	M	Yes
27-May-21	VS3a	VS3	Leader/Follower	7 years	M	Yes
31-May-21	VS3b	VS3	Leader/Follower	16 years	M	Yes
TBC	VS3h	VS3	Leader/Follower	TBC	F	Yes
01-Jun-21	VS3d	VS3	Leader/Follower	15 years	F	Yes
12-Aug-21	VS3e	VS3	Follower	18 years	M	Yes
03-Jun-21	VS3f	VS3	Follower	13 years	F	Yes
22-Jun-21	VS3g	VS3	Follower	4 Years	M	Yes
17-May-21	VS3c	VS3	Leader/Follower	7 years	M	Yes

Document analysis

To date, 17 documents have been analysed. When undertaking the document analysis, the researcher was mindful of the purpose of each document, in order to determine how and why the document was generated and how it is utilised in the organisation (Atkinson and Coffey, 1997; Prior, 2004). All the documents were examined and explored to interpret meaning and understanding in order to generate knowledge (Corbin and Strauss, 2008). As per the iterative nature of interpretive research, documents targeted for analysis were driven by discussion points during the in-depth interviews and participant observation (Delamont, 2004). These included training and employee induction manuals, training documents, organisational strategic policies, and the Shingo award achievement summary

report. Document analysis was used to support, strengthen, and compliment the other methods used (Yin, 2009). In many instances it provided background information and often contextualised the research. For example, the site project management and the site strategic alignment (Hoshin Kanri) documents gave significant context to participant observation during problem-solving and project meetings. It also allowed the researcher to discover data that was forgotten by the organisation, or not observable during the in-depth interviewing or the participant observation. Table 3 provides an overview of the 17 documents analysed to date.

Table 3 - Document Analysis Progress

Document	Document Purpose	Number of Documents
Employee induction	New hire training	1
Training Documents	Lean Training	12
Shingo Award Report	Achievement Summary	1
Site Policies	Discuss production progress	3

Participant Observation

Participant observations focussed on meetings and lean activities such as problem-solving within the value-streams and employee training sessions and employee induction as well as project updates. As with document analysis, this researcher was led by discussion during the in-depth interviews as to what areas to focus on from a direct participation point-of-view. Table 4 gives an overview of the participant observations analysed to date.

Table 4 - Participant observations

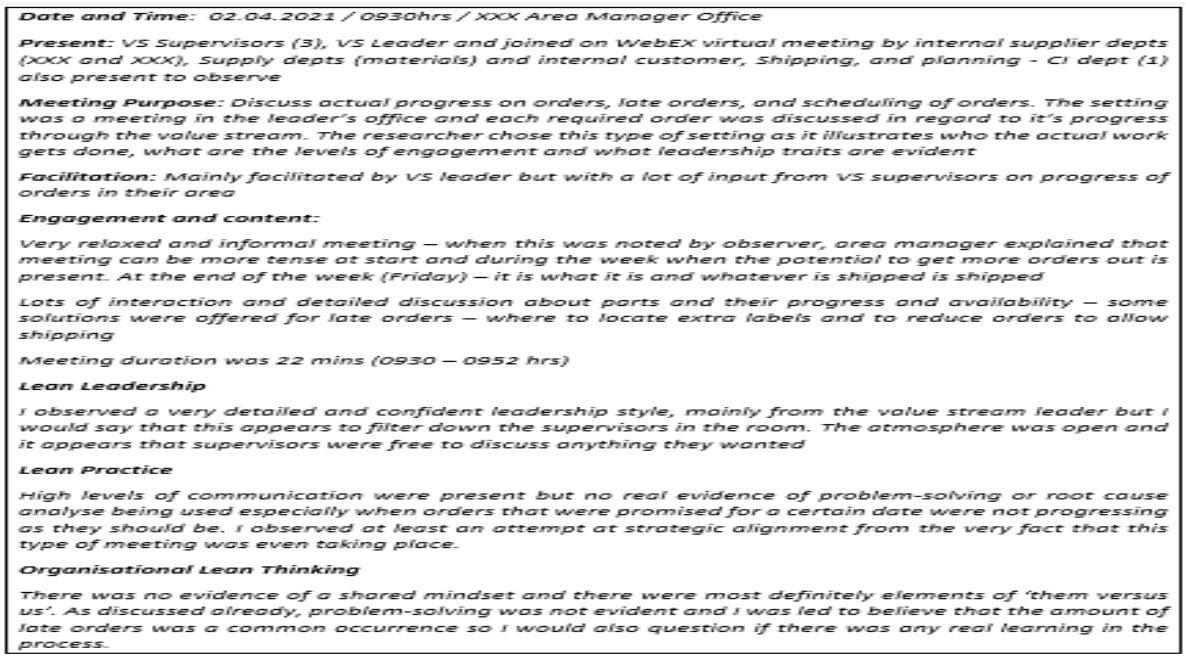
Settings	Event Purpose	Number	Duration
Employee induction	New hire training	1	2.5 hrs
Value-stream 1 meeting	Production progress	1	31 mins
Value-stream 2 meeting	Production progress	1	22 mins
Value-stream 3 meeting	Production progress	1	20 mins
Project meeting	Project action update	4	55 mins
Problem solving	Site strategic alignment	1	45 mins
GEMBA walk	Shop floor waste walk	1	65 mins

Following recommendations from Robson (2002), this researcher used a structured approach to documenting participant observations, as follows:

- Describe the setting
- Names and relevant details of people attending
- The activities and the actions involved
- Sequence of events and what people were trying to achieve
- Emotions and feelings of those involved

Figure 4 provides an example of a participant observation event with analysis.

Figure 4 - Direct Observation Meeting 1



Date and Time: *02.04.2021 / 0930hrs / XXX Area Manager Office*

Present: *VS Supervisors (3), VS Leader and joined on WebEX virtual meeting by internal supplier depts (XXX and XXX), Supply depts (materials) and internal customer, Shipping, and planning - CI dept (1) also present to observe*

Meeting Purpose: *Discuss actual progress on orders, late orders, and scheduling of orders. The setting was a meeting in the leader's office and each required order was discussed in regard to it's progress through the value stream. The researcher chose this type of setting as it illustrates who the actual work gets done, what are the levels of engagement and what leadership traits are evident*

Facilitation: *Mainly facilitated by VS leader but with a lot of input from VS supervisors on progress of orders in their area*

Engagement and content:

Very relaxed and informal meeting – when this was noted by observer, area manager explained that meeting can be more tense at start and during the week when the potential to get more orders out is present. At the end of the week (Friday) – it is what it is and whatever is shipped is shipped

Lots of interaction and detailed discussion about parts and their progress and availability – some solutions were offered for late orders – where to locate extra labels and to reduce orders to allow shipping

Meeting duration was 22 mins (0930 – 0952 hrs)

Lean Leadership

I observed a very detailed and confident leadership style, mainly from the value stream leader but I would say that this appears to filter down the supervisors in the room. The atmosphere was open and it appears that supervisors were free to discuss anything they wanted

Lean Practice

High levels of communication were present but no real evidence of problem-solving or root cause analyse being used especially when orders that were promised for a certain date were not progressing as they should be. I observed at least an attempt at strategic alignment from the very fact that this type of meeting was even taking place.

Organisational Lean Thinking

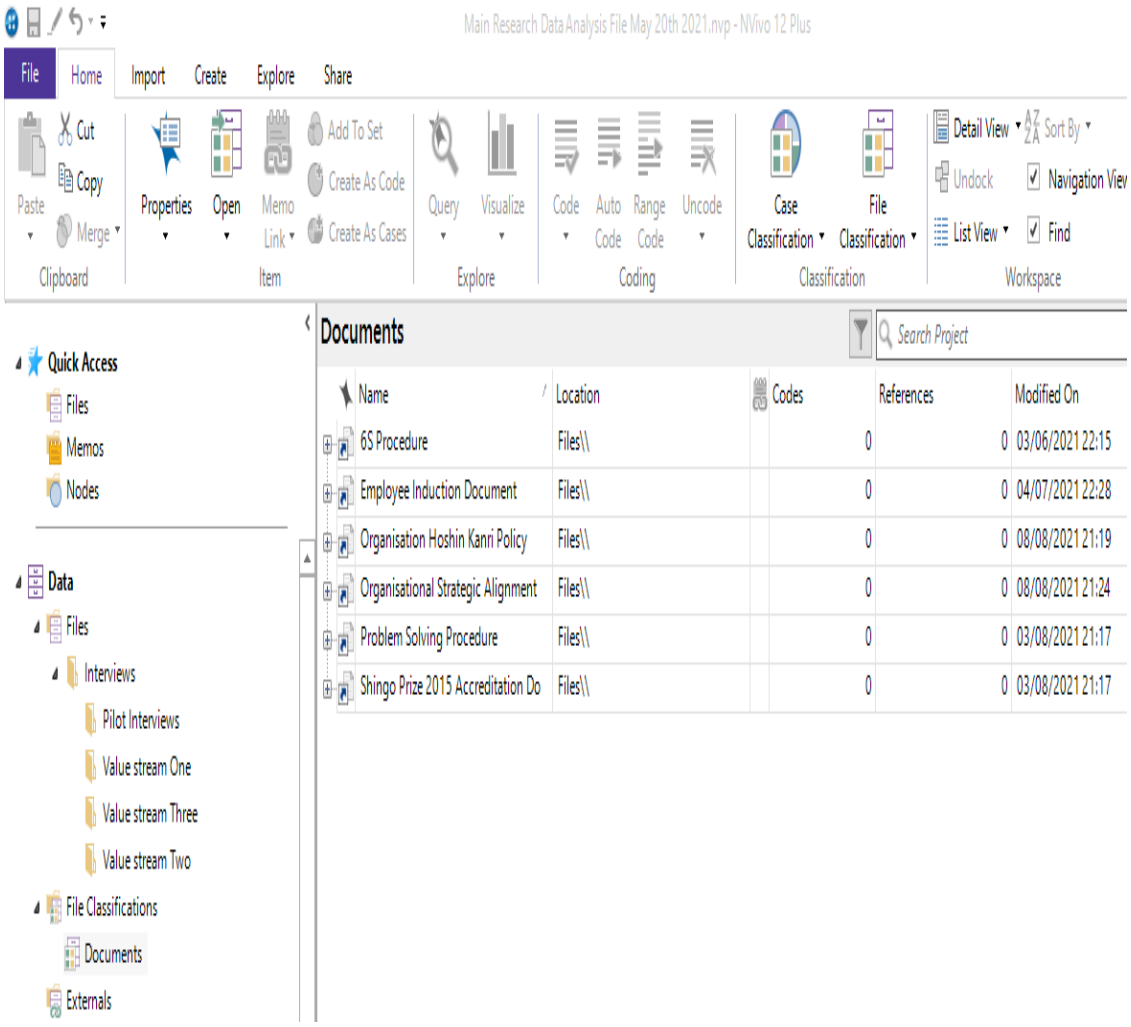
There was no evidence of a shared mindset and there were most definitely elements of 'them versus us'. As discussed already, problem-solving was not evident and I was led to believe that the amount of late orders was a common occurrence so I would also question if there was any real learning in the process.

4.0 Data Analysis

As already stated, this research will utilise the NVivo software package for data analysis purposes (Robson, 2002; Kelle, 2004; Yin, 2009; Miles *et al*., 2014). Transcripts from interviews and relevant documents were imported to the software package once data collection began in May 2021. It is important to note at this stage of the study that it is the researcher, not the software that is responsible for the actual analysis of the data (Kelle, 2004). The use of CAQDAS will support this researcher to be "more explicit about the categories that are developed in the on-going research process" and allows greater transparency and accountability about the thought process employed by the researcher (Kelle, 2004, p.486). Transcripts from the in-depth interviews, event logs and meeting

minutes from participation observation and selected documents have been uploaded to the NVivo software. Figure 5 below is a screen shot that illustrates the current loading of the documents.

Figure 5 - NVivo10 Software File Development



The qualitative data analysis strategy selected for this paper is thematic analysis, which will necessitate the researcher to identify certain coding that reflects repetitive words and phrases that can then be utilised to distinguish and generate a theory or set of themes (Leech and Onwuegbuzie, 2008). Boyatzis (1998) describes thematic analysis as a process for translation of qualitative data which requires the data to be explicitly encoded to reveal themes within the data that support the analysis. This researcher will carry out an examination of the themes or patterns of meaning that emerge within the data which can then be used to explore both the obvious and implied meanings within this data.

As outlined in paper two, there are five main phases in the utilisation of this data analysis method – data immersion, data coding, category and theme creation, analytical writing and lastly, data analysis (see Boyatzis, 1998; Nowell *et al*., 2017; Green *et al*., 2017; Castleberry and Nolen, 2018). In order to fulfil the dependability and confirmability aspects of research legitimisation (Nowell *et al*., 2017; Castleberry and Nolen, 2018), this section of the paper will clearly explain the steps taken in the data analysis method and the assumptions that underlined the analysis to allow others make an informed decision on the integrity of this research process.

The first step in thematic analysis is for the researcher to familiarise themselves thoroughly with the data to be processed and to start considering potential codes or themes that could emerge (Nowell *et al*., 2017). This data immersion occurred naturally as the researcher conducted all the interviews personally and later transcribed and imported the data into the NVivo software which enabled this researcher to start to pull together the different elements and see if there are any patterns emerging at an early stage (Green *et al*., 2017). This initial stage of the data analysis has been described by Castleberry and Nolen (2018) as the compiling phase and state that the data should be formatted into a "useable form" (p. 808).

As per recommendations that Qualitative data analysis needs to happen while data collection progresses (Robson, 2002, Miles *et al*., 2014), data analysis ran concurrently with data collection and codes were initially organised using a set of pre-coding based on the conceptual framework. The NVivo software uses terminology such as 'children', 'parents', 'grandparents' or 'grandchildren' when creating a hierarchical structure with nodes to show the relationship between them. Figure 6 is a screenshot of these pre-coding sets which are being used as 'Grandparent nodes' to bring together all other nodes at the initial stages of data research that relate to them. These grandparent nodes were derived from the sections of the conceptual framework but will not influence the data analysis but rather provide an initial structure in which to organise the nodes.

Figure 6 - NVivo10 Software Pre-coding

The researcher found the coding process to be a very time intensive and laborious task which precedes the more eventful process of making meaning of the data during categorisation and theme building (Kelle, 2004). The progress of coding involved probing the information for repetitive statements or thoughts contained in the data and then examining and arranging the data to determine if certain codes or labels emerged (Spencer *et al*., 2003). Both Kelle (2004) and Miles *et al*. (2014) assert that coding is the start of analysis and not just a preparatory step in the process and as such can be deemed heuristic or exploratory as the person assigning the coding has to reflect and interpret the data's meaning. The codes the researcher selected were attached to "data chunks of varying size – words, phrases, sentences, or whole paragraphs, connected or unconnected, to a specific setting" (Saldana, 2016, p. 56). This phase of the data analysis has been described as the disassembling of the data (Castleberry and Nolen, 2018). It is vital that the person who was completing this coding was fully aware of the context behind the gathered data (Castleberry and Nolen, 2018; Green *et al*., 2017). After initial coding was completed and before theme categorisation took place, 34 different nodes were identified. These different nodes were named but not sorted into any categories in Figure 7.

Figure 7 - Pre-hierarchical Node Listing

Nvivo Node	
Change management	Leader who is organised
Communication	Lean not present
Cost	Lean Tools and Processes
Culture	Listen
Customer focused	Manage Conflict
Embeded	Metrics
Employee Engagement	No Time
Excessive Inventory	Organisational Lean Thinking
Experienced in Lean	Output only approach
GEMBA	Parts are 'hot'
Goal setting	Poor Planning
Hoshin Kanri	Problem Solving
Influencing	Respectful
Inventory control	Top-down
Lead by example	Training
Leader Problem Solving	Visual management
Leader Self-Knowledge	Waste elimination

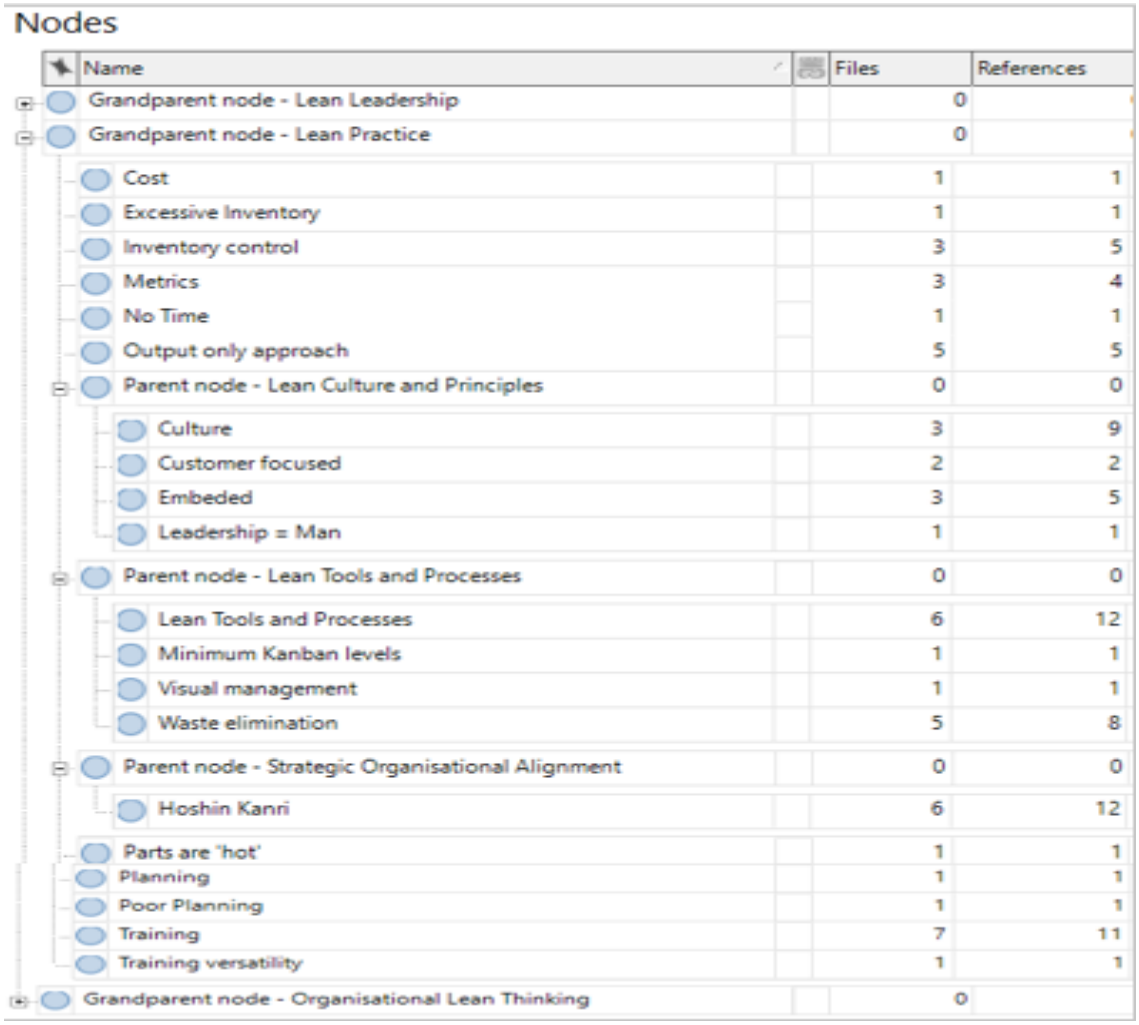
The researcher then moved onto the next phase of data analysis and started to create categories and themes. Both Spencer *et al*., (2003) and Castleberry and Nolen (2018)

describe this phase as the reassembling of the data. “The human mind finds patterns almost intuitively; it needs no ‘how-to’ advice. But patterns don’t just happen; we construct them from our observations of reoccurring phenomena” (Miles *et al*., 2014, p. 278). Using the initial three pre-coded ‘grandparent’ nodes as very high-level categories of a hierarchical coding scheme (see Figure 5), Lean Leadership, Lean Practice and Organisational Lean Thinking, the researcher started to create hierarchical relationships by matching the existing nodes into these categories. Within the ‘Lean Practice’ node, three additional ‘parent’ nodes were created to reflect the three elements of the Lean Practice, namely, Lean Tools and Processes, Lean Culture and Principles and Strategic Organisational Alignment.

Most of the nodes were an obvious fit however there were quite a few anomalies. Being aware of both selectivity bias and reporting bias, as discussed in paper two, these outliers were not conveniently crammed into an existing category node but rather regarded as phenomenon that will need further exploration during data analysis (Miles *et al*., 2014). When information emerges that does not fit your expectations, this development should be regarded as the researcher’s “friend” as this “can test or strengthen the basic findings and protects you against self-selecting biases and help you build a better explanation” (Miles *et al*., 2014, p. 301). Not to disregard any emerging themes was very important advice because “the importance of the theme is not dependent upon how often it appears or how much data is contained within the theme. Rather, the importance is related to whether it captures something important in relation to the overall research questions” (Castleberry and Nolen, 2018, p. 812).

Figure 8 illustrates the current progress of the data analysis and gives an example by expanding the view of the grandparent node, lean practice. As depicted, there are six codes not sorted yet as they did fit into a parent node at that stage of the data analysis – ‘cost’, ‘excessive inventory’, ‘inventory control’, ‘metrics’, ‘no time’ and ‘output only approach’ whereas ‘hoshin kanri’ was deemed a fit for the parent node, Strategic Organisational Alignment. The grandparent nodes of Lean Leadership or Organisational Lean Thinking have not been expanded in the illustration shown in Figure 8.

Figure 8 – NVivo Preliminary hierarchical coding



Nodes

Name	Files	References
Grandparent node - Lean Leadership	0	
Grandparent node - Lean Practice	0	
Cost	1	1
Excessive Inventory	1	1
Inventory control	3	5
Metrics	3	4
No Time	1	1
Output only approach	5	5
Parent node - Lean Culture and Principles	0	0
Culture	3	9
Customer focused	2	2
Embeded	3	5
Leadership = Man	1	1
Parent node - Lean Tools and Processes	0	0
Lean Tools and Processes	6	12
Minimum Kanban levels	1	1
Visual management	1	1
Waste elimination	5	8
Parent node - Strategic Organisational Alignment	0	0
Hoshin Kanri	6	12
Parts are 'hot'	1	1
Planning	1	1
Poor Planning	1	1
Training	7	11
Training versatility	1	1
Grandparent node - Organisational Lean Thinking	0	

The next step is analytical writing. For Stake (1995, p. 19), "good research is not about good methods as much as it is about good thinking". The importance of analytical writing in this research process cannot be understated in its purpose to ensure that the researcher thinks about the data gathered and what it is informing the researcher-analytical writing is "one of the most useful and powerful sense-making tools at hand" (Miles *et al*., 2014, p.96). Analytical writing is documenting the fieldnotes, reflecting on the notes, capturing the reflections, and then testing the insights (Delamont, 2004). During the course of data analysis, the researcher made several memos in the NVivo software (see Figure 9). Initial memos were expanded upon and developed into analytical writing which in essence is a narrative of the researcher's reflections and thinking process about the data. This in turn allowed the researcher to synthesise and draw meanings and interpretation from the data (Miles *et al*., 2014).

Figure 9 – NVivo Analytical Memos

Memos

Name	Codes	References	Modified On
Additional memo	0	0	30/06/2021 22:26
Data Analysis Progression 3 Aug 2021	0	0	03/08/2021 23:45
Initial research data analysis thoughts	0	0	30/06/2021 22:26
Memo 20 May 2021	0	0	20/05/2021 21:30
Reflective memo	0	0	20/05/2021 21:28
Research documents	0	0	31/05/2021 23:00
Research Interview Progress	0	0	03/06/2021 21:00
Research Progress	0	0	03/06/2021 21:00
Research progress 31 May 2021	0	0	03/06/2021 21:00
VS1_F	0	0	15/09/2021 22:23
VS1_LF Data analysis progression	2	2	13/09/2021 22:08
VS2 L_F Data analysis progression	8	11	13/09/2021 22:01
VS3 L_F Data Analysis progression	1	1	13/09/2021 22:01

5.0 Initial Findings and Emerging Themes

After conducting preliminary analysis of the information gathered so far from the three data collection processes, in-depth interviews, document analysis and participant observations, this section of the paper will present the emerging themes and initial findings coming from this research process. It is important to note that as data collection and data analysis stage is still on-going, what will be presented as preliminary findings in this paper should be considered as the emergence of descriptive accounts. Castleberry and Nolen (2018) stress the point that a researcher should be careful not to infer that the presence of the codes and themes in the data as adequate interpretation and then draw conclusions to support or reject the theory. Paper four will contain the explanatory accounts or findings which is when this researcher can move away from this descriptive phase and try to find "patterns of association within the data and then attempt to account for why those occur" (Richie and Lewis, 2003, p. 214-215).

This study is being undertaken from an insider researcher vantage point and as a result this researcher is in a position to have a deeper understanding of the organisations culture which enables a thicker description of the context when exploring the perspectives of the study participants (Rapley, 2004; Trowler, 2011). This unique perspective has allowed the researcher to be aware of the fact that organisation ABC is in a period of rebuilding its lean culture and several initiatives have started to support this process. For instance,

there is a re-invigoration of the lean 5S program, lean problem-solving training for employees, a new focus on strategic alignment of continuous improvement efforts and a planned lean leadership training program. In addition to these steps, the continuous improvement team have been expanded which would lead the researcher to think that the organisation ABC believed that the lean culture needed to be improved.

Theme 1 – Organisational Lean Thinking

There is evidence of Organisational Lean Thinking (OLT) in organisation ABC in that there are manifestations of higher levels of problem-solving and learning with a shared mindset that is supportive of lean activities. However, the research findings also suggests that the awareness of OLT is not consistent throughout the organisation. The findings emerging from the in-depth interviews indicate that awareness of OLT is sporadic and is at various stages of maturity in some value-streams (VS) versus others. This divergence in OLT awareness can be illustrated by the understanding of two Leader-followers in VS2 and VS3. For instance, the leader-follower in VS2, appears to have a high level of awareness of organisational lean thinking and understands the role lean leadership in embedding a lean culture and the utilisation of the lean tools and processes being used. The interviewee was very cognisant that OLT is a mindset rather than a single use approach to eliminating waste.

> The point of view that, from the top down, there is a methodology and a culture of waste elimination. Improvements, using lean tools and techniques happen on a day-to-day basis, not just when we are going for the Shingo prize or when there is a Kaizen event, it is built into the culture [Participant VS2b].

In contrast, the leader-follower from VS3, showed less awareness and understanding of organisational lean thinking and equated it to just the lean principle of waste removal.

> Identify waste and eliminate it – materials, time, energy to produce it, stock, any type of waste? [Participant VS3a].

It is interesting to note that inconsistency is also evident in the deployment of lean tools and processes between value-streams. In VS2, the VS leader is actively embedding lean tools and practices within their value stream and is witnessing high levels of problem solving and OLT awareness, whereas in VS1, the is little evidence of this deployment. The quote below is from the leader of VS1.

> I have a high interest in lean but do not know enough about it. The day-job gets in the way, I must make time for it but I am always challenged by time [Participant VS1h].

Participant observation also supported this finding. In Value Stream Meetings, lean activity within VS1 has not progressed past talking about basic lean tools and everyday problem solving amongst operatives is not evident.

The emerging findings are suggesting a link between the leader's role and the establishment of OLT and the embedding of lean practices within the organisation. This will be explored in greater detail in the ongoing analysis of the collected research data.

Theme 2 - Lean Practice

The organisation understands that lean implementation is complex and that it requires time and commitment of leaders. In order to establish an implementation standard to follow, the organisation and senior management are investing significant resources in embedding an organisational lean thinking mind-set and the supporting lean tools and practices within the site. In addition, the company has established a dedicated continuous improvement unit to support the management and operatives in acquiring lean knowledge.

Theme 2.1 – Lean tools and processes training

It is obvious from the research that the company places great emphasis on the execution of lean tools and processes to overcome challenges, root-cause problems and improve the day-to-day running of the value-stream. The importance of training regarding lean tools and processes such as the 5S lean program and 8-step problem solving was very prevalent and the belief that lean training could be improved came from all three value-streams and also from all three employee groups (Leaders, Leader-followers, and Followers).
During in-depth interviewing, several quotes from interviewees, on the discussion of lean training, indicated that there is a belief that lean training is very important as this puts the employee on the right footing but even though, lean training starts strongly in the organisation at induction, it then becomes less evident on an on-going basis.

> Induction for CI [Continuous Improvement], as there is for quality as there is for safety as there is for customer service and all other things. But after that, then, when the trainers get the associates, it is just operational issues. They are not involved in CI. So, it has gone then [Participant VS2a].

> Training and understanding of lean. I think people that are not, maybe haven't, you know, are coming into an organisation and they actually haven't been a part of Lean before [Participant VS1a].

> It is regular training, and it is continuous, reminding us through training, of the techniques, what we need to be looking at, because we are inclined to give training on an eight Step [Participant VS3g].

The lack of lean training within the organisation is also indicative of the inconsistency of OLT. As training began to emerge as an important element in OLT during the data collection, a full assessment of the organisation ABC's assigned training was undertaken. Table 5 is a summary of this assessment which contains the training documents that were identified as being associated with lean and lean training. In total, there are 940 training documents within the organisation and they were reviewed for their relevance to lean leadership, lean practice, and organisational lean thinking. From this, only 17 documents were identified as being relevant to lean. It is noted that only five of the 17 lean training documents are issued to all employees of organisation ABC and that lean training in general is only a small fraction of the overall organisational training program.

The critical insight here is that there is in-sufficient focus on lean training for lean tools and processes within organisation ABC even though there is general consensus amongst the research participants that this is an important part of organisational lean thinking.

Table 5 - Site lean document analysis

POLICY NUMBER	POLICY TITLE	CATEGORY
CI00002*	6S Procedure	Lean tool - 5S
EI00116	Recurring Problem Activity Sheet Procedure (RPAS)	Lean tool -Problem Solving
EI00179	Time Study Procedure	Lean tool - Process Improvement
ENV00001*	Housekeeping/Cleaning	Lean tool - 5S
ENV021	Cleaning Policy	Lean tool - 5S
G005	Guidance on Statistically Valid Sample Plans	Lean tool - Process Improvement
HRI00006*	New Hire Induction	Lean - People Development
HRI001*	Training Policy for All Lake Region Employees	Lean - People Development
HRI025	Go-Look-SeePolicy	Lean Culture & Principles
M01295	Operations Trouble shooting guide for the Cordis Coilwinding Machines	Lean tool -Problem Solving
MI00030	Fault finding methods procedure	Lean tool -Problem Solving
MI00167	Supervisor Standard Work Instructions	Lean tool - Standard Work
NRO_QS-WI-00010*	8 Step Problem Solving Methodology	Lean tool -Problem Solving
SOP100	Responsibility, Authority & Communication	Organisational Strategic Alignment
EI00078	Procedure for the Management of Signifcant Projects	Organisational Strategic Alignment
HRI020	Standard Work	Lean tool - Standard Work
M01108	Process Failure Modes and Effects Analysis	Lean tool -Problem Solving

** ASSIGNED TO ALL EMPLOYEES*

Theme 2.2 – Lean Culture

Similar to lean tools and processes, there appears to be a high level of awareness of the importance of a lean culture to the success of a lean organisation but it is not embedded

– this came across to the researcher from both the in-depth interviewing and document analysis.

References to lean culture featured heavily in the data analysis of the in-depth interviewing completed to date, with participants noting the importance of embedding a lean culture and the lean leadership's role in this. It is also mentioned that the lean culture has diminished in recent years.

> Culture overall is what matters and the leadership have a big part to play in maintaining the culture [Participant VS2b].
>
> As opposed to been part of what we do every day. It should be part of what we do as a culture [Participant VS2a].
>
> Back in the past, we had a good positive culture, driven eight steps, driving projects, and really engaged with the workforce. I think we probably stepped away from that a little bit. And there's still remnants of it [Participant VS2h].

In the document titled 'Shingo award achievement report' from 2016, organisation ABC's lean culture is commented on in a positive manner.

> A culture of CI [Continuous Improvement] is evident throughout the site [Shingo award achievement report].

A possible emerging finding and theme is that lean culture has weakened in recent years and is no longer embedded within organisation ABC.

Theme 2.3 – Organisational Strategic Alignment

When the topic of strategic alignment was discussed during in-depth interviewing, it was mentioned under various names such as planning, hoshin kanri, and inventory control. It was not always discussed in a positive manner although most of the interviewees were quite passionate about its importance to organisational lean thinking, below are some of the interviewee's perceptions about the importance of organisational strategic alignment.

> I would expect to see everybody in the whole factory working together as one team [Participant VS3a].
>
> The factory is like a tree with the branches? but all coming in back into the trunk [Participant VS2f].

However, on a less than positive outlook on planning, one interviewee came across as very disappointed in the organisation's strategic alignment.

> But it looks to me, it does not matter how much we produce here, it is never enough. We produce 100,000 parts. There is another 120,000 waiting to be made or if we produce that, there is another 120,000 to be made. I do not know how it happens. I still do not understand it [Participant VS3a].

In the document titled 'Shingo award achievement report', several positive statements are made about organisation ABC's organisational strategic alignment in 2016.

> XXX's strategy deployment system is well described and understood across the site. Strategy deployment is very well visualized and understood by employees [Shingo award achievement report].

The initial finding emerging is that organisational strategic alignment, although felt to be important to the research participants, and was once a strong element of organisation ABC's lean practice but is no longer consistent throughout the organisation.

Theme 3: Lean Leadership

Two lean leadership practices were prevalent during the in-depth interviewing.

Theme 3.1 – Leading by example

Across several of the in-depth interviews, there was a repeated assertion that the ability to 'lead by example' was critically important for a lean leader. When probed as to what was meant by leading by example, participants said it was the lean leader displaying good lean practice themselves, not always looking for only production output and causing stock to build up and to use problem solving tools themselves to find root-causes to issues. Two insights from interviewees underlined the importance of lean leadership to lean practice when it comes to leading by example –

> Like, generally speaking. I would say leadership needs to be an example. Okay? work as an example. Okay? Because if workers, they see that you're doing your best, and you're there, you're making your job as good as it's possible. And they see that they will recognize that if they see that management is a bit sloppy, yeah. They will recognize that as well [Participant VS1].

> And if you believe in yourself, I think that will come through as you're trying to walk the walk and talk the talk [Participant VS1a].

The emerging theme here is that the ability of lean leadership to set a good example when it comes to lean is viewed as important to the participants.

Theme 3.2 – Communication

The majority of interviewees felt that a lean leader should be able to communicate effectively during discussions with the follower group about what the current and future plans are but also to be able to communicate effectively with the other leaders as well. The sentiment has featured prominently during the in-depth interviews with several mentions in the data analysis so far.

> Communication, to be able to explain bigger picture to anyone within the team so everyone knows where we are heading towards what is this about [Participant VS2b].
>
> I think there has to be, like kind of good communication between the other leadership's because communication will be the first thing [Participant VS2f].

The emerging theme being presented here is the importance of effective communication for a lean leader.

6.0 Concluding remarks and next steps

This paper has introduced the research organisation and discussed the researcher's position within the organisation.

This paper provides details of how the research study design is being operationalised in terms of data collection and the process for data analysis. Initial findings are presented under three main thematic headings, explicitly (1) Organisational Lean Thinking (2) Lean Tools and Processes and (3) Lean Leadership. The richness of the initial findings endorses the appropriateness of the interpretive single case study and the data collections methods of in-depth interviews, document analysis and observation.

The data has identified insights to answer the core research objective of exploring the relationship between lean leadership and lean practice to achieve organisational lean thinking. From the initial findings, there appears to be a relationship between knowledgeable lean leaders and the effectiveness of embedding lean practices and tools within a value stream. In essence, lean tool and practice implementation requires the involvement of the leadership team and the analysis showed that in value streams where the leader was not actively involved in tool implementation, the adoption rate was significantly lower. When lean tools and practices are embedded through leaders – 'leading by example' – the followers are more willing to adopt the practices and engage

the culture of lean thinking. Although the analysis is at an early stage, the initial findings do suggest that successful lean tool and lean practice implementation is connected to the leader but it is also connected to the main business strategy alignment within the organisation. While this analysis only represents a small part of the planned data analysis, the emergent insights demonstrate the appropriateness of the data collection, implementation, and analysis strategies. Over the coming period, the remaining research interviews and observations will complete the data collection until data saturation is reached. The notion of the evolving project that is presented here is that, understanding of complex phenomenon such as the relationship between Lean Leadership, Lean Practice and OLT will materialise over time from an iterating cycle of deduction and induction toward a robust research study and fulfilment of the research objective.

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Paper 4

RESEARCH FINDINGS AND DISCUSSION

Paper Four Preface

This paper is the point in the research where there were a lot of emerging realisations arising from the advancement of the thematic analysis. Having completed the initial analysis portion of the research, the researcher began to see high-level themes being established, for instance, if there is a perception that the company has a greater level of lean thinking now, what was the difference previously? What began to become clear to this researcher is that there were two states of lean at organisation ABC being discussed in the interviews, being written about in the documents and being observed on the shop floor. ABC's strategy during the time of their initial lean implementation differs from the new lean re-invigoration program that aims to achieve organisational lean thinking at the company.

This allowed the research to contrast and understand the differences between the two states and to improve the depth and richness of the data and to arrive at a deeper understanding of the dynamics of both states.

In addition, it became obvious to the researcher that there were two elements of lean practice that were overlooked in the initial lean literature review and both these lean constructs found their back into the research discussion through the 'active communication' and 'structured learning' themes that emerged from the data analysis.

Paper 4 of the Cumulative Paper Series, the Findings and Discussion Paper, was presented to the DBA Examination Panel in April 2022. The examiners made minor recommendations for improvement of the paper. The paper that is presented in this thesis is the revised and approved paper.

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RESEARCH PAPER SERIES

Paper 4:

FINDINGS AND DISCUSSION PAPER

"To explore the relationship between Lean Leadership and Lean practice to achieve Organisational Lean thinking"

ABSTRACT

The reason for this research is to determine why the practical implementation of lean and achievement of organisational lean thinking in organisations has differed so much from the many positive stories and accolades that inhabit much of the available literature over the last thirty years. The researcher has chosen a single site to carry out a case study to explore the relationship between lean leadership and lean practice to achieve organisational lean thinking. The power of a single-site case study is the depth and richness of the findings that it affords the researcher as an insider to fully explore the phenomenon being studied. Using interviews, participant observation and documentary analysis, the paper presents detailed insights into the themes that emerged and show an organization that is attempting to reinvigorate organisational lean thinking. The paper concludes with the intention of the researcher to bring these findings forward to the next stage of discussion. What emerged from the analysis is the cyclical and perpetual nature of the relationship between lean leadership, lean practice and organisational lean thinking.

Word count: 11,820

1.0 Introduction

Both the academic and the practical worlds of industry have accepted that lean is a powerful tool that can transform an organisations performance (see Womack and Jones, 1996; Spear 2004; Bodek, 2008; Sisson and Elshennawy, 2015). Nevertheless, the failure rate for lean implementations is unacceptably high, ranging from 50% to 90% (Ringen and Holtskog, 2011; Pedersen and Huniche, 2011). For this reason, organisational lean thinking has been criticised in both industry and academia as a fad for not being applicable beyond mass production (Cooney, 2002; Crute *et al.*, 2003; Pearse and Pons, 2019). For numerous authors (Mann, 2009, Kimsey, 2010; Pham and Thomas, 2012; Netland *et al.*, 2020), lean leadership is the missing link and is critical in promoting lean practices and embedding an organisational lean thinking mind-set within an organisation. However, research to date has not adequately addressed the interrelationships between lean leadership and lean practice in regard to organisational lean thinking (Mann, 2009, Pham and Thomas, 2012) and a significant gap remains in our understanding of the role that lean leadership plays in embedding lean practices to achieve organisational lean thinking (see Lewis, 2000; Proudlove *et al.*, 2008; Radnor, 2011; Dahlgaard *et al.*, 2011).

With this research gap in mind, this study sets forth to explore the relationship between lean leadership and lean practice to achieve organisational lean thinking. Specifically, the study seeks to research the following,

- To investigate the concept of organisational lean thinking
- To explore the nature of the relationship between lean leadership and lean practice
- To explore the relationship between lean practice and organisational lean thinking
- To explore the relationship between lean leadership and organisational lean thinking

This paper will present findings from a single case study on an organisation who has been on the lean journey for many years now and provides a rich source of information to explore the research problem of how lean organisations can achieve and sustain organisational lean thinking. Paper four builds on the work of paper three by presenting the completed findings of the data analysis on this research organisation which are relevant to the study objectives. The completed data collection and subsequent data analysis took place over an eight-month period from May 2021 to December 2021 and

encompasses data analysis of in-depth interviews, documents, and participant observations.

The rest of the paper will be structured as follows. Firstly, this paper will set out the context of the data analysis and findings. This is followed by a summary of the completed data collection that was undertaken before a full and detailed representation of the findings is documented under the sections of three areas – what the researcher read about lean in the organisation, what the researcher observed about lean in the organisation and lastly, what steps the organisation are taking to improve lean in the organisation. Next, a reflective section on the researcher's findings is included which incorporates an overview of the legitimisation of the data. Finally, a summary of the findings and a preliminary discussion will be provided. The full discussion on the findings will occur in the next section of the thesis.

2.0 Case Study Overview

This research is based upon a single case study in a large Irish medical device organisation employing nearly 1000 employees. The organisation ABC was identified as a suitable research site due to the organisation's attainment of a Shingo award which indicated that it had achieved a level of OLT. The Shingo model is a transformational model that supports the implementation of lean in an organisation through the use of guiding principles that promote the lean tools and systems in addition to a culture of full immersion by everyone in the organisation into the use of these tools and lean thinking in general. In order to be successfully awarded the Shingo prize, an organisation "must be able to demonstrate that these guiding principles are embedded in their culture through the behaviour of all employees" (Bicheno and Holweg, 2016, p.6). Organisation ABC was evaluated against the Shingo models guiding principles, lean systems and tools and results and was awarded Shingo accreditation. Moreover, the company has been recognised nationally as a centre of excellence in the Irish Medical Technological industry which is a further indication of the presence of a strong continuous improvement culture which bases itself on the philosophies of lean. As detailed in paper three, the researcher has recently been employed by the research organisation in the role of Continuous Improvement (CI) coach and so the study is being undertaken with the benefits of being an insider researcher which include having a unique awareness and understanding of the organisations culture which in turn supports the research to deliver

a richer and deeper context to the research findings (Rapley, 2004; Trowler, 2011). This enabled a greater level of trust between the researcher and the research participants which resulted in a high level of openness and sharing of experiences. The researcher was also very conscious of researcher objectivity and introducing bias and a number of mitigating actions were undertaken. For example, a strong focus on only discussing historical events that occurred before the researcher's employment started was maintained during the interviews. Document analysis only occurred on documents created before 2021 and participant observation was undertaken only where the researcher had no direct bearing on the events being observed.

3.0 Data collection summary

Data collection was between May and December 2021. Table 1 provides an overview of the data sources. The in-depth interview strategy remained consistent with the proposals outlined in paper three with the exception of the intended 'leader-follower' (VS3h) participant being replaced by another participant as the intended candidate left the organisation's employment. In total, 24 candidates were interviewed, eight from each value-streams with a gender split of 33.3% female to 66.7% male which is largely consistent with the overall organisation gender split (38.7% female / 61.3% male).

Table 1 - Completed In-depth Interviews

Date	Participant Code	Value-Stream	Employee level grouping	Tenure	Gender
01-Sep-21	VS1a	VS1	Leader/Follower	3 years	F
11-Aug-21	VS1b	VS1	Leader/Follower	2 years	M
13-Aug-21	VS1c	VS1	Follower	15 years	M
12-Aug-21	VS1d	VS1	Follower	4 years	M
17-May-21	VS1e	VS1	Leader/Follower	7 years	M
16-Dec-21	VS1f	VS1	Follower	5 years	F
17-Dec-21	VS1g	VS1	Leader/Follower	6 years	F
26-Aug-21	VS1h	VS1	Snr Leader	<1 year	M
19-May-21	VS2a	VS2	Leader/Follower	15 years	M
19-May-21	VS2b	VS2	Leader/Follower	16 years	F
24-May-21	VS2c	VS2	Leader/Follower	16 years	F
25-May-21	VS2d	VS2	Leader/Follower	16 years	F
02-Jun-21	VS2e	VS2	Follower	4 years	M
17-Jun-21	VS2f	VS2	Follower	5 years	M
02-Jul-21	VS2g	VS2	Follower	6 years	M
07-Sep-21	VS2h	VS2	Snr Leader	5 years	M
27-May-21	VS3a	VS3	Leader/Follower	7 years	M
31-May-21	VS3b	VS3	Leader/Follower	16 years	M
17-May-21	VS3c	VS3	Snr Leader	7 years	M
01-Jun-21	VS3d	VS3	Leader/Follower	15 years	F
12-Aug-21	VS3e	VS3	Follower	18 years	M
03-Jun-21	VS3f	VS3	Follower	13 years	F
22-Jun-21	VS3g	VS3	Follower	4 Years	M
11-Dec-21	VS3h	VS3	Leader/Follower	<1 year	M

A total of 35 documents were analysed – see Table 2. For the purpose of organisation, the researcher used the groupings from the initial priori groupings – Lean Leadership, Lean

Practice and Organisational Lean Thinking. Lean Practice was sub-divided into Lean tools and processes, Lean culture and principles and Strategic organisational alignment.

Table 2-Document analysis

		Doc Code	Document#	Document Name	Year Created
Lean Leadership	Lean Leadership	LL1	N/A	Lean Leader Training	2018
		LL2	HRI025	Go-Look-See Policy	2016
		LL3	N/A	Lean Leader GEMBA Training	2020
Lean Practice	Lean Tools and Processes	LPLT1	CI00002	6S Procedure	2015
		LPLT2	EI00116	Recurring Problem Activity (11-Step)	2009
		LPLT3	EI00179	Time Study Procedure	2017
		LPLT4	ENV021	Cleaning Policy	2005
		LPLT5	HRI020	Standard Work Document	2012
		LPLT6	MI00167	Supervisor Standard Work	2015
		LPLT7	MI00030	Fault Finding Methods Procedure (6-Step)	2003
		LPLT8	MI00126	Writing Job Breakdown Sheets	2008
		LPLT9	QS-WI-00010	Eight Step Problem Solving (8-Step)	2016
	Lean Culture and Principles	LPLC1	ENV016	Internal and External Communication	2003
		LPLC2	QI019	Scheduled Plant Meetings	2004
		LPLC3	HRI024	Employee Engagement Policy	2012
		LPLC4	HRI032	Communications Policy	2016
		LPLC5	HRI029	Meeting Etiquette Policy	2013
		LPLC6	MI00174	Plant Escalation Procedure	2012
		LPLC7	SMI00002	Customer Satisfaction Policy	2011
		LPLC8	N/A	Q3 Town hall communications document	2021
	Strategic Organisational Alignment	LPSOA1	ENV002	Management Systems Structure and Responsibility	2006
		LPSOA2	MAI007	Planning Policy	2012
		LPSOA3	MAI008	Inventory Policy	2012
		LPSOA4	MI00193	Pull System Procedure	2014
		LPSOA5	PR0-001200	Management Review	2018
		LPSOA6	QI00149	Value-stream Quality Plan	2012
		LPSOA7	SFT1028	Crisis Management Plan	2007
		LPSOA8	SFT1039	Business Continuty Plan	2012
	Organisational Learning	LPLRN1	HRI00006	New Hire Induction	2005
		LPLRN2	HRI001	Training Policy for all employees	2012
		LPLRN3	PR0-002139	4-Step Training Method Procedure	2015
		LPLRN4	PR0-002140	JBS 4-Step Training	2015
Organisational Lean Thinking	Organisational Lean Thinking	OLT1	N/A	Shingo award achievement summary report	2016
		OLT2	N/A	Lean Fundamental Concepts	2018
		OLT3	N/A	Organisation Production System	2018

The strategy surrounding the direct participant observation was altered and any previously proposed observations where it may be construed that the researcher might

have had a bearing on the event being observed were excluded from the data collection and data analysis of the research. It should be noted that identifying participant observation opportunities that fulfilled these criteria was a difficult task for this researcher. However, an opportunity was afforded to this researcher when he was asked to accompany members of the senior leadership team on their initial leader GEMBA walks through an initiative to re-invigorate leadership presence on the shop floor. The brief was to be present and observe the leader's interactions with the production associates and to give informal feedback to the leaders privately on how they performed their task and how consistent they were with the spirit of the leader GEMBA walk's intentions. Table 3 is a summary of the included participant observations.

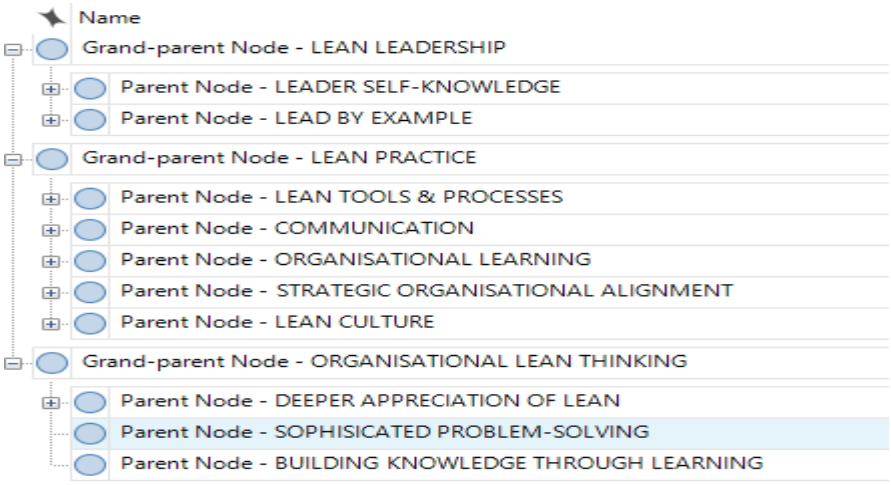
Table 3 - Participant observations

Participant Observation	Event Purpose	Number of observations	Observation Duration
Employee Induction	New Hire Training	1	2.5 hrs
Leader Gemba Walk 1	Leadership Walk	1	1.1 hrs
Leader Gemba Walk 2	Leadership Walk	1	1.0 hrs
Leader Gemba Walk 3	Leadership Walk	1	1.2 hrs
Site Townhall	All-Employee meeting	1	0.75 hrs

Data Analysis and Research Themes

Using thematic analysis and an iterative approach, the researcher began the task of breaking down the data from the in-depth interview analysis and eventually some key themes began to emerge. Intertwined in this process of emergent themes is the essential feature of going back and forth between theory and data, iterating toward a theory that closely fits the data (Eisenhardt, 1989). However, going forward and back between data and theory and trying to make sense of it all, is a messy and confusing process (Ritchie and Lewis, 2003). Indeed, this sense-making process is not easy by any means. In the beginning there was uncertainty about whether or not this research would yield anything at all from the data because it was difficult to see any patterns or threads emerging. Nevertheless, this was followed by a phase where the analysis began to converge and the researcher began to get some insight, which led to other insights and then certain themes beginning to materialise. Figure 1 is a screenshot from NVivo of the identified themes. (See Appendix 1 for a more detailed summary of all the nodes that are organised and contained within these themes).

Figure 1 – Main Theme List



The main themes are ‘Lean Leadership’, ‘Lean Practice’ and ‘Organisational Lean Thinking’. There are also sub-themes identified, which are 'Leader Self Knowledge', 'Leading by example', 'Lean Tools and Processes', ‘Organisation Learning', ‘Communication’, ‘Strategic Organisational Alignment, ‘Lean Culture', 'Deeper Appreciation of Lean', ‘Sophisticated Problem-Solving’ and ‘Building Knowledge through Learning’.

The next part of this paper will present what the researcher read, heard and observed at Organisation ABC about each of these themes and what subsequent findings emerged.

4.0 Findings

Theme 1-Lean leadership

There are references to the role of leadership contained in the Shingo assessment report that pointed out areas of opportunity for the organisation.

> Leadership should have a stronger presence at Gemba (Shop Floor) and should assist in problem solving activities. Senior leaders need to learn more about the Shingo Principles and how they can drive positive behaviours which significantly strengthen the organisation for the long term. Remove non value adding tasks from the Supervisors to allow them time to coach their teams in problem solving [Shingo Assessment Report].

It is noted by the researcher as a finding that all three documents that were analysed were created and published by organisation ABC after the Shingo assessment and could be a response to the criticism contained in the report. These efforts are focussed on providing a standardised approach to the lean leader approach and aim to train lean leaders on the

current best-known method to lead work safely, efficiently and at a high-quality level. Even though not all of the Lean Leader training is implemented, it is being included in this research as an indicator of the organisation's intentions in this regard. Organisation ABC advocates the following characteristics of lean leadership - visibility on the shop floor, be a model for consistency and accountability, coaching and mentoring, continuous learning, and people development. In addition, there is a focus on four lean tools and processes, namely, Standard Work, Visual Controls, providing a Vision and Change management.

ABC's leadership intention illustrates that consistent efforts are present to strengthen a GEMBA operating philosophy in that confirmation and verification of information is completed first-hand at the point of occurrence and the need to instil a behaviour of 'fact driven' rather than 'opinion driven' approach to seeking out critical information. It reinforces the need for dignity and respect for all employees and to adopt a process rather than a people approach to problem solving that will result in process improvement rather than a personnel discipline outcome. It also advocates that senior leadership have a strong presence on the shop floor where they can ensure that company values and behaviours are being adhered to and to have a 'hands-on' approach to problem-solving. The importance of the role of lean leadership placed in the organisations documentation also manifested in the in-depth interviews. Indeed, nearly all the participants felt that 'top-down' leadership was critical in embedding lean practices and achieving OLT.

> Lean leadership comes from the top and it starts from the top…If it's not - you can't be a lean organization, or in my opinion, unless the very top management believe in lean, understand lean, and believe in lean as a philosophy, and understand that as a philosophy, it can transform an organization [Participant VS3c].

Overall, the majority of participants mentioned the need for OLT to be driven by lean leadership but one quote from a member of the leader-follower group during the interviews seems to sum up this belief best.

> It needs the support from above, that support and setting expectations but also give them the support to do the work [Participant VS3b].

In regard to lean leadership a number of important insights emerged: a lean leader having a strong self-knowledge of lean and being able to lead by example.

Sub-theme 1a - Leader Self-Knowledge

During the interviews with the leader-follower group, the theme of leader self-knowledge and specifically having a deep knowledge of lean featured heavily.

> For a lean leader, you are looking at probably black belt minimum [Participant VS1e].

> Trained and experienced in, actually, the practices of lean [Participant VS1a].

A quote from the follower group indicates that a lean leader with sufficient lean knowledge allows followers to have trust in their leader.

> The general operative has to be confident of the leadership's knowledge because you trust someone who has like, already has the knowledge, and then he is judging the position of who is going to lead, if he does not have a clue of what he is doing [Participant VS2f].

Related to this, participants felt that building trust can be accomplished by demonstrating credibility in that a lean leader should be well organised, be more present to employees on the shop floor, be able to provide a vision and have a good grasp of problem solving and be able to coach and mentor their employees in this regard.

> A good, organized person that can organize the associates [Participant VS1a].

> Organizational skills? Okay. So organizational skills. Yeah. I suppose everything's organized, that organizing everything in a structured way that everybody's on the same [Participant VS1e].

> To encourage lean thinking, give our feedback, or encourage participation in an eight-step training or actually completing the eight steps, facilitating the resources for the time and helping them if they do get stopped, maybe, and they need a little bit of advice [Participant VS3b].

> Someone who knows how to break down a problem, or someone who can look for proper identification of a problem before they think of a solution [Participant VS1e].

The leader of VS2 captures the essence of a lean leader's role in providing a vision very well and these sentiments are shared by a leader-follower from this value-stream also.

> People who are able to demonstrate a vision, show people what their vision is, show the path that we're going to take to get there and get people to buy into that, are the people who are more successful [Participant VS2h].

> The key part of it is that leadership is explaining well, where are we heading? Why are we doing it [Participant VS2b].

The requirement that a leader should spend a lot of time at the place where the work was happening (GEMBA), was very prevalent in both what was written and what was said during the interviews. The Leader-follower group certainly believed this to be important

> Yeah, I think all the supervisors on-site would like to spend more time being present in the area that they supervise [Participant VS1g].
>
> Leadership are supposed to be visual, they need to be visual on the floor [Participant VS3b].

In regard to participant observation findings related to Leadership GEMBA Walks, the researcher observed that all three leaders on the GEMBA walks were more than capable of engaging in warm and open conversation and all three leaders listened to the associates and asked open-ended questions that prompted the associates themselves to seek solutions. On a less than positive note, all three leaders took a lot of notes and missed several opportunities for eye contact and connection even though the guidelines for the GEMBA walks did not encourage excessive note taking.

The leader on the GEMBA walk in VS2 was very open and honest and stated that as a leader, they were more comfortable with check-sheets and audits than open, un-scripted conversations with production associates.

Another finding from the direct observation of the leader GEMBA walks was the under-lying mild unease that was apparent on the production associates' behalf of the agenda behind the leader being present on the shop floor at all, even though the intention behind the walks was clearly explained at the start. Greater probing revealed that the GEMBA walks seemed to be only taking place in a structured manner in 2021 even though the original training document (LL2) was created in 2016. The leadership inaction in this regard is in direct contrast with the level of importance that is attached to the GEMBA philosophy apparent in both the in-depth interviews and the document analysis. The lack of direct engagement between the leaders and the followers was also evident in the following quotes where the interviews expressed that the VSM's are not spending enough time on the shop floor.

> The managers are never probably on the floor, we don't see them at all, well almost at all…it's like, I don't even know where my current manager's office is? You know, I didn't even know where they work, you know? Maybe it's only me? [Participant VS3d].
>
> So, they don't enjoy or want to come down to the face of it all and see the cold hard front of it all, and to see exactly the challenges and realities that these guys are up against on a daily basis [Participant VS3b]

Sub-theme 1b - Lead by Example

The theme of 'lead by example' began to emerge during the in-depth interviews and is supported by several other findings. These are, first and foremost, to be able to generate employee engagement by having the ability to listen, being open to ideas and to be respectful at all times.

Most participants felt that lean leaders must lead by example and one of the best ways to do this is by giving people a reason to believe and to follow the lean leader. The participants felt that good leadership is present when the employees respect and trust that their leader is doing right by the team in terms of supporting and nurturing ways to help them grow, develop and take on more responsibilities.

> Leading by example, showing example, and leading by example [Participant VS2g].

> I think every leader should be, how to say, that everybody wants to look at them and say, this is my supervisor. A good example to everybody. Okay, that's what a leader should be [Participant VS3f].

Motivating and inspiring your team and being respectful as a lean leader was also deemed very important. Participants felt that inspirational lean leaders generate enthusiasm and passion for the organisations core lean values and helping employees align their personal values with company initiatives. To achieve this, the lean leader must inspire and motivate employees not only in the short term but also in the long term by showing employees how to engage in lean practices and to do the best that they can for the benefit of the organisation.

> Try to motivate people, even if that means saying "you are brilliant five times a day [Participant VS2e].

> Have the personality to get people to work with you [Participant VS3g].

> In my opinion, always ask, never order, even if you are the man, as a leader, if you're on the top of the ladder, always ask, you have to be right with people. You can't just demand from everyone. Do you know what I mean? Eventually, it'll get back to you [Participant VS1c].

Participants also expressed that lean leaders who lead by example, treat their co-workers with dignity and respect. They also mentor and coach people through teachable moments and demonstrate real empathy, passion and integrity in what they do and in what others do. When this is done, respect goes both ways between the leader and follower.

> Yeah, and I think you have to treat everybody the same way. Like you want to be treated yourself. It's, I think it's very important… And I think people have to respect the leader [Participant VS3f].

Most participants felt that lean leaders must lead by example and lead from the front, instead of from 'up-on-high'. In essence, they should display good lean practice themselves and empower others. Participants were adamant that leading by example is not a solo act. It does not involve always looking for only production output, assigning blame or using problem solving tools themselves to find the root-causes to issues. Indeed, the general consensus was leading by example is where the leader collaboratively works with the team as well as sharing the credit for success. For the participants, when such a lean leader gets involved, it communicates to the team that the leader is showing them that they value their work and appreciates the effort that is being contributed by the employee. It was also felt that 'walking the talk' and getting involved, demonstrates to the team that the leader supports their work and is acknowledging and appreciating their time. For the followers, appreciating their contribution helps strengthen the relationship and the trust between the leader and the followers. This is eloquently represented in the following quotes.

> Practice what you preach…And if you believe in yourself, I think that will come through as you're trying to walk the talk [Participant VS1a].

> But as a value stream manager, I need to have an interest in lean and embed lean thinking [Participant VS1h].

The ability of lean leaders to listen and to be open to ideas and to help their followers deal with change featured heavily in the interviews. Indeed, the interviewees felt that when the 'voice of the employee' is wanted, heard and incorporated into lean initiatives, it will lead to more successful and sustainable lean implementations because the leader is not just seeing the employee as a resource but as a valuable and respected work colleague who can bring capabilities to the task at hand. It was also felt that this builds greater trust based relationships between employees and leaders because it shows that leaders care about their employees' best interest and will truly listen to them.

> So, you have to listen to your team, in order to determine what problems we have on the floor, to address them, and make the commitment to their employees that we go on to fix them to make the necessary improvements to make the job easier, faster, and more efficient for everyone [Participant VS2b].

> You're going to have to be very open to people, open to ideas, open to suggestions [Participant VS1a].

> To take the fear out of change [Participant VS3b].

Besides listening skills, the lean leader should exhibit good communication skills because it fosters trust, inspires, instils motivation and helps team members to be as productive as possible.

> A leader must have good communication skills [Participant VS1h].

> One of the biggest things in lean, or anything you're doing, is communication, communication - communication has to be a major issue. I mean, what is the leadership's commitment to lean… basically, I mean, communication is central to the whole thing. Yeah. probably the single most important for you [Participant VS1b].

For the participants, the leadership's communication skills allow the leader to inform employees about initiatives and educate them in the best practices to achieve success. Good communication also eliminates ambiguity around what needs to be done and by whom. It gives clarity as to the actions that need to be achieved. The participants also felt that a good lean leader who has the ability to communicate persuasively to motivate and encourage people to adopt the desirable action that leads to results is important.

> I think communication between the different levels is equally important. And also, when I understand the communication, I believe it's a big chunk of what I mean by communication also involves associates on the floor, they need to know where they can place themselves in the current project or improvement and what that means for them in the future, too. So, definitely communication is a part of it at all different levels [Participant VS2b].

Linking in with other themes such as problem-solving and other lean tools, which will be presented later in this paper, the leadership's responsibility to enable and support the use of lean tools also emerged during the lean leadership conversations as a prerequisite lean leadership trait and there is an awareness of this amongst the leaders themselves.

> What I see as my biggest role in, in theory, would be to encourage my guys to, to see a problem and try and solve a problem to come up with project ideas or an idea, the 8 step ideas [Participant VS3b].

Apart from lean problem-solving tools, the participants from the leader-follower group were aware of their role with other lean processes such as line balancing and standard work.

> To ensure the line was being efficient. To know what was coming next and how long we had to get what we had on, to get it off the line to make sure resources were levelled [Participant VS1e].

It became apparent from both the in-depth interviews, the lean training documents and the endorsement of leader GEMBA walks, that both Organisation ABC and its employees felt that lean leadership should be the driving force to achieve OLT. Also, the advocation

of lean should be undertaken by lean leadership on two fronts, by having sufficient self-knowledge of lean and then by leading by example.

There are several aspects to a lean leader having self-knowledge. First and foremost is having the wisdom that a leader gains true knowledge by going to GEMBA and using a fact rather than an opinion driven approach to problem solving. Being organised and having the knowledge of how to use lean tools and processes such as problem solving and the ability to coach and mentor their employees in the use of these tools is also important as it builds trust between the leader and the follower.

In regard to a leader being able to lead by example, again the requirement to actually be on the shop floor and listening to your employees whilst being open to ideas is important. To truly lead by example, a leader must be able to provide a vision and then be able to motivate and engage their employees to foster the change required to make the vision a reality.

Theme 2: Lean Practice

Under the general theme of lean practice, a number of themes emerged such as Lean Tools and Processes, Lean Culture and Communication, Organisational learning and Strategic Organisational Learning.

Sub-theme 2a - Lean Tools and Processes

The area of lean tools and processes was widely discussed and was one the most prevalent responses from participants when they were asked what they felt comprised Lean Practice. Both the leaders of VS1 & VS2 stated that lean practice is comprised of:

> Lean Tools, implementation of these tools, product flow, 5S, Problem-solving, Kaizens and DMAIC's [Participant VS1h].
>
> We do our eight-steps that work very well [Participant VS2h].

The leader-follower group also had similar responses to the same question.

> Tools are obviously the basic elements [Participant VS2b].
>
> It's all processes and procedures [Participant VS2d].

It is interesting to note that whereas the Shingo assessment of ABC also highlighted the company's strengths and capability in this area, it also commented that the organisation was overtly 'lean tool' dominated with a strong focus on structured problem-solving but

with scant consideration for the accompanying lean processes such as employee suggestion schemes, value-stream mapping, and Kaizen. This observation is further endorsed from participants that lean practice should consist of more than just Lean tools

> Well, you can have all the lean tools in the world – process mapping, A3's, 5S, Problem-solving, Kaizens but if the 'spaghetti diagram' is too big, none of this will matter… I am talking about the process to getting things done – going to someone for a signature then having to go back again and again for more signatures – the actual politics of getting stuff done here is frustrating [Participant VS3h].

Nevertheless, the presence and execution of problem-solving exercises and techniques is felt as very strong and evident at ABC.

> We do the Kaizen events with involving teams. So, a brainstorming session with involving associates on the floor in order to either address customer complaints or looking for any new suggestions or different way of thinking and root cause analysis [Participant VS2b].
>
> They have to follow the steps they have to continuously improve the processes, review the processes and complete projects, identify the steps where can be improved, and continuously look at their area to improve and eliminate waste" [Participant VS2d].
>
> The ability to problem solve correctly before they've thought of a solution. Identify the problem, first, be aware of what the problem is. And then more receptive to associates observations [Participant VS1e].

When probed about particular lean tools and processes, participants in all groups responded that the main lean tools being utilised at the site are '8-Step' and '11-Step' problem-solving which provide a logical step-by-step approach to finding the root cause of issues and to provide a viable solution. Moreover, it is evident from the documentary analysis that organisation ABC has invested heavily in their implementation. Included in the training documents on these problem-solving tools are some very thorough manuals that go into a lot of detail on the use of lean tools such as pareto charts, cause-effect diagrams and 5-Why's which drive the use of lean tools in a logical fashion to get to a root-cause for the problem. An example of this is the 11-step lean tool (Appendix 2) which is very easy to follow and forces the person completing it to follow a fact-based process to determine the root cause of the problem being solved. Another such lean tool, the 8-Step problem solving procedure, is designed to be led by employees with either a lean background or who are experienced in completing 8-Step procedures previously. This also includes a comprehensive process flow through the eight steps (see Appendix 3) and has the different steps clearly mapped out. There are clear instructions on which other lean tools to use and to support the employees not to skip to root causes without

taking time to properly analyse the opportunities. There is also reference to third-party governance in the form of an advisory panel and an 8-Step organisational team.

With both problem-solving tools, there is also an element of organisational learning being introduced with stipulations that completed projects using these tools be stored for future retrieval. Another lean process, standard work, was also mentioned several times by participants and was heavily advocated in the training documents as an important part of lean and this is noted by a participant from the follower grouping who has 18 years' service.

> Like I noticed in my department, there might be too many sequences involved in doing the job that maybe you could be like doing with less sequences…everybody's kind of on the same, same page, they're not like, one person is doing this. And the other person's doing that, and they have their own way of doing things…because it standardizes the way we work, standardizes the way we work [Participant VS3e].

The power of visual management as a lean process within ABC was raised on numerous occasions by the participants.

> I think we have demonstrations of achievements put up on walls, whether or not people read them or not, that's another matter, but they are there for people to see [Participant VS1e].

> We are probably, I do not think, we are visual enough in the lean. Now, maybe that is going to change. So, I think the visual part and possibly a few good successes, may that be what you would like to see. And, yeah, that will drive it on a bit more [Participant VS3a].

The participants felt that if ABC becomes too heavily focussed on lean tools and processes without a balanced approach of also including lean philosophy and lean culture as part of their lean practice, it will negatively affect the company's chances of achieving and sustaining OLT.

> …Tools- I suppose are no good on their own without the culture to go behind this [Participant VS3d].

It is interesting to note that the Shingo award assessment highlighted the same concern to ABC that lean tools and processes need to be accompanied with training and coaching of the front-line staff to empower them and build a more holistic lean culture.

> Introduce more leading indicators. Remove non value adding tasks from the Supervisors to allow them time to coach their teams in problem solving. Use front line associate knowledge to create fixtures, poka-yoke and jigs to improve process. More effort required around Shadow boards, Gemba walks, Internal VOC programs [Shingo Assessment Report].

In regard to the use of lean tools and processes, the findings would suggest that this element of lean is very strong within the organisation. A re-invigoration of the 5S program has been undertaken which encourages the use of visual management tools by organisation ABC to create a standardised approach in each area that supports waste elimination. Another lean process that is being utilised by organisation ABC is process mapping that aims to present a 'current state map' of different processes to highlight the difference between value-added and non-value-added tasks. Process mapping is also included in the two structured problem-solving tools that are included in the appendix of this paper (Appendix 2 & 3). Organisation ABC also endorses the importance of Lean Leader training and GEMBA in its training documents.

Sub-theme 2b - Organisational Learning

A key finding that emerged from the analysis is the importance of organisational learning in terms of having a structured organisational plan to support the absorption of lean tools and processes by the employees. The induction procedure at ABC was created to establish the deliverance of training documents from the various areas to induct new employees. It is noted that Continuous Improvement (CI) is listed as one of the nine areas that induction training is required to cover with the new employees and details that the area managers and supervisors are responsible for ensuring that all associates reporting to them are fully trained in all the tasks they are completing.

During participant observation of the induction training for new employees, the researcher noted that there was a very strong focus on lean training in this programme. The document LPLRN1 describes the governance of the induction training and it was observed that the area of continuous improvement was presented very passionately by a member of the CI team and appeared to be well received by the new employees with a high level of engagement through observed interactions between the presenter and the new employee group.

Post induction, standard work is introduced and associated with learning with the training on the use of a 'job break-down sheet' (JBS) for the methodology to effectively train an associate on how to perform a job correctly, safely and conscientiously to achieve the highest quality level. The introduction of a 4-Step training methodology (LPLRN3) provides a level of standard work to ensure that the training is performed correctly. This training document provides a structured approach to the training at organisation ABC. It

points out that the training process can be a source of information for improvement opportunities while also underlining the importance of showing respect to the trainee or associate and mentions thanking the associate, listening to any problems or issues being experienced on the job and asking for any improvement suggestions. Despite the existence of these afore-mentioned training documents, there was a strong belief amongst participants that lean training was stopped after induction and that lean leadership has a significant role in supporting the continuance of lean training beyond employee induction.

> That's part of the leadership, it's bringing these people on this journey to actually get the results [Participant VS2a].

> The induction covers, there is a section induction for CI, as there is for quality as there is for safety as there is for customer service and all other things. But after that, then, when the trainers get the associates, it is just operational issues. They are not involved in CI. So, it has gone then [Participant VS2a].

Regarding learning and the leadership's role in supporting learning, it is a surprising finding that although the theme of lean training is a heavily featured discussion point in the in-depth interviews and dominates most of the documents that were analysed, there is very little ownership from either the senior leadership or the leaders-follower group for their responsibility in driving organisational learning.

In general, most participants felt that leaders do not have enough time to train and coach their followers in problem solving techniques or to have a greater presence on the shopfloor.

> It is challenging, where time is precious and often, I have to say I do find being stretched of time to get some stuff done [Participant VS3d].

> They are supposed to approach their employees, we don't see it! Like, the managers are never probably on the floor, we don't see them at all, well almost at all… it's like, I don't even know where my current manager's office is? [Participant VS3d].

It is also interesting to note that the Shingo assessment report observed that the execution of lean training in ABC could be improved through more coaching.

> One to one coaching is very limited and needs to be increased [Shingo Award Report].

Nevertheless, there are some notable exceptions at ABC. For example, in value-stream two, the leaders do acknowledge their role in supporting organisational learning. It is also

noted as a finding that both leader-followers quoted below from VS2 have 16 years tenure with the research organisation and there is a link between employee tenure and OLT.

> My role would be really, I suppose, just ensuring training is being completed [Participant VS2c].
>
> From the leadership point, it would be to train your team on lean. Because not everyone is aware of lean [Participant VS2d].

Another observation is that organisation ABC endorses a coaching approach to learning and that respect for the employee training is maintained. References to taking a coaching approach are included in the organisation's documentation on general training along with the steps required to prepare to train, conduct training with an associate and ensure proficiency to job requirements. There is also an embedded holistic element to learning which appears to take into account the trainee's potential anxiety associated with training on a new method – phrases such as 'creating a relaxed atmosphere' are used and 'get the associate interested in learning the job', explaining on how task fits into overall process and 'getting the associate excited about learning', 'ensure the associate is comfortable', 'put the associate at ease' are contained in the training documents. The training mentions not to 'introduce too much information'.

To summarise the findings in regard to organisational learning, this research finds that organisation ABC's intentions in this area are admirable but ineffective. Even though there are extensive training documents available that try to provide a structured approach to learning, they have not been absorbed by the participants of this study. As a result, there is a clear lack of ownership by the leadership and this important task has been de-prioritised which is evident by the lack of time given by the organisation's leadership to support and deliver training to their followers. It could be argued that ABC is attempting to correct this imbalance by the introduction of a new CI department and the introduction of the CI coach role but this does not negate the requirement for lean leadership to be the driving force for organisational learning.

Sub-theme 2c – Communication and Lean Culture and Principles

In the Shingo award assessment report, this area of lean is often referred to as the 'guiding principles' and there are very positive observations made about organisation ABC in this regard.

> People have a strong sense of pride in the products they produce. Organisation [ABC] has a strong community presence both as a stable employer and good corporate citizen e.g. charity work. Very strong safety culture e.g. near miss system. Great work by Finance, I.T., H.R. and Facilities in creating a C.I. culture [Shingo Award Report].

When reviewing and analysing the documents pertaining to organisation ABC'S lean culture and principles, it can be said that the vast majority of what is written is dominated by communication and focus on topics such as how and when the organisation communicate with its employees, how to conduct meetings and whose responsibility it is, to facilitate this communication. This dominance is perhaps not surprising given that organisation ABC clearly link communication with building and fostering employee engagement stating that communication is a key element of Employee Engagement in Organisation [ABC].

The finding that organisation ABC links communication to employee engagement is further reinforced within the document analysis where it is discussed that the setting up of a site sports and social group is called a 'connections committee' with reference to the need to have adequate notice boards to communicate planned social events and activities. Other areas of site culture that are promoted by organisation ABC are also evident including the need to have respect for all employees by references to deliberate cultural initiatives such as, not having designated management car-parking or employee canteen spaces, the requirement that every single employee is treated the same way as regards clocking in and out of work, the presence of leadership being located on the shop floor and a GEMBA culture.

Embedded in the organisations vision statements is a general theme of 'openness and honesty' and to ensure that supervisors and managers are engaging in regular communication (weekly and quarterly) with their teams. Interestingly and being consistent with the findings on lean tools and processes, organisation ABC introduce a form of 'standard work' to the communication tools by the use of templates and a structured approach to communications. Figure 2 illustrates the level of detail and thinking that has been put into the organisation's efforts so that all the necessary steps to communicate are present to ensure that all safety, quality, business related and environmental issues throughout the plant to the employees.

Figure 2 – Site Communication Plan

NO.	MEETING	MEETING LEADER	VP	Site Directors of Operations	Managers	Supervisors	Team Leaders	Engineers	SME/ Specialists	Associates
1	Annual Management Review Meeting	Quality Manager								
2	Health & Safety EHS Committee Meeting	EHS Manager								
3	Plant Communication Briefings	HR Generalist								
4	Director of Operations and Managers PMR Meeting	Quality Manager								
5	Site Leadership Weekly Operations Meeting	Director of Operations								
6	New Product, Process & Automation Meeting	R&D Director								
7	PMR: PBS IPS Meeting	Area Manager								
8	PMR: Components IPS Meeting	Area Manager								
9	PMR: Assembly IPS Meeting	Area Manager								
10	PMR: Backoffice IPS Meeting	Area Manager								
11	PMR: PBS CI Meeting	Area Manager								
12	PMR: Components CI Meeting	Area Manager								
13	PMR: Assembly CI Meeting	Area Manager								
14	PMR: Back office CI Meeting	Area Manager								
15	Plant Project Prioritisation Review	Engineering Director								
16	Corporate SBR Meeting	President COO Cardio & Vascular Segment								
17	Corporate Cardio & Vascular QA-RA Site Review	Quality Manager								
18	Charity Meeting	Charity Committee Chairperson								

The organisation clearly states and believes that communication is a ‘two-way’ street and the ‘need to listen’ gets a strong focus in the discussion on how constructive feedback can be given to management and the ways to improve site communications. This appears to be the reason for the establishment of a communications team to enable a ‘two-way’ communication path to ensure everyone at the organisation is kept informed of key business issues likely to have a substantial impact on their economic situation, working

environment and employee welfare. Aligned to the understanding that effective communication only occurs when all parties have a voice, is the recognition on the importance of listening to the external customer. This is strengthened by the endorsement of a process that is focused on Customer Satisfaction which provides details on how the organisation ensures it determines and implements effective arrangements for customer feedback. This also reinforces the link with communication and strategic organisational alignment, which is introduced by the establishment of a standard operating process for the reporting of relevant concerns or issues to the appropriate plant leadership in the organisation.

Further linkages with lean tools and processes are also created here through very clear instructions around timelines and responsibilities and incorporation of the following lean tools within the training documentation on communication-cause-effect problem solving diagram, 5-Why's, countermeasures and a standard work approach to solution.

ABC's focus on communication as a central element of the organisation is also embedded into the mindset of its employees – the quote below is the response on what elements of lean practice are most important and is from a participant within the follower group.

> Communication, to communicate, is the most important thing, with no hesitation, communication! Because, without communication, like, we are not able to basically provide anything [Participant VS1d].

All three value stream managers believe that an embedded lean culture is very important to the achievement of OLT.

> To me, it means that there's a culture and I suppose, lean practices, constantly improving, reducing waste in its various forms. And that is culturally integrated into how the company operates [Participant VS1b].
>
> Cultural end is driven from day one from induction, when people are inducted into XXX that they understand CI…what work they do, and that's your first steps to kind of establishing a culture that's reinforced, then through the use of the tools [Participant VS3c].
>
> Culture overall is what matters and the leadership have a big part to play in maintaining the culture [Participant VS2b].
>
> In very healthy lean environments, and it's ingrained in the day to day [Participant VS2h].

However, not all participants from the leadership groups were aligned that the research organisation's lean culture was embedded, a quote from two interviewees from the leader-follower illustrates this.

> Do we look at where there's opportunity to improve? I think we only do it as ‘an add on’ to our normal jobs as opposed to been part of what we do every day. It should be part of what we do as a culture, as a company [Participant VS2a].

> I'm on the bottom line of employees, okay. And just, you cannot really see. Like, what culture the whole organization has and follows, it's, you know, it's just kind of closed into your own department to be honest [Participant VS3d].

Three of the four participants from the leader-follower group in VS1 believed that lean culture is not embedded by senior leadership due to the pursuit of short-term goals and that an ‘output only’ approach is prevalent at the research site.

> There is a culture here of just pushing everything out the door and making revenue and output targets and the culture does not support anything else [Participant VS1g].

> They want product out the door, or money or revenue [Participant VS1a].

> I think the priority is getting the product through regardless of lean, I would suggest [Participant VS1e].

The findings in this section of the research is that Organisation ABC believe that communication is an important enabler for employee engagement and the embedment of site lean culture. The need for show respect for all employees is very much evident in the training documentation and it is emphasized that communication should be a two-way street and that leadership should be willing to listen to feedback from their employees and customers. Because of this, there is a very structured approach to site communication being advocated by the organisation which incorporates a lot of lean tools and processes such as standard work and problem-solving. Despite these efforts, there is widespread belief amongst research participants that the lean culture is not embedded and that is possibly due to the pursuance of short-term goals such as output by the site leadership.

Sub-theme 2d - Strategic Organisational Alignment

In relation to Strategic Organisational Alignment, the Shingo assessment report had favourable comments to make.

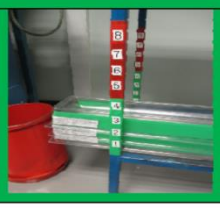
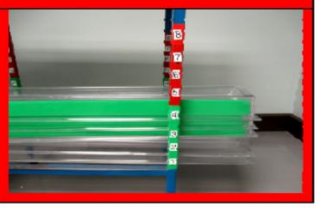
> Strategy deployment very well visualized and understood by employees. The consistency the team has established in terms of inbound receipts is a model of performance and has enabled the receiving team to plan their resources effectively. Good use of customer feedback surveys to gauge how customers view the organisation and strengthen the customer / company relationship. Excellent work done by the purchasing and supply chain in connecting process improvement both upstream with suppliers and downstream with customers [Shingo Award Report].

Documentary analysis indicates that ABC is very strong in regard to strategic organisational alignment. Strategic documents detail the establishment of organisational responsibilities for the management of safety, quality and environmental systems, which applies to all departments but calls out specific responsibilities for the senior leadership team. In addition, the topics of planning and inventory are also addressed by organisation ABC because they are deemed important enablers for organisational strategic alignment. There is a policy for the planning department at the organisation to introduce a standardised approach (uniform policy) which refers to Kanban's and the actual role that the planning department has in managing inventory. The optimisation of inventory levels within the organisation without compromising customer delivery dates and legal obligations is advocated through the use and scheduling of cycle counting.

Again, there are links to lean tools such as visual management of daily consumption, promotion of Just-In-Time (JIT) production and attempts to eliminate the waste of over-production through the TIMWOOD philosophy and use of Kanban's. The procedure outlines a very simple and effective colour coded system (Figure 3) that controls production – see below.

Figure 3 – Organisation Pull System

7.9. **TABLE 1:** RULES

SIGNAL	No Trays in designated area	Trays in green section	Trays in red section
ACTION	Stop Production	Start Production	Ramp Up Production
			

Source: ABC Inventory policy (MAI008, 2012)

Other areas of strategic alignment are also covered by organisation ABC such as value-stream quality plans and how these should be controlled in regard to formal management reviews, system rating and training. These documents contained detailed process flow maps and conveyed a certain amount of strategic alignment in respect to the management of quality. Lastly, crisis management and business continuity plans are presented that are designed to protect the organisation in the event of an unplanned crisis and to set up an integrated framework within the organisation for the achievement of an effective and efficient response to crisis. The overall goal of both documents is to ensure a fast response

that allows the organisation to continue its operations. In the case of crisis management, the use of the term ‘integrated’ in the purpose of the 2007 document shows a level of strategic alignment with full plans with process flows to provide a holistic approach. In regard to maintaining business continuity, the identification of possible threats to the business and the mitigating actions in the event of these occurring are established. This forms part of a three-tier response – Emergency Response – Crisis Management – Business Continuity. It is interesting to note that the site managed to stay open for business with very little disruption during the 2020 to 2022 global pandemic.

For both leaders and followers, the value of having a very high level of strategic alignment (Hoshin Kanri) seemed very important to achieving OLT.

> Buy-in from everybody within the company. Okay. Because you need to get this buy-in from everyone. Okay. Everyone in the company-from the cleaners all the way to the top [Participant VS3g].

> We hit the production build plan and that involved managing people, schedules, materials and so on at a very high level…hoshin kanri for the whole site, the overall site goals and how they're aligned to lean organization, lean organizational thinking [Participant VS3c].

In vast contrast to what the researcher read about the state of strategic alignment at ABC, the full results of the data analysis paint a very different picture to what was being experienced and expressed by the participants during the in-depth interviews. The finding here is that despite the organisations planning in terms of strategic alignment, it became obvious very early on in the in-depth interview process, that there was a perception amongst interviewees that there was a lack of strategic organisational alignment at ABC.

> I would expect to see everybody in the whole factory working together as one team…I do not think that we have joined-up thinking” [Participant VS3a]

One participant from the leader-follower group was very clear on this point and even alluded to there being a link with lean culture in this regard.

> If you're going to run a multiple of projects in a company that are lean projects, but you don't have a lean culture. All you have are individual projects. Yeah, that doesn't create a culture that creates a multitude of lean projects. Yeah. That may or may not be successful. Okay. But where are they? Where are they tied them together? What brings them all together? [Participant VS1b]

Further examples of this perception permeated into other observations on the way inventory control, which included stock levels, kanban’s and planning are being handled at the plant. The vast majority of participants had particular criticisms for the way the

organisation was managing inventory and the overall lack of planning at ABC. These quotes illustrate a link between poor planning and communication.

> Having too much stock, having wasted of people's time organizing stock that is not necessary…it could sit there for three weeks, sitting on a shelf before it goes out the door…but inventory and planning are still a big issue [Participant VS2a].

> It looks to me, it does not matter how much we produce here, it is never enough. We produce 100,000 parts. There is another 120,000 waiting to be made or if we produce that, there is another 120,000 to be made. I do not know how it happens. I still do not understand it. Yeah, no matter how much we produce, we always have more to fill that gap…this is what I am seeing – a lot of problems are stemming from planning [Participant VS3a].

> Well, communication is very poor, to start with. When you try to start a work order that is on the plan, the parts are not there for it [Participant VS3a].

Other interviewees believed that there was a lack of strategic alignment because it was not embedded in the culture of the organisation

> There needs to be the culture and there needs to be the recognition of what our goals are and how they are aligned, and the communication of our overall strategy [Participant VS3c]

Strategic Organisational Alignment was deemed to be active and commendable during the Shingo Assessment of organisation ABC in 2015. There is a strong focus on strategic alignment within the organisation contained within the organisation's documents, which also incorporate many lean tools and processes such as standard work, inventory pull systems and process flow mapping. Having a holistic approach and Hoshin Kanri was very much advocated by the study participants, yet there was also very negative comments in regard to the reality of the organisation's execution in this regard, particularly in relation to poor planning, inventory being out of control and the lack of joined-up thinking.

Theme 3 - Organisational Lean Thinking

The analysis shows that OLT is present in ABC as there are manifestations of higher levels of problem-solving and learning with a shared mindset that is supportive of lasting lean activities, improvements and sustainability. Furthermore, ABC is making available sophisticated problem-solving tools to their employees. Observations during the research also supported the finding that these lean tools were actively being used with the presence of an 8-step problem solving board in every area with recent issues and solutions present

on the boards. A quote from a participant in the leader-follower group shows that there is an understanding of what it means for an organisation to have OLT.

> The point of view that, from the top down, there is a methodology and a culture of waste elimination. Improvements, using lean tools and techniques happen on a day-to-day basis, not just when we are going for the Shingo prize or when there is a Kaizen event, it is built into the culture [Participant VS2a].

Nevertheless, the presence of OLT in ABC varies from area to area and from one participant group to the next. This inconsistency is linked to the sporadic nature of organisational learning in existence at ABC.

> I suppose to be honest about it, it is probably not doing lean to any great degree right now – it used to practice lean when I started working here but that has gone since we got the last Shingo award [Participant VS1g].

During the data analysis of the in-depth interviews, there was a total of 384 codes generated which were used to build a thematic picture of where the organisation stood with the achievement of OLT. An interesting finding that comes to the surface here is that actual knowledge of lean varies significantly between different participant groups. Table 4 below illustrates this finding and notes that there is a pointed difference in the appreciation of the concept of lean between followers and leaders with both the leaders and leader-follower group being able to vocalise more extensively on lean topics than the follower group.

Table 4 – Knowledge of lean between leaders and followers

Participant Type	Interview Codes	Average Code	Combined average
Followers	114	12.66	12.66
Leader-Followers	217	18.08	17.87
Leaders	53	17.66	

Sub-theme 3a – Deeper Appreciation of Lean

What is also being noted in this paper as a finding are the efforts of organisation ABC to introduce lasting improvements that sustain OLT. The intentions of the organisation to continue on their journey to attain a higher level of OLT is obvious from the two global documents ‘Lean Fundamental Concepts’ and ‘Organization ABC Production System’.

These documents attempt to instil a deeper appreciation of lean and this is enabled through an introduction to lean philosophy which supports the development of a

Continuous Improvement culture and the promotion of Continuous Learning. There is further evidence of higher thinking with an explanation of why lean is important to organisations and the endorsement of value-stream mapping, being present at GEMBA and seeing things through a lean lens that seeks to find opportunities to improve flow. There are elements of six-sigma variation tracking mentioned and identifying waste is regarded as a priority and the document describes in detail the seven forms of waste in an organisation. Standard work is also discussed as an important lean process. All of these concepts are then brought together to provide a complete Organisational Production System – it is difficult here not to draw comparisons with the Toyota Production System. These documents draw on system thinking, teamwork, the PDCA cycle, and a series of creative and logical tools designed to accelerate the achievement of the organizations' goals and objectives which include an approach to planning for breakthrough improvements towards an organization's vision. These documents are very detailed and highly conceptual while managing at the same time to create a holistic vision for organisation ABC that clarifies the responsibilities of each member of the organisation on the exact steps are required to deliver the short and long-term company goals.

Sub-theme 3b – Building Knowledge through Learning

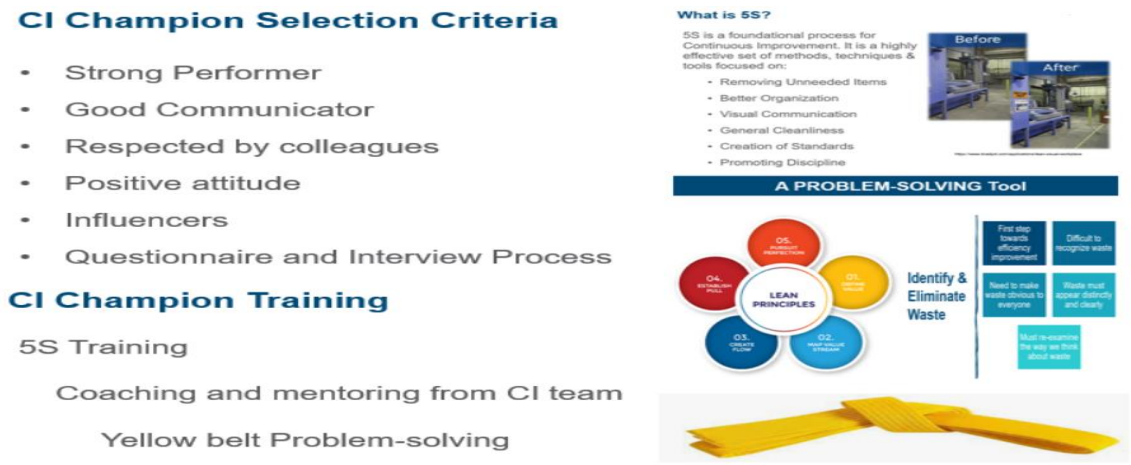
The organisation's drive for lean re-invigoration through building knowledge through learning is also being supported both locally at the site and globally through the organisation's headquarters. This strategy to embed OLT is targeting two specific aspects of lean – lean leadership and lean practice.

Lean Leadership Development: Lean leadership is being rejuvenated through leadership lean training, workshops and the promotion of GEMBA walks for leadership. To support a deeper appreciation of lean, workshops were commenced in December 2021 with production supervisors from the leader-follower group. This initiative was driven by the site lead on operations and the site Continuous Improvement leader. The purpose of the workshops is to brainstorm and find collective solutions to improve the performance of their role – topics included were communication, training, non-value-added task completion and standard work for the role. In addition, and based on best lean practices, a set of training modules (Document LL1) have been created by the global organisation and the training is expected to start in late 2022. Finally, and as already discussed in this paper, the research organisation has initiated a program and a schedule of leader GEMBA

walks (Document LL3) that are structured to ensure a more consistent presence on the shopfloor by the site's leadership. This initiative was driven by the site Continuous Improvement leader

Lean Practice Enhancement: Lean practice is being re-energised through improvements in lean culture through the introduction of a new Continuous Improvement (CI) Champion role and the development of an employee suggestion scheme. Other areas in lean practice that are being enhanced are increased training in problem-solving and strategic alignment on lean projects and a structured holistic approach to communications. As a building block for OLT, the research site 5S program was re-invigorated in April 2021 and a new role of Continuous Improvement Champion was created to facilitate the re-energising and execution of the program. These champions were selected by the production supervisors and an intensive training course was delivered to enable them to fulfil their new role. To generate a deeper appreciation of lean, the scope of the role was increased from just facilitation of the 5S program to involvement in several key lean initiatives such as value-stream lean project prioritisation, site capacity and automation projects. Figure 4 illustrates the broad range of organisation lean learning being targeted and the leadership traits that are expected from the new CI champions, while also advocating in-depth problem-solving tools to identify value-added from non-value-added tasks. The realisation on behalf of organisation ABC that 5S is not just a house-keeping process but rather a foundational problem-solving technique also supports the finding that the company are advancing on their lean journey.

Figure 4 – CI Champion Role



In addition, work has started within the CI team to develop and implement an employee suggestion scheme to encourage employees to come forward with continuous improvement suggestions and also be part of the implementation of same. The CI Champion will be a pivotal role in this new process and this initiative will support and endorse a shared lean mindset at the organisation.

Sub-theme 3c – Sophisticated Problem Solving at all levels

Further organisational learning will be provided by structured lean training on problem-solving tools. The first series of yellow-belt lean training commenced in Sep 2021 and was initiated by the site Continuous Improvement (CI) leader and supported and facilitated by the CI coaches. This training focus is on training employees on the organisation's 8-step problem-solving lean tool. This involves an initial class of 14 who were trained in the use of various lean tools which included problem-solving, brain-storming and other lean root-cause analysis techniques. All graduates of this training received an official lean yellow-belt certification from Lean Ireland. Two more training courses are currently being organised for 2022. Efforts to create strategic alignment at all levels of the organisation is being supported by a new approach to identifying a pipeline of lean projects that can deliver objectives and cost improvements over the next one to three years. This initiative is being utilised to pull together the various departments that support each value-stream and to pool all resources through problem-solving techniques to generate lean projects that could be jointly executed for the benefit of each value-stream.

In summary, whereas organisation lean thinking is evident in certain pockets of the company, it is inconsistent and actual knowledge of lean varies between the participant groups. There is a perception that lean thinking within the organisation has declined since the Shingo award was achieved. One of the three aspects of OLT has remained strong – sophisticated problem solving and ABC is actively attempting to improve in regard to embedding a deeper appreciation of lean and building knowledge through learning.

5.0 Researcher Reflection on Findings

Understanding the relationship between lean leadership and lean practice to achieve OLT is the central quest of this research. Before the researcher entered the 'real-world' scenario

of a lean organisation in practice, there was limited literature on which to base the conceptions of the study on (see Antony and Gupta, 2019; Pearse and Pons, 2019). The research process has uncovered on a first-hand basis how lean practice is executed on a daily basis. Even though, the researcher is directly employed in the continuous improvement department that advocates and supports lean thinking in the organisation, it was possible to observe how lean practice operates without the research becoming biased by taking some precautions. For example, when observing participants, it was important for the researcher to only include scenarios where the researcher did not have a direct bearing on the outcome. One example of this was the inclusion of the employee induction process where the researcher was being inducted and was not part of the team delivering the training. Another group of observations occurred during leader GEMBA walks, where the researcher's role was clearly defined as an observer and not a participant of the process – this was explained to the participants at the start of the event and any feedback or interaction from the researcher occurred after the walk and privately with the leader who conducted the walk. It is not possible to say whether or not, the researcher's presence had any bearing on people's behaviours during these events but the researcher remained mindful of the possible bias that could exist in such situations to present a favourable outcome to the researcher (Kvale, 1996; Robson, 2002; Yin, 2009). Also, the findings would suggest that as there were shortcomings arising from the execution of the leader GEMBA walks, this would imply that the walks were undertaken without any particular motive to present a situation that was not 'real' or an honest reflection of the situation. As regards to the analysis of documents, the researcher did not include any documents where they had a direct input to the generation of same. As all documents were created before the researcher's employment commenced, this was relatively straight-forward to execute. The researcher is also in a position to be able to monitor any relevant documents that may have had to be excluded as a result of this criteria and at the time of writing, no such documents exist. As stated previously, during the in-depth interviews, the researcher only discussed events that had occurred prior to their employment starting with the research organisation. In regard to carrying forward the awareness of bias to the analysis phase of this study, several precautionary measures were undertaken. Table 5 provides an overview of these quality checks and safeguards that were put in place during the data analysis which includes consultation with a 'dis-interested peer' (in this case, the DBA supervisors), awareness of insider-researcher bias, triangulation of data from each data source and data strength considerations.

Table 5 - Data Analysis Legitimisation

	Data Analysis Area	Quality Check	Safeguards
Assessing Data Quality	Data Representativeness	Do the participants, events or activities a fair sample or representation of the research area	Random sampling, triangulation of data collection methods, seeking data for weak or empty cells in data display matrix, sample selection auditing by dis-interested peer, Researcher bias awareness
	Researcher effects	What effects has the researcher had on the case study? What effect has the research work had on the researcher?	Awareness of this
	Triangulation	Are there data sources conflicting or inconsistent after triangulation?	If this occurs, investigate further - triangulation needs to become a way of life for the researcher and inbuilt into all the research (Miles and Huberman, 1994)
	Data Strength	Have you weighted the data gathered - data is more reliable when gathered directly, from trusted sources, repeated contact,	For example, document analysis findings need to be weighted lighter than interviews and direct observation

Source: adapted from Robson, 2002, Miles and Huberman, 1994

The findings have uncovered knowledge in regard to the achievement of OLT that have enhanced this researcher's knowledge in this area. It is obvious from the findings that there are further aspects to lean practice that were not contained in the original conceptual framework, namely the importance of communication and organisational learning. What has also emerged from this case study is that obtaining OLT does not mean that an organisation can sustain this without the active involvement of lean leadership. Therefore, a main finding is that the relationship between lean leadership and the promotion of lean practice to achieve organisational thinking is not sequential as had being previously proposed (Roth, 2006; Achanga *et al.*, 2006; Bodek, 2008; Kimsey, 2010; Poksinska *et al.*, 2013; Trenkner 2016; Willis *et al.*, 2016; Aij and Teunissen, 2017) but cyclical and perpetual in nature.

What is evident from the findings is that organisation ABC had indeed achieved a level of OLT but this had not been sustained and somehow, this had dissipated over time. What is the updated understanding of this researcher is that in order to reach and sustain any level of OLT, there is a requirement for an organisation to be able to learn and continuously improve (Bhasin and Burcher, 2006; Manos, 2007; Mann, 2009; Pettersen, 2009; Dahlgaard *et al.*, 2011; Liker and Rother, 2011; Bicheno and Holweg, 2016). What is also now understood from the findings is that in addition to lean tools and processes, lean culture and principles and strategic organisational alignment, communication and organisational learning are key elements of lean practice. As a result, this researcher has made some updates to the conceptual framework to incorporate these findings.

Finally, below is a summary of the research findings

Lean leadership is the driving force behind OLT. Lean leadership is most effective in this regard when there are high levels of self-knowledge of lean and also the ability to lead by example.

In addition to the elements of lean practice already identified – Lean tools and processes, Lean culture and principles and Strategic organisational alignment, there are additional important elements also required, namely, Communication and Organisational Learning.

Lean tools and processes are a very important part of lean practice but an over-reliance on this single lean practice element will not achieve OLT.

Organisational learning is equally important to ensure that Lean Tools and processes are delivered to everyone in the lean organisation and it is an important part of the role of lean leadership to support this.

Lean Culture and principles need to be present in the lean organisation to embed OLT and communication is an enabler for this to happen. Again, Lean leadership have a role to play in this element of Lean Practice.

For Organisational Lean Practice to be achieved, the lean organisation needs to have a clearly defined organisational alignment strategy that is actively executed by lean leadership to ensure that everyone in the organisation is on the same page.

OLT will not be maintained or sustained without constant interactions and support from Lean leadership. It is not a destination but a direction that the Lean leadership need to keep the lean organisation pointed towards.

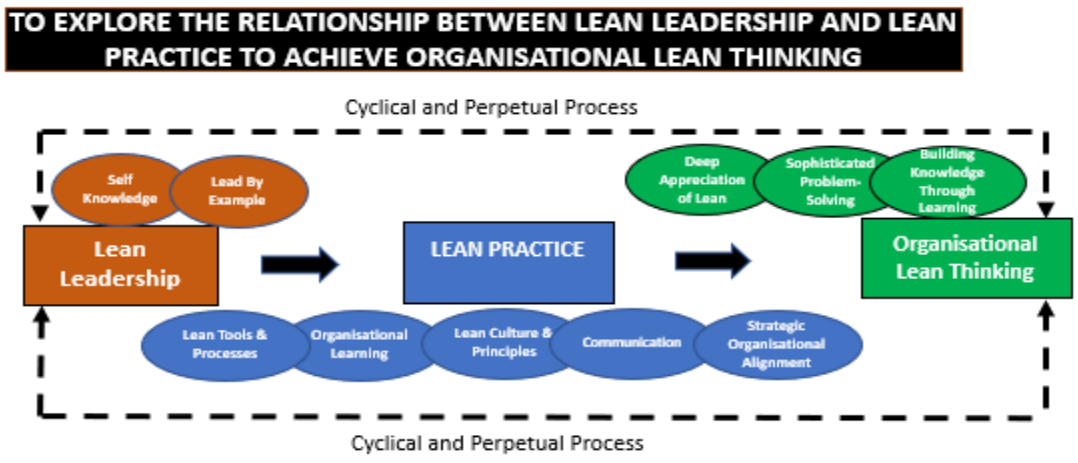
6.0 Preliminary Discussion

Based upon the foregoing, a number of critical insights for further discussion begin to materialise. The researcher found that the Organisation ABC is very well equipped to achieve OLT from what is documented, albeit mainly, in its training documents. As per the Shingo assessment report, there seems to be very strong indicators that the research organisation has strong and positive intentions on how it directs its lean leaders on how to perform their role in the organisation. However, it is clear that the research organisation has lost its way on their lean journey and there are several findings that indicate this.

There seems to be a separation from what is documented and what the researcher observed and heard from further analysis of the data collected. These findings point to an organisation who has challenges in their execution of effective lean leadership mainly in the areas of leader self-knowledge and the ability to lead by example. Even though there is sufficient training available in lean tools and processes albeit heavily rooted in lean tools, it has not been supported by structured organisational learning. Furthermore, there is a perception that there is very little alignment in the organisations planning, organisational structure and its deliverance of key strategic projects. As a result, it is clear that the fundamentals of lean culture and principles have not been embedded. It is promising that the research organisation has also realised this and is taking very deliberate steps to improve the situation. What will be interesting in the discussion is to explore the reasons for the disconnection between the organisation's lean aspirations and its implementation of lean.

The main objective of this study is to explore these relationships and to make a significant contribution to the implementation and sustenance of lean which will inform practitioners such as the research organisation on the criticality of lean leadership and lean practices in building OLT. Figure 5 presents these research objectives and has been modified to incorporate the findings from the research to date. For example, the addition of communication and organisational learning has been included as important elements of lean practice and the continuous aspect of the relationship between lean leadership and OLT has been given more prominence. The inclusion of arrows that reflect the continuous cycle between lean leadership and OLT has also been added to the updated conceptual framework.

Figure 5 – Updated Research Conceptual Framework



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Appendices

Appendix 1 – Detailed NVivo Node Summary Table

Name	Nodes	Created On
Grand-parent Node - LEAN LEADERSHIP		24/01/2022 23:52
Parent Node - LEAD BY EXAMPLE		24/01/2022 22:58
Child Node - Ability to Listen		26/01/2022 22:00
Leadership - Listen to people	10	29/11/2021 23:20
Listen	2	12/09/2021 19:24
Child Node - Be an Example of Lean		26/01/2022 22:01
Lead by example	9	13/09/2021 21:27
Leader Problem Solving	7	03/08/2021 22:17
Leadership Bravery	2	29/12/2021 20:42
Not professional	1	14/12/2021 20:16
Quality focussed	1	01/12/2021 10:03
Child Node - Employee Engagement		26/01/2022 21:58
Employee Engagement	5	09/09/2021 20:24
Motivate people	5	14/09/2021 22:19
Child Node - Open to Ideas		26/01/2022 21:59
Leadership - Approachable	3	01/12/2021 12:05
Open to ideas	9	14/09/2021 22:18
Child Node - Respect for all		26/01/2022 21:57
Leadership - Caring	1	01/12/2021 10:05
Leadership Patience	1	16/11/2021 23:20
Respectful	8	12/09/2021 19:37
Trust	3	15/09/2021 22:36
Child Node - Top-down	12	08/09/2021 22:35
Parent Node - LEADER SELF-KNOWLEDGE		24/01/2022 23:04
Child Node - Ability to Foster Change		26/01/2022 22:03
Change management	5	12/09/2021 19:40
Ensuring safe environment	2	29/11/2021 23:01
Influencing	5	12/09/2021 19:38
Manage Conflict	1	03/08/2021 22:18
Child Node - Ability to Provide a Vision		26/01/2022 22:04
Goal setting	2	12/09/2021 19:36
Leadership - Honesty	4	01/12/2021 10:00
Leadership - vision	4	16/11/2021 22:48
Child Node - Coach & Mentor		26/01/2022 22:08
Coach & Mentor	1	01/12/2021 11:59
Emotional Intelligence	2	14/09/2021 22:21
Leaders rather than managers	2	16/11/2021 22:47
Leadership - Recognition	4	23/01/2022 17:06
Not seeing themselves as leaders	1	30/11/2021 00:03

Child Node - Lean Knowledge		26/01/2022 22:05
Experienced in Lean	2	13/09/2021 21:23
Leader Self-Knowledge	13	03/08/2021 22:16
Leadership confidence	4	15/09/2021 22:35
Leadership past lean experience	1	16/11/2021 22:52
Child Node - Organised Leader		26/01/2022 22:09
Leader who is organised	7	03/08/2021 22:16
Grand-parent Node - LEAN PRACTICE		05/04/2022 22:13
Parent Node - COMMUNICATION		24/01/2022 23:01
Child Node - Communication		26/01/2022 21:56
Poor communication	1	29/11/2021 23:20
Communication	15	09/09/2021 19:28
Employee morale	2	01/12/2021 09:53
Leadership_communication	2	16/11/2021 06:05
Parent Node - LEAN CULTURE		24/01/2022 23:27
Child Node - Lean Embedment		
Leadership - embed Hoshin Kanri	1	16/11/2021 22:54
Leadership - embed lean culture	3	16/11/2021 06:00
Lean not present_was before	15	03/08/2021 22:06
Embeded	14	08/09/2021 22:38
Lean not embeded	2	01/12/2021 11:50
Fear	3	16/11/2021 06:14
Leadership = Man	2	15/09/2021 22:39

Child Node - Short Term Goals		
Cost	8	09/09/2021 19:34
Metrics	5	08/09/2021 22:34
Output only approach	11	03/08/2021 22:09
Work Pressure	4	23/01/2022 17:03
Child Node - Lean Philosophy		
GEMBA	6	12/09/2021 19:33
Lean Principles	2	01/12/2021 14:06
More than lean tools	3	16/11/2021 05:55
Continuous improvement	3	29/11/2021 23:04
Culture	12	08/09/2021 22:36

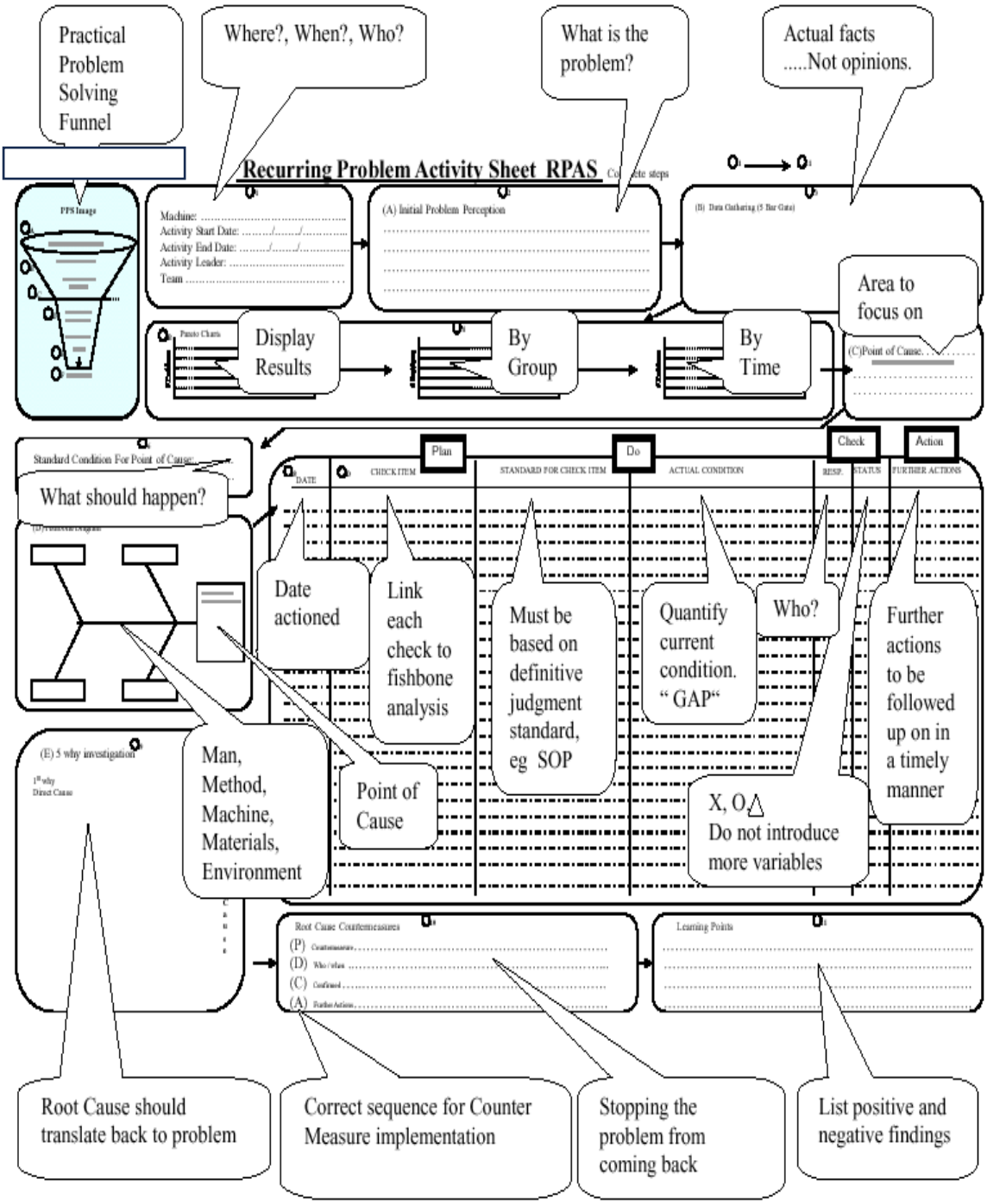
Child Node - Lean Re-invigorated		
Previous Leadership	2	01/12/2021 10:00
Recent organisational changes	4	16/11/2021 22:50
Lean culture re-invigoration	4	24/01/2022 20:21
No set leadership style being advocated	2	01/12/2021 14:13

Parent Node - LEAN TOOLS & PROCESSES		24/01/2022 23:16
Lean Tools and Processes	17	03/08/2021 22:07
Line balancing	1	01/12/2021 14:01
Problem Solving	8	08/09/2021 22:40
Standard Work	2	30/11/2021 00:28
Visual management	2	03/08/2021 22:20
Waste elimination	11	08/09/2021 22:37
Parent Node - ORGANISATIONAL LEARNING		24/01/2022 23:04
Child Node - Lean Training Leadership Support		26/01/2022 22:21
Leadership - training support	1	23/01/2022 17:48
No Time	7	09/09/2021 20:23
No Lean Training	2	24/01/2022 20:28
Child Node - Documented Lean Training		26/01/2022 22:21
Leadership - People orientated	2	01/12/2021 12:45
People Development	1	01/12/2021 09:51
Training	20	08/09/2021 22:39
Child Node - No Plan After Lean Induction		26/01/2022 22:21
No set lean training plan	2	29/11/2021 23:31
Poor Housekeeping	1	01/12/2021 09:57
Training versatility	4	14/09/2021 22:11
Parent Node - STRATEGIC ORGANISATIONAL ALIGNMENT		24/01/2022 23:17
Child Node - Hoshin Kanri		
Hoshin Kanri	14	03/08/2021 22:12
Child Node - Inventory Control		26/01/2022 21:26
Excessive Inventory	1	03/08/2021 22:10
Inventory control	5	13/09/2021 21:07
Minimum Kanban levels	1	14/09/2021 22:15
Pull not push	1	30/11/2021 00:18

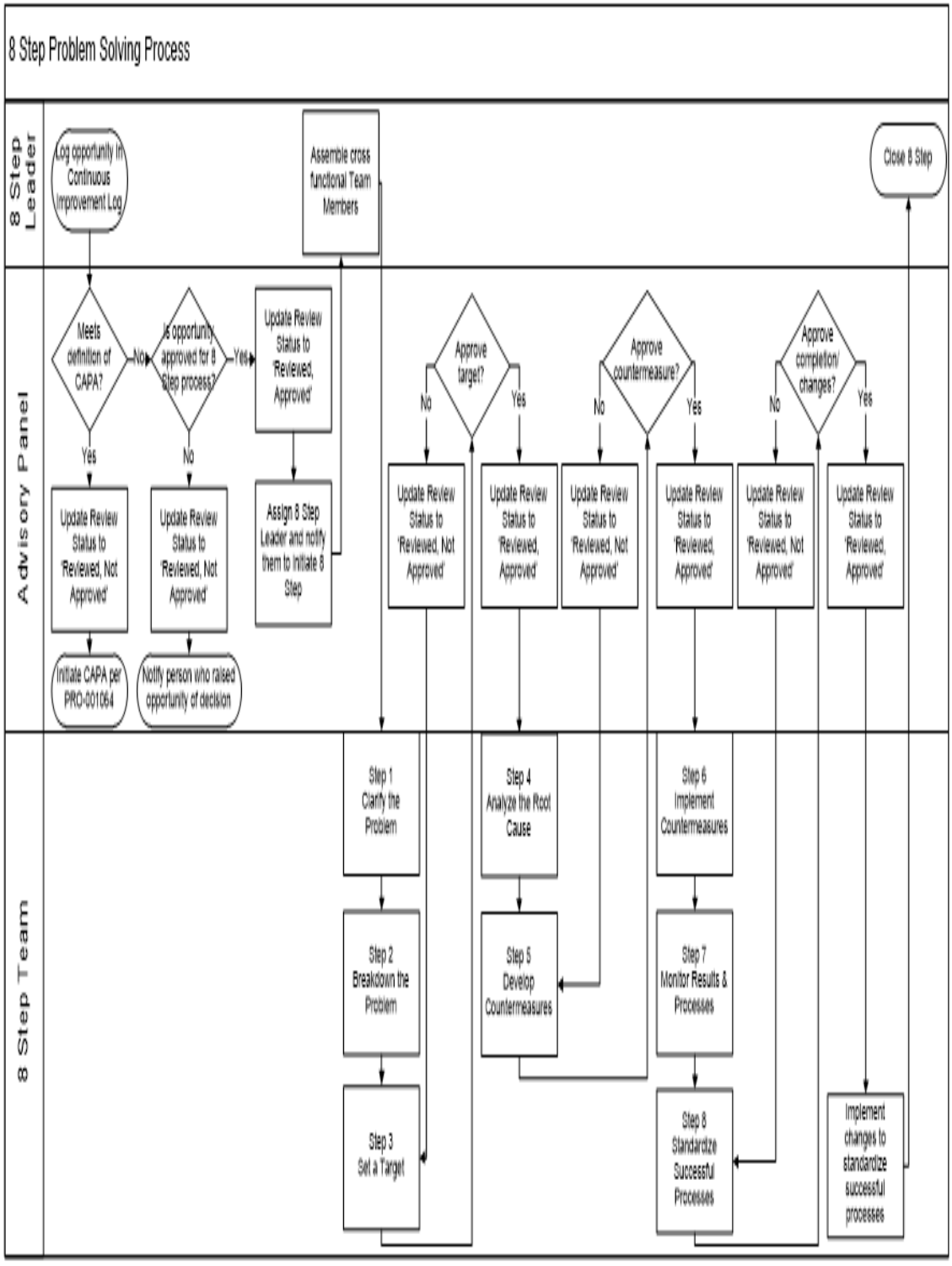
Child Node - Planning		26/01/2022 21:31
Long-term investment	1	29/12/2021 20:25
Planning	1	14/09/2021 22:14
Poor Planning	3	03/08/2021 22:11

Child Node - Prioritisation		26/01/2022 21:32
Parts are 'hot'	2	03/08/2021 22:13
Child Node - True Value-Stream Alignment		26/01/2022 21:35
Customer focused	3	12/09/2021 19:30
Excessive non-value admin tasks	2	23/01/2022 17:09
Span of control	2	23/01/2022 17:10
Value Stream Identification	1	01/12/2021 14:07
Grand-parent Node - ORGANISATIONAL LEAN THINKING		24/01/2022 23:51
Parent Node - ORGANISATIONAL LEAN THINKING		
Child Node - True Value-Stream Alignment		
Organisational Lean Thinking - Document analysis	12	12/09/2021 19:25

Appendix 2 - Recurring Problem Activity Sheet (RPAS)



Appendix 3 – Eight-Step Process Flow



Section 3

DISCUSSION, CONCLUSION & RECOMMENDATIONS

1.0 Introduction

This study has examined the concept of OLT, with a specific focus on how it is sustained through the interrelationships between lean leadership and lean practice. Paper four provided a detailed analysis of the findings from a single case study and this chapter allows the researcher to integrate these findings with the extant literature in order to develop insights and conclusions from the study.

The concept of OLT was introduced by Womack and Jones in 1996 and discussed widely by numerous other authors since then (see Roth, 2006; Liker and Convis, 2012; Dombrowski and Mielke, 2014; Sisson and Elshennawy, 2015; Hensley, 2017 and Maijala *et al*., 2018). Most of the literature advocate that attaining OLT is advantageous for companies in that it can yield very beneficial business rewards (Sohal and Eggleston, 1994; Womack and Jones, 1996; Slack *et al*., 2015; Laureani and Antony, 2018). Nevertheless, OLT is complicated because it is comprised of many elements such as sophisticated problem solving (Liker, 2004; Mann, 2015), organisational learning (Spear, 2004; Hines *et al*., 2004) and culture and mindset (Mann, 2009; Hensley, 2017). The complexity surrounding OLT can be traced back to the inability of academics and lean practitioners to understand coherently what OLT actually is (Thirkell and Ashman, 2014; Hines *et al*., 2018). Additionally, when trying to implement lean, a lot of organisations focus only on the aspects of lean that they can see and miss the intangible aspects of lean that are also required (Mann, 2005; Liker and Rother, 2011).

This lack of understanding has now manifested itself in organisations failing to sustain lean thinking (Goodridge *et al*., 2015; Mårtensson *et al*., 2019) which is evident in the unacceptable high implementation failure rates ranging from 50–90% (see Spear and Bowen, 1999; Emiliani, 2007; Bhasin, 2011; Kinder and Burgoyne, 2013; Dombrowski and Mielke, 2014). Several lean writers have drawn the conclusion that leadership is the critical success factor in sustaining lean implementations (Mann, 2009; Pham and Thomas, 2012; Laureani and Antony, 2018). In attempting to understand why leadership plays an important role in achieving OLT, there has been a tendency amongst authors to focus on lean leadership solely and ignore the relationship between leadership, lean practice and OLT (Dombrowski and Mielke, 2014; Laureani and Antony, 2018). The aim of this study is to address this gap in the knowledge by exploring and understanding the relationship between lean leadership and lean practice to achieve OLT.

Using a single case study of a recognised lean organisation, this study focused on the views of leaders and their followers to explore and understand the mindset of people actually working in a lean thinking organisational setting in order to understand what constitutes OLT and how it can be achieved and sustained. This case study provided a rich narrative of a lean organisation that had been recognised with a Shingo award but who are still actively engaged in a process of reaching a higher level of OLT. Valuable and insightful findings emerged from the privileged viewpoint of the insider researcher through twenty-four in-depth interviews with both leaders and followers from three different value-streams. These findings were supplemented by a series of direct observations and the analysis of thirty-five relevant lean documents. It highlighted the interactions between lean leadership and lean practice and how these interactions achieve OLT. The case findings were presented through themes in order to provide a deep and complete picture of those interactions.

In summary, this chapter of the thesis starts with an overview of the thought process that has emerged from the four documents in the cumulative paper series. Next, having presented the research findings, this chapter endeavours to explore the implications of these observations, within the context of reviewed literature. It is hoped that the findings and discussion presented in this chapter will advance the literature and provide a dialogue that will be helpful for both lean practitioners and lean academics on how the relationship between lean leadership and the lean practice components is critical to achieving and embedding a state of OLT. An overview of the important findings for lean practitioners and potential contribution to the theoretical and methodological knowledge will then be presented. Next, some suggestions for further research will be offered in order to progress the study of OLT further. Finally, a critical reflection on the thesis and the authors personal experience within the DBA course will be presented.

2.0 Case Study Discussion

The findings from the case study organisation ABC show that their lean efforts can be viewed from two distinct moments in time. Their initial lean state had a lean perspective that was very narrow and primarily focussed on the implementation of lean tools and processes and as a result, OLT was not attained or sustained. ABC's current evolved lean efforts are broader in scope, rooted in lean leadership action and include additional lean

practice elements that transforms lean practice from a theoretical perspective to an active pursuit in their lean organisation.

In their initial attempts at implementing lean, Organisation ABC achieved a notable degree of success in their implementation of lean tools and processes mostly in the area of problem solving. Indeed, this was recognised by the assessment team for their Shingo award. However, in their initial lean state, attention on the other aspects of lean practice were limited and seemed to exist mainly in their training documents. It is obvious that ABC focussed their initial lean efforts on the visible aspects of lean and had a somewhat linear viewpoint that the implementation of lean tools and processes alone would lead to OLT (Radnor, 2011; Poksinska *et al*., 2013). As a result, lean thinking was not embedded in their lean culture and it seemed to wane considerably after the Shingo award was achieved. There was no consideration from ABC's lean leadership at that time to keep actively monitoring and assessing their lean levels and to take the necessary steps to keep their lean thinking alive.

Taking learnings from their lean implementation, ABC have now taken steps to reinvigorate and elevate their lean efforts to a higher and more evolved state. Their strategy to bring lean thinking from a paper exercise to a practiced norm is clearly working and ABC's approach and understanding of OLT has also deepened during this progression. A holistic lean system at ABC is starting to be embedded and it exists in both the tangible elements and intangible elements of lean practice. In their more recent evolved lean efforts, ABC have realised that similar to the viewpoint of Lewis (2000), lean is not sequential or linear, but is an "unceasing" process (p.960).

Table 1 illustrates the differences between these two lean states at ABC and provides a narrative on how the lean elements have evolved at ABC from lean leadership to lean practice and also their OLT. The divergence between the two lean states proved very useful in understanding the nuanced and often complex inter-relationships between lean leadership, lean practice and OLT. Indeed, the forthcoming discussion will first present insights into the initial lean state, followed by the more evolved lean state and in that way, we can get a deeper and richer understanding of how lean leadership's relationship with lean practice has led to organisational thinking.

Table 1: The Evolution of Lean in ABC

	Initial Lean State	*Evolved Lean State*
Lean Leadership	No leadership presence on shop floor	Structured leader GEMBA walks
	Focus on leadership attributes only	Leadership action focus
	Top-down leadership approach	Shared Lean Practice approach
Lean Practice	Paper based Lean practice efforts	Practice based efforts
	Focus on Lean Tools and Processes	Focus on *all* lean practice elements
		Lean Culture & Principles
		Strategic Organisational Alignment
		Structured Learning
		Active Communication
Organisational Lean Thinking	Visible Lean	Both Visible and Intangible
	Critical Success Factors	Adapting, constantly moving
	Set of elements	A System
	Lean as an outcome	Lean as an unceasing process

Source: Paper Four Research findings

Lean Leadership

From the outset, ABC's senior management were acutely aware that lean leadership is a critical aspect to embedding lean practice and culture in the organisation (Mann, 2009) and that OLT needed to be driven by 'top-down' lean leadership (Cudney, 2009; Netland *et al*., 2019). Much like Bodek, (2008) and others (see Dahlgaard *et al.*, 2011; Pham and Thomas, 2012), ABC advocated that leadership must be the instigator and impetus for lean progress. To this purpose, the company produced numerous strategic policy documents (e.g. Employee Engagement Policy, Supervisor Standard Work and 'Go Look See' policy) outlining the importance of leadership attributes and the expectation that leaders should be visible on the shop floor (Netland *et al*., 2019), should be honest (Seidel *et al*., 2019), should be respectful (Kimsey, 2010), should openly communicate with their employees (Poksinska *et al*., 2013) and should take a 'hands-on approach to problem-solving (Mann, 2015). For Aij *et al*., (2015a) these leadership attributes are necessary competencies to implement lean management successfully because when leaders portray these behaviours, they expound an understanding of the complexities of building relationships with their followers and a willingness to empower their workers to share problem-solving with the leader which in turn creates shared learning opportunities that build towards the achievement of OLT.

However, what is particularly interesting to note in this study's findings is that despite the logic and understanding within ABC of the importance of lean leadership to

embedding OLT, these leadership documents remained at a conceptual policy level within the organisation and were not effectively actioned. As a result, ABC's initial lean journey stalled. The consequence of not embedding lean leadership within the organisation was significant. ABC failed to move forward on their lean journey as they did not stipulate what actions were required by lean leadership to progress the organisations lean strategies (Mann, 2005). The lack of leader standard work meant that without actions to measure, they had no baseline from which to take a lean measure or determine the level of success they were having with their lean implementation (Emiliani, 2008). One of the main reasons why organisations discontinue lean is their inability to measure their progress (Wahab *et al*., 2013). For Hines *et al*. (2018) leader standard work is an essential part of a 'lean maturity framework' and lean organisations hoping to evolve, use leader standard work as a mechanism to take appropriate actions that are needed to sustain their lean progress. As a result, the failure of the leadership at ABC to be present on the shop floor (Gemba) negatively impacted employee trust (Hines *et al*., 2008) and weakened the natural communication lines that are there when all people are present in the same area (Aij *et al*., 2015a). This distance from their workers and the lack of interaction between leader and follower hindered learning and people development and the employee engagement with lean practice elements such as shared problem-solving, which is an important element of OLT (Bicheno and Holweg, 2016). Indeed Kupec *et al*. (2022) credits leader standard work with freeing up valuable lean leadership time that can then be devoted to more meaningful tasks such as coaching and mentoring and building accountability amongst their team which in turn raises the overall team performance. Without consistent coaching and mentoring from leaders to followers, learning opportunities are lost and people development is stifled (Proudlove *et al*., 2008; Radnor, 2011).

However, as the findings illustrate the thinking around lean leadership has subsequently evolved in ABC, whereby what was once only conceptual in regard to the lean leader's role in the implementation of lean, has now evolved into a more action-driven approach to lean leadership (Bicheno and Hennessey, 2022). For instance, ABC no longer only advocate leadership attributes such as honesty and problem solving but focus now on leadership action (Holt, 2022). An example of this action is ABC's introduction of leader standard work to ensure that leaders spend time on the shop floor (Bicheno and Holweg, 2016).

For Liker and Convis (2012) implementing lean leadership requires support. To enable this new lean leadership strategy, ABC put significant provisions in place to back their lean leadership in the transition to a new more action-based role. ABC supported the development of their own lean leadership with targeted training, 1:1 coaching and mentoring and increased the number of lean coaches to carry out this task which includes shadowing lean leadership on their GEMBA walks and providing feedback to the leaders afterwards.

When ABC's introduced more standardised approaches to lean leadership such as the structured and scheduled leader Gemba walks, they re-emphasised that regular presence of lean leadership at Gemba is a vital part of a lean leader's role as it places the leader in the place where value is being created (Aij *et al*., 2015a; Mann, 2015). There is good support in the literature for ABC's decision in this matter. Writers such as Spear (2004) and Bodek (2008) endorse the presence of leaders where the actual value is being produced as it allows the leader to drive good lean practice such as shared problem-solving in this vital location of the organisation. This also communicated to employees that problem solving is no longer a 'top-down' exercise but rather a shared experience between leaders and their followers (Jørgensen *et al*., 2007).

According to Liker and Rother (2011), the learning that takes place for both leaders and followers when they conduct problem solving together at Gemba is a strong enabler towards building a shared lean mindset that will ultimately put an organisation on a path to perfection. Furthermore, when a leader spends enough time at the shop floor, they start to see things for how they really are and more importantly, they share their followers every-day experience (Dombrowski and Mielke, 2014). This facilitates faster and more informed decision-making because the leader is amongst their followers and takes the time to listen to them and a sense of trust starts to emerge towards the leader (Poksinska *et al.,* 2013).

To facilitate shared problem-solving, ABC now promote a requirement for all lean leaders to have a deep understanding about lean concepts and practices as a prerequisite in their role as mentor and teacher to their followers (Aij *et al*., 2015a). ABC felt that lean leaders must first have a commitment to their own self-development (Mårtensson *et al*., 2019) before they can coach and mentor and be role models to their team (Mann, 2009). ABC's approach here is very much aligned with the thinking of lean writers such as Dombrowski

and Mielke (2014) who stated that in order for leaders to become role models for lean philosophy and execution, they need to first have this lean knowledge themselves.

Since ABC no longer exclusively focused their efforts on what attributes the leader has and concentrate more on how effective the leader is and what actions are being taken to empower their followers, the organisation is now challenging the lean leader themselves to constantly learn through doing (Frei and Morris, 2020). Other writers such as Aij and Teunissen (2017) believe that in order for OLT to be truly achieved, an improvement culture needs to develop and that in this culture both the leader and followers need to be versed in the knowledge of lean. At ABC, this constant learning is occurring through a routine approach to problem-solving that is embedded in their lean culture (Liker and Rother, 2012).

Very much entwined with a lean leader's self-knowledge and ability to develop their people is ABC's requirement for the leadership to lead by example as the leadership themselves must believe in these changes before they can lead their team through them (Goodridge *et al*., 2015). ABC believe that the requirement for leaders to be a role model can be achieved through modelling what is expected and encouraging the same behaviour from their team staff (Mackenzie *et al*., 2001). A key component of leading by example is being able to listen to your followers which in turn increases employee engagement (Willis *et al.*, 2016). ABC felt that this ability to listen and to be truly open to ideas (Poksinska *et al.*, 2013) underlies the respect that a lean leader has for their followers (Aij *et al*., 2015a).

ABC believe that being able to communicate a vision to your team as to where the lean journey will take them is a vital part of lean leadership (Mackenzie *et al*., 2001) in order to reach a higher level or the 'True North' of OLT (Liker and Convis, 2012). ABC feels that the lean leader's ability to foster change by allowing their team to see the need for the change themselves (Kimsey, 2010; Maijala *et al*., 2018), needs to come from a place of knowledge on the behalf of the lean leader. This now enables and facilitates a shared lean practice to exist at ABC. In summary, ABC's new action-based approach to lean leadership is firstly to have the self-knowledge of lean and then to lead by example. Holt (2022) captures the 'Know and Show' requirement better with his use of the term – 'lead it, do it, live it' (Holt, 2022). It is through this interaction where the lean leaders actively involve themselves in driving lean practice that promotes and achieves OLT.

Lean Practice

For Kimsey (2010), organisations striving to become lean can often just concentrate on the visible aspects of the lean practice and this was the case within ABC. The obvious danger of this approach is very well depicted in the 'lean iceberg' model by Hines *et al*., (2008) where they highlighted that the negative consequences of organisations such as ABC when they only focus on the elements of lean practice that are above the waterline and neglect all the other parts of lean that lie below, thus making their lean implementation un-sustainable. For Radnor (2011), when organisations only "considered lean as a set of tools and techniques rather than a fundamental shift in culture and approach based on the lean principles", they will not embed lean properly into the organisation and ultimately not succeed in achieving OLT (p. 1).

In its initial implementation of lean, ABC placed a heavy focus on achieving an elevated level of expertise in lean tools and processes and this is understandable to an extent as these are seen as enablers to achieve results in lean organisations (Dahlgaard *et al.*, 2011). This initial emphasis and investment on the use of lean tools and processes such as time studies, problem-solving, 5-Why's, cause effect diagrams, pareto charts and standard work was favourably commented on by the Shingo award examiners but it was also noted that the organisation was overtly 'lean tool' dominated with a strong focus on structured problem-solving and that they did not supplement this expertise with the other elements of lean practice. These comments from the Shingo examiners are very much aligned to the thinking of Gaiardelli *et al.* (2019), who also came to the realisation that lean thinking is much more than lean tools and processes. For Dombrowski and Mielke (2014), one of the reasons for organisations such as ABC being unable to sustain their initial lean implementation in the long term is that they neglect the other elements of lean practice – "enterprises achieve significant results in the first years of lean by implementing Kanban, 5S, SMED, FIFO and many more but improvements stagnate sooner or later" (p. 565). There were further drawbacks to ABC's single-mindedness pursuit of lean tools and process in that more sophisticated problem-solving at the organisation did not flourish and deep lean thinking did not emerge (May, 2005). This thought process is supported by Hines *et al.*, (2004) and later by Manos (2007), who purports that organisations that have sustained lean implementations have moved beyond a complete reliance on lean tools and processes and utilise a more diverse range of lean practice elements.

Certainly, it could be said that ABC's single-track approach to lean practice was to the detriment of placing the required effort to embedding a sustainable lean culture based on the exercise of living the lean principles (Mann, 2014). Initially, ABC did not put the correct focus on building up and sustaining their own lean culture of shared values and principles as an embedment device for lean (Garza-Reyes *et al*., 2018), instead the leaders "succumb to the ease of implementing processes and tools as the end-all solution to improved efficiency" (Ingelsson *et al*., 2020, p. 16). The consequence is that both the lean culture and principles and the strategic alignment elements of lean practice largely remained at a policy level in ABC and were not developed, practiced or embedded within the organisation (Nesensohn *et al*., 2014) and as a result, OLT at ABC was not sustained. When lean culture was first broached by ABC, it was conceptual and extremely limited in its scope and seemed to hinge only the importance of communication as the singular tool to create employee engagement without consideration for the other factors that constitute and support lean culture.

Having organisational strategic alignment or 'Hoshin Kanri' as part of lean practice is vital for the achievement of OLT, as it advocates the organisational deployment and alignment of strategic priorities across the whole organisation from the individual, team and organisational levels (see Dombrowski and Mielke, 2014). The importance of 'Hoshin Kanri' was not lost on ABC when they first attempted to achieve OLT. They had an impressive range of documented processes that endorsed strong organisational alignment in regard to management of the quality, planning and inventory processes and also had outlined plans to ensure business continuity in the face of unforeseen adverse events. Embedded within ABC's documented strategic alignment are links to other elements of lean practice such as the lean tools and processes of JIT inventory control, the visual management of daily consumption through kan-bans and the elimination of waste such as over-production (Melton, 2005; Robinson and Schroeder, 2009). Other examples of strategic alignment to other aspects of lean practice were also to be found within ABC's value-stream quality plans whose documents include detailed process flow maps and strategic planning in the area of the management of quality. However, these initiatives were never fully implemented in ABC which in turn led to poor internal strategic alignment between supply chain, planning and operations and these inconsistencies are to be found within the negative viewpoints from the study participants

about not having ‘joined-up’ thinking about areas such as planning as inventory control (Gurumurthy *et al*., 2021).

In addition, in their initial attempts to achieve OLT, ABC did not focus on an organisational learning program or an active communication plan as part of their lean practice. Even though ABC had put a lot of emphasis on the importance of communication as the baseline for employee engagement and a good lean culture, these intentions were never translated into practice and the findings clearly show that there was poor communication from leadership to employees often resulting in wasting valuable resources such as the organisations time and money (Redeker *et al*., 2019). ABC’s oversight and failure to incorporate active communication acted as a barrier for the rest of their lean practice (Kumar and Rodrigues, 2020) as they did not have a vehicle to pass on their lean intentions. For Singh *et al*., (2014), not having an organised learning plan hinders the embedment of lean practice in the organisation because lean knowledge was not permeated consistently throughout all its workforce. Other contributors such as Keyes (2013) have also identified and linked structured lean training as the main factor for success in lean program transformations.

Following the initial lean state, ABC evolved their approach to the utilisation of lean tools and processes. The organisation is now very much aware that an over-reliance on lean tools (see Sohal and Eggleston, 1994; Bhashin and Burcher, 2006) can often be the reason for lean transformation failures (Dombrowski and Mielke, 2014) and so they expanded their lean practice focus. Indeed, there was a realisation within ABC that it is not just one lean element that sustains lean implementations, but rather how all the parts work together in a lean system (Mann, 2009). This evolved OLT is not so much about the actual elements of lean practice but rather how and where they are being practiced (Roth, 2006; Liker and Rother, 2011). In essence, within ABC, lean is now considered both a methodology and a philosophy that must include the invisible elements such as continuous learning cycles in order to have a successful outcome (Kinsman *et al*., 2014; Lawal *et al*., 2014).

Evidence that this new mindset is very much embedded within ABC can be found in their current ‘lean fundamentals’ training document which states that being lean is not just about using a few selected lean tools (see Holmeno and Ingvaldsen, 2016; Netland *et al*., 2019) and that lean is a holistic system and a different way of thinking that focusses on

creating value throughout the whole organisation. ABC have realised that when employees have been trained to use lean tools in a more meaningful way, it empowers them to understand and appreciate a more expanded lean practice (Liker and Rother, 2011).

The re-invigoration of their 5S methodology is an example of a more evolved approach by ABC to introduce a broader lean culture at the company. ABC realised that having an active 5S system is the foundation on which to build a meaningful lean culture at the organisation (Michalska and Szewieczek, 2007). There is a new awareness by ABC that 5S is not just a house-keeping process (Randhawa and Ahuja, 2017) but is in fact a methodology to create a lean mind-set (Singh *et al*., 2014). ABC are using this 5S methodology as an enabler and catalyst to both embed and sustain a lean culture through the every-day use of problem-solving techniques to identify value-added from non-value-added tasks, employee engagement and visual management (Randhawa and Ahuja, 2016). Another example of building a lean culture is the organisations efforts in regard to introducing an employee lean suggestion scheme called 'my Innovation' and they have started to train its employees on this process and educate them on how this initiative will help the company to sustain benefits from lean (Kumar and Rodrigues, 2020). ABC is aware that an employee suggestion scheme will empower operators to improve their work area, whilst also improve the visibility of operational problems to the senior management team, who can then provide resources to address the problem and harvest the opportunities (Biedermann and Kinz, 2019). ABC are cognisant of how impactful an organisation's stated values are to achieving goals (Collings *et al*., 2021) and to shaping employee's behaviours (Arieli *et al*., 2020). As a result of this realisation, ABC has complimented those two afore-mentioned lean culture and principles initiatives and revamped and strengthened its focus on the company core values of 'Putting Customers first, Innovation, Collaboration, Inclusion and Integrity' and the company now incorporates them in the annual performance review where both indirect and direct employees are measured on how well they 'lived the values' in the execution of their jobs. These three lean cultures enabling initiatives are notable examples of a more evolved approach to instilling lean culture and principles into the organisation (Hines *et al*., 2008).

For Kinsman *et al*. (2014), having strategic alignment in a lean organisation is as important as leadership when it comes to successful lean implementations. ABC have taken a lot of steps in their lean reinvigoration efforts to improve strategic organisational

alignment. One such initiative is the introduction of an aligned approach to identifying opportunities that pulls its employees together and increases their commitment, job satisfaction and trust (Gagnon and Michael, 2003). This strategic alignment program is being utilised to involve the various departments that support each value-stream such as operations, quality and engineering and to have a structured approach to brain-storming to identify key strategic projects for each of the value-streams (Longoni and Cagliano, 2015). ABC has used these new efforts to create strategic alignment at all levels of the organisation that have allowed them to identify a pipeline of lean projects that can deliver objectives and cost improvements over the next three years.

The biggest difference in ABC's more evolved approach to strategic organisational alignment is the generation of an Organisational Production System that provides the governance of all ABC's lean practice efforts. This plan draws on system thinking, teamwork, and a series of creative and logical tools such as the structured problem-solving (Liker and Rother, 2011), curated organizational memory databases and the PDCA (Plan, Do, Check, Act) cycle (Realyvásquez-Vargas *et al*., 2018), to accelerate the achievement of the organizations' goals and objectives which include an approach to planning for breakthrough improvements towards ABC's vision. This new strategic alignment strategy is very detailed and manages to create a holistic vision (Liker, 2004) for organisation ABC that clarifies the responsibilities of each member of the organisation on the exact steps are required to deliver the short and long-term company goals. Each lean leader is now being asked to actively embrace the new Organisational Production System and its five focus areas of Strategy Alignment, Leadership of Sustained Change, Standardization, Associate Engagement and Systems and Process Optimization. This is an excellent tool to enable organisational strategic alignment as it pulls together a lot of lean system elements from leadership to lean practice and points the whole organisation in the right direction to achieve their goals.

Just as both Kinsman *et al.* (2014) and Lawal *et al.* (2014) have recognised the need for a continuous learning cycle in a lean system, ABC comprehended that the foundations for lean practice should be based on a philosophy of knowledge and education which is delivered through continuous reflection and learning (Liker, 2004). Indeed, numerous other lean authors see structured learning in an organisation as a fundamental part of achieving OLT (see Spear, 2004; Roth, 2006; Mann, 2009; Hines *et al*., 2004; Goodridge *et al*., 2015; Sisson and Elshennawy, 2015; Maijala *et al*., 2017). ABC have supported

their new structured approach to learning in many ways such as introducing several learning opportunities for their employees through lean white belt, yellow belt and green belt training. ABC also realised that in order to facilitate and embed all the elements of lean practice throughout the organisation, an organisational learning program with a detailed and targeted training curriculum is necessary (see Mitki *et al*., 1997; Liker, 2004; Netland *et al*., 2019). Liker and Rother (2011) advocate the importance of learning through coaching and mentoring where the person being coached is allowed to learn through many cycles of plan-do-check-act (PDCA). For this purpose, ABC have expanded their lean department and added several other continuous improvement (CI) coaches to support their lean leaders to coach and mentor their employees through these processes.

Many lean scholars have emphasised that it is only through active communication that employee behaviours and expectations can be set and the lean culture can be shaped so it can guide all employees towards the organisation's long-term goals (Liker, 2004; Radnor, 2011; Trenkner, 2016; Maijala *et al*., 2018). For Lawal *et al*., (2014), a key part of a vibrant lean practice is daily visual management – "where staff members take the time each day to evaluate their progress using the key elements of daily huddles" (p. 3). In their new approach to lean practice, ABC have introduced an employee suggestion scheme that enables two-way communication (Lowry *et al*., 2009). Within the leadership at ABC, active communication is evidenced almost everywhere now in the company from the daily production meetings, the weekly project update meetings, the monthly KPI board reviews and the quarterly Town Hall meetings (Alpenberg and Scarbrough, 2016).

Organisational Lean Thinking

ABC were recognised for their initial achievements with a Shingo award and had achieved a level of OLT. Nevertheless, it was not sustained. It is interesting to note that other scholars in lean attribute the lack of sustainability of OLT to a mindset whereby the achievement of these accolades is an end in itself (Sony, 2019). Certainly, the findings from the case study would suggest that in their initial attempt at achieving OLT, ABC appeared to stop most of their lean efforts once they had achieved the Shingo award. For Carvalho *et al*. (2017), the achievement of lean accolades such as the Shingo award is not a positive indicator that an organisation is truly lean nor does it mean that the lean transformation will be sustained. Even the Shingo awarding organisation themselves have

previously acknowledged concerns around previous award holders sustaining their lean thinking (Keates, 2013).

In the initial stages of implementing lean, ABC believed that an organisation could consider themselves a lean organisation by just having the right set of lean elements and that having critical success factors (even if only on paper) would deliver the right set of results in a sustainable manner (Aij *et al*., 2006; Laureani and Antony, 2018). The manifestation of this narrow view of lean in ABC's case was their relentless focus on establishing problem solving capability without consideration for the other elements of OLT. ABC clearly believed that having a competence in lean tools and processes meant that they were in fact a lean organisation (Poksinska *et al*., 2013).

For Liker and Rother (2011), companies tend to focus on what they refer to as overt lean practices or visible lean elements such as lean tools and processes and ignore the invisible aspects of lean that determine whether or not a lean implementation will be successful or sustained. According to Radnor *et al*. (2011), these intangible elements are the need for a new business approach that is supported by a fundamental shift in organisational culture.

To sum up ABC's initial lean efforts – the organisation failed to grasp that OLT consists of many elements other than sophisticated problem solving such as organisational learning, a deep appreciation of lean and a shared mindset. In addition, they believed that becoming lean meant that they would stay lean and they put all their efforts on achieving lean recognition with no consideration after this point on how to remain a lean organisation with sustainable OLT.

However, there has been a major mindset change in how ABC viewed OLT. In this evolved state of organisational thinking, the organisation implemented sophisticated problem solving that went simply beyond just the execution of lean tools and processes in order to embed a lean mindset across the organisation (Hines *et al*., 2004). ABC moved away from just concentrating on the parts of lean thinking that were visible – the overt lean elements (Lewis, 2000), and refocussed efforts on the intangible side of lean such as the lean culture (Radnor *et al*., 2011). ABC began investing in a vibrant lean culture that is grounded in lean principles and supported by active communication which built a deep appreciation of the power of lean amongst its management and also its followers (van Ruler, 2018). It is this grounding in culture that creates and sustains the shared lean mindset (Trenkner 2016; Willis *et al.,* 2016; Aij and Teunissen, 2017). The fact that ABC

now view the attainment of OLT as a continuous cycle can be seen in the creation of the new role of Continuous Improvement Champions to facilitate the continuous re-energising and execution of their lean efforts. These champions were selected by the site lean leadership and they received intensive training on the philosophy of lean to enable them to fulfil their new role. To generate a deeper appreciation of lean, the scope of the role was expanded from facilitation of 5S to also be involved in several key lean initiatives such as value-stream lean project prioritisation, site capacity and automation projects. This ability of ABC to learn and continuously problem solve is now being driven by deeper thinking at an organisational level (Spear, 2004).

ABC are also taking actions to prevent future deteriorations in their OLT from occurring again, through the wider adoption of the PDCA cycle (Plan-Do-Check-Act), the re-invigoration of their 5S program and the introduction of leader standard work (Hines *et al*., 2008). The PDCA cycle is a lean process that has multiple uses for lean organisations including the monitoring of "a new or improved design of a process" (Realyvásquez-Vargas *et al*., 2018). According to Jelenc *et al*. (2020), the PDCA is a 4-cycle lean process model that can enhance an organisations strategic deployment, sustain organisational changes, improve learning and ultimately increase an organization's lean thinking. This lean process when used as a strategic OLT sustaining device, similar to their use of 5S and leader standard work process provides advantageous results for the organisation (Hines *et al*., 2008). When ABC's overall evolved lean strategy is viewed holistically as an improved process design, there seems to be a fit with the use of this lean process given that their previous efforts at lean implementation were not 'checked' and 'acted' upon in time to sustain the organisations' lean thinking.

There are two elements in the 5S methodology that ABC have reinvigorated that enable the organisation to ensure that their lean efforts are maintained and do not diminish over time – 'standardise' and 'sustain' (Michalska and Szewieczek, 2007). As ABC understand that 5S is not simply a device to control house-keeping standards and that when used properly can create and shape a site-wide mindset, it will not only improve the entire organisations performance but also will protect their progress by enabling regular self-assessment (Randhawa and Ahuja, 2017).

The introduction of leader standard work is another indication that ABC are mindful of not regressing this time with their lean process – according to Mann (2005), leader

standard work is a lean process that not only ensures that a leader checks and monitors the organisations progress on a regular basis, but it is also an excellent vehicle to challenge whether further improvement and refinement is required within an organisation. It is through this consistent striving for continuous improvement and structured discipline that ABC's leadership will negate their progress backsliding (Liker and Convis, 2012).

3.0 Conclusion

Based on the findings and discussions presented in the previous sections, this section will examine the research outcomes, in terms of the individual objectives of the current project and then the overall aim of the study, which is, explicitly, *to explore the relationship between lean leadership and lean practice to achieve organisational lean thinking*.

Research Objective 1:

To investigate the concept of organisational lean thinking

The concept of OLT is based on the premise that in order for lean implementations to be sustained, lean thinking must have permeated throughout the whole organisation and every employee must share this mindset. This OLT mindset is achieved by a desire to understand and practice lean at all times and through a higher level of problem solving that view's problems as learning opportunities. Critically, this research highlighted that the OLT mindset cannot not be viewed as a *destination* for lean organisations to reach but rather a mindset that needs to be constantly nurtured to be sustained through a cyclical and un-ceasing process (Lewis, 2000).

Based upon the foregoing, this research concludes that *Organisational lean thinking is strongly orientated towards sophisticated problem solving at all organisational levels based on building knowledge through learning and is the manifestation of a deeper appreciation of lean, it is this mindset that supports lasting improvements and lean sustainability*.

Research Objective 2:

To explore the relationship between lean leadership and lean practice

In contrast to the majority of lean literature which puts focus on leadership traits or leadership, this study would support that it is the lean leaders' actions rather than their traits that is paramount to driving lean practice (Aij *et al*., 2015b). Lean leaders must be present at Gemba where the lean practice is taking place. They must have a deep understanding of lean and then they must lead by example to show their followers the way forward. Lean leaders must *know* and *show* and in the words of Holt (2022, p. 3), "lead it, do it, live it".

Consistent with Holmemo *et al*. (2022), this research found that effective lean leadership depends on two elements – a leader's knowledge of the lean principles and the ability to lead by example to enrich lean culture. The requirement for a lean leader to have a deep understanding about lean concepts and practices is regarded as a prerequisite in their role as mentor and teacher for their followers in lean organisations (Liker and Convis, 2012; Aij *et al*., 2015a). It is the support that the lean leader has for the execution of lean practice elements such as problem-solving through the use of lean tools and processes which leads to sustainable lean implementation (Roth, 2006; Dombrowski *et al.*, 2014; Mann, 2015; Trenkner, 2016). To provide this support, lean leaders must first have a commitment to their own self-development (Poksinska *et al.*, 2013) before they can be role models to their team (Mann, 2009). The ideal lean leader is one that is open to learning (Trenkner (2016). Adopting a 'learning how to learn' mentality that is reinforced by leadership through coaching and mentoring is a vital part of a healthy lean organisation (see Liker, 2004; Spear, 2004; Kinsman *et al.*, 2014; Goodridge *et al.*, 2015; Aij and Rapsaniotis, 2016). It is only through learning that an organisation can 'evolve' into a lean organisation (Hines *et al.*, (2004). Indeed, the organisation needs to build their capacity for continuous learning where leadership development is addressed holistically, where learning serves as a dual purpose of both building personal and interpersonal skills as solving problems and improving lean (Holmemo *et al*., 2022).

To be able to lead by example, the leadership themselves must believe in these changes before they can lead their team through them (Goodridge *et al*., 2015). The requirement for leaders to lead by example, through modelling what is expected and encouraging the

same behaviour by their team is endorsed by Mackenzie *et al*. (2001). A leader's ability to communicate and transfer this knowledge back to their followers is an important enabler for a successful workplace (Thomas, 1985). Leading by example is an action driven pursuit on the behalf of the lean leader and involves providing a vision, communication, listening to followers, showing respect and then pulling all the elements together into a coherent strategic plan for the organisation (Dombrowski and Mielke, 2014). Being able to communicate a vision to your team as to where the lean journey will take them is a vital part of lean leadership (Mackenzie *et al*., 2001). Pointing your followers in the direction or the 'True North' (Liker and Convis, 2012) depends on a lean leader's ability to foster change by allowing their team to see the need for the change themselves (Kimsey, 2010; Maijala *et al*., 2018).

A key component of leading by example is being able to listen to your followers as this increases employee engagement (Willis *et al.*, 2016). This ability to listen and to be truly open to ideas (Poksinska *et al.*, 2013) underlies the respect that a lean leader has for their followers (Aij *et al*., 2015a). Achieving OLT requires the leadership to adopt a holistic approach (Pham and Thomas, 2012) that pulls together all the lean practice elements along with the organisations strategic goals to embed them in the organisational culture (Aij and Rapsaniotis, 2016, Willis *et al*., 2016). What is critically important to note here is that it is *what* Lean leaders do and are seen to be doing, that drives lean practice (Aij *et al*., 2015a). Equally as important to this is *where* this happens. In order to lead by example and drive lean practice, a lean leader needs to be visible so the majority of a lean leader's time must be spent on the shop floor (Gemba) where lean is being practiced (Bicheno and Holweg, 2016).

Research Objective 3:

To explore the relationship between lean practice and organisational lean thinking

In alignment with the lean literature, this study has found that the important components of lean practice in supporting OLT are lean tools and processes (Dahlgaard *et al.*, 2011), lean culture and principles (Mann, 2009), strategic organisational alignment (Dombrowski and Mielke, 2014), organisational learning (Liker and Rother, 2011) and active communication (van Ruler, 2018).

Lean tools and processes are a fundamental part of a lean organisation and their everyday use can be used to instil a deeper lean thinking culture into the organisation by a continuous re-enforcement of these lean tools and processes to sustain OLT (Bicheno and Holweg, 2016). Additionally, the use of problem-solving tools on a day-to-day basis facilitates an organisational state of perpetual learning (see Dombrowski and Mielke, 2014; Nesensohn *et al.,* 2014; Kinsman *et al.,* 2014; Goodridge *et al.,* 2015; Aij and Teunissen, 2017). Lean tools and processes are important but equally having a structured organisational learning program in place to deliver them is vital. This research has found that just having an impressive suite of training procedures that provide a detailed approach to problem-solving on paper is not enough to achieve OLT. A structured organisational learning plan is required to ensure everyone in the organisation is trained and able to execute these lean tools (Mitki *et al*., 1997; Netland *et al*., 2019).

Lean Culture and Principles is the element of lean practice where all the lean progress is stored, embedded and sustained (Poksinska *et al*., 2013). It is this often-overlooked hidden organisational memory that is the manifestation of OLT in practice - "the way we do things here" (Mann, 2009, p.17). Lean Culture and principles are the link to achieving OLT because it encompasses and embeds the long-term changes in the values, beliefs and assumptions of people in the organisation (Willis *et al*., 2016). Ignoring the lean philosophies that underpin lean culture will not result in the achievement of organisational lean culture (Holmemo and Ingvaldsen, 2016; Netland *et al*., 2019).

Because lean culture is not always a visible entity, an active communication plan is vital for its sustainment (Lewis, 2000). This research has found that lean thinking organisations such as ABC have identified that active communication is equally as important as lean leadership in the successful implementation of OLT (Worley and Doolen, 2006).

Lastly, this research has shown that it is through the use of strategic alignment techniques that all the important elements of a lean system are brought together (Bicheno and Holweg, 2016), which enable the organisation to align lean thinking goals on every level (Mann, 2015). In summary, this research finds that there is no one lean practice element that creates OLT, but it is all the lean practice elements working in unison (Mann, 2009).

Research Objective 4:

To explore the relationship between lean leadership and organisational lean thinking

As highlighted in the discussion, achieving OLT is not a 'left-to-right' event with a start and an end point – it is a continuous, cyclical process. This study started out with the premise that lean leadership is at the very centre of this process and the research shows that this thinking remains true. It is the leader's initial actions and interactions with lean practice through having the correct self-knowledge of lean and leading by example that drive lean practice to achieve OLT. However, this is a continuous process, where the leadership need to keep a check on the health levels of OLT and take steps to inject further momentum when this is required. In essence, lean leadership is both the driving force and the guardian of OLT.

This research found three mechanisms that can support a lean leader to monitor the level of OLT and to take appropriate actions when required, explicitly the 5S methodology, leader standard work and the PDCA cycle. For instance, ABC used 5S methodology at all levels of the organisation to monitor and check OLT levels and create a unified mindset that can be standardised and sustained (Michalska and Szewieczek, 2007; Randhawa and Ahuja, 2017). Leader standard work is an effective lean process to sustain lean gains as it can prevent 'back-sliding' by consistent focus on the process and not the results. This enables the lean leader to carry out structured and periodic tasks that check aspects of lean practice and to ensure that they are still delivering what is expected from them (Mann, 2015).

Overall Research Objective:

To explore the relationship between Lean Leadership and Lean practice to achieve Organisational Lean thinking.

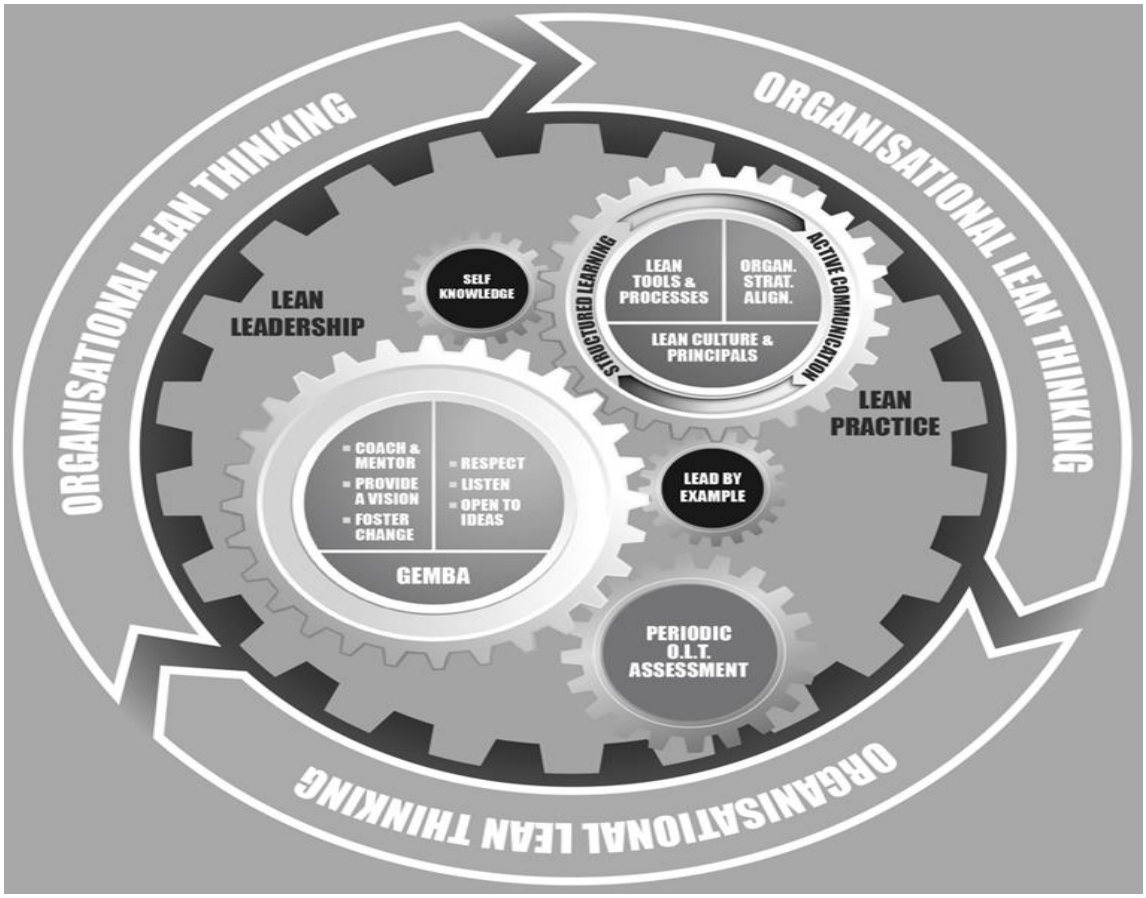
In order to focus the following discussion, a refined conceptual model is introduced (see Figure 1 in this section), that creates a visual depiction of the overall relationship between lean leadership and lean practice to achieve OLT. The pattern that emanated from this study is the understanding that lean leadership is at the very centre of the lean system (Mann, 2009) and through its interactions with lean practice, it is both the driving force

and the guardian of OLT. However, OLT is not a destination but a cyclical event that demands continuous assessment and re-invigoration by leadership (Lewis, 2000). Lean leadership drives lean practice through two main actions explicitly, leader self-knowledge and the ability to lead by example (Holt, 2022). There are smaller components or leadership attributes that comprise both of these elements.

Lean Practice is what generates OLT and this consists of Lean Tools and Processes (Dahlgaard *et al.,* 2011), Lean Culture and Principles (Michalska and Szewieczek, 2007) and Strategic Organisational Alignment (Dombrowski and Mielke, 2014), but it is Active Communication (van Ruler, 2018) and Structured organisation learning (Goodridge *et al*., 2015) that allow lean practice to become embedded.

OLT is driven by lean practice but is not a permanent fixture and needs to be constantly supported by a strong lean leadership commitment to lean. OLT must be constantly monitored through use of the 5S methodology, leader standard work and the PDCA cycle by Lean Leadership and needs to be re-invigorated by the continuous practice of lean within the organisation.

Figure 1: Refined Conceptual Framework



At a high-level, the framework is explained as follows:

- OLT is both a cyclical and a perpetually moving entity and it is built through the learning that comes from a deep appreciation and a shared mindset of continuous sophisticated problem-solving at all levels of the organisation.
- Lean Leadership is the element in the lean system that both drives lean practice to achieve OLT but it is also the where the overall health of the lean system in the organisation remains monitored and acted upon, when necessary.
- Lean leadership performs these tasks through their actions of gaining sufficient lean knowledge and then leading by example.
- Lean Practice is the enabler for OLT and it is comprised of several elements and it is the combination of these parts that enable OLT.
- Having an active communication plan and a structured approach to organisational learning are the vital conduits within lean practice that allow it to permeate throughout the organisation.

The detail of the various interactions in the framework is now provided.

First and foremost, through their interactions with lean practice, lean leadership is the driving force behind OLT through ensuring that everyone in the organisation has a deep appreciation of lean that perpetuates from the routine learning that is derived from the everyday use of advanced problem-solving techniques embedded in lean practice. How the lean leader interacts with lean practice is through their own self-knowledge of lean and through their ability to lead by example – 'Know and Show'. In order for a leader to be able to do both these exercises, they must be present at Gemba (Aij *et al*., 2015b), the place where their followers are and where value is created (Fine *et al*., 2009).

Lean Practice comprises of Lean tools and processes, Lean Culture and Principles, Organisational Strategic Alignment, Active Communication and Structured Organisational Learning. However, what is particularly noteworthy here about Lean Practice is that it has to be 'perpetual' in nature because that is what allows an organisation to achieve their lean thinking mindset. Lean tools and processes enable the 'sophisticated problem solving' aspect of lean thinking but it is the routine use of problem-solving tools that creates a mindset of continuous learning (Liker and Rother, 2011). Having the right set of Lean Tools and Processes that are supported by lean leadership is the right place to start for the attainment of OLT but this should not be the only area of focus for a lean

organisation. The lean culture and principles element of lean practice is where the deep appreciation of lean starts and it needs to be embedded through communication. After all, unless every employee knows 'how things get done' through active communication, the organisations lean culture will not be known or retained. Lastly, the strategic alignment of an organisation ensures that all employees efforts are pointed in the right direction and this is also an enabler for the attainment of a shared mindset. Achieving OLT is not a 'left-to-right' event with a start and end point – it is a continuous, cyclical process and it is the culmination of all these parts working together in a symbiotic relationship that achieves it.

The Leader's Self-Knowledge of lean is an enabler to coach and mentor employees in the use of Lean Tools and Processes. In order for the lean leader's knowledge of lean to spread throughout the entire workforce, the lean leader must put in place a structured organisational learning program (Mitki *et al*., 1997; Netland *et al*., 2019). In addition, their self-knowledge of lean allows the leader to firstly create a vision and then be able to foster the change required to deliver this vision. Change and vision are two very important parts of Organisational Strategic Alignment. The leader's self-knowledge of lean enables the leader's ability to Lead by Example.

By placing themselves at Gemba, the leader can be visible in how they interact with lean practice. By being available and openly leading by example, not only does it show respect to their followers but also allows the leader to listen and be open to ideas. In addition, a leader being at Gemba enhances and supports open and active organisational communication. How and how often an organisation communicates with its employees is an important part of its lean culture and principles (Hines *et al*., 2008).

Going back to the start to lean leadership role in this process in the true cyclical nature of lean thinking, it is the lean leader's role to carry out periodic assessments of the health levels of OLT. If and when action is required to sustain the organisations lean efforts, it is the lean leader's role to take the necessary steps through lean devices such as 5S, the PDCA cycle and leader standard work.

4.0 Contributions of the Study

The contributions of the study can be divided in to theoretical, practical and methodological. Each are now discussed in turn.

4.1.1 Theoretical Contribution

Firstly, the decision to explore organisational thinking in a case study that had previously failed to sustain it and to take the subsequent learnings from this failure is a step forward for our understanding of lean theory. For Lawal *et al*. (2014), one of the reasons for the slow progress in the field of lean research is that there has been a tendency amongst lean studies to publish a carefully curated selection of lean success stories. The consequence is that while there are a plethora of studies investigating the positive aspects of lean, our existing knowledge about the phenomenon is not expanding in conjunction with actual practice (Hines *et al*., 2018). Indeed, a number of authors (see Mann, 2009; Kimsey, 2010; Kinder and Burgoyne, 2013) have argued that lean research has become somewhat stagnant, re-producing existing findings, and resulting in a significant gap between theory and practice as to what constitutes and drives OLT. The consequential effect of this theoretical deficit is that the actual effort of implementing OLT in practice will be even more difficult to achieve, which is evident in the unacceptable high failure rates being reported (Bhasin and Burcher, 2006). Indeed, the case study account in this research and its subsequent discussion between the initial and evolved state of lean, provides a rich description and insight to what worked and what did not work in the organisation and allows further understanding of a number of areas, namely the expansion of the understanding what constitutes lean practice, the role that lean leaderships plays in achieving OLT and lastly how the overall concept of lean thinking operates in a lean organisation.

With regard to lean practice, historically, lean practice was mainly represented from the simple perspective of the execution of lean tools and process and the embedment of lean culture and principles (see Poksinska *et al*., 2013; Mann, 2015). However, this study has shown that lean practice involves a lot more than tools and culture, it encompasses critical overlaying concepts such as structured learning and active communication as well as strategic alignment. This research has explored how each of these elements contribute to achieving and sustaining lean thinking.

In the area of the lean leader's role, even though lean theoretical discussion has identified the critical role of lean leadership in the sustenance of lean thinking, very few studies delve into how this is achieved (Dombrowski and Mielke, 2014; Laureani and Antony, 2018). This study has bridged this theoretical gap by not only providing a modern re-assessment of the lean leadership concept by identifying the six attributes that are required

by lean leadership but also the accompanying actions that are required also. The necessary actions that have been determined that broaden the theoretical discussion are that a lean leader needs to have sufficient self-knowledge of lean and then the ability to lead their followers by example. The lean leadership attributes that enable these actions are (i) the ability to coach and mentor (ii) the facility to provide a vision and (iii) their capacity to enable and foster change (iv) the leader to show respect and (v) listen to their followers and (vi) be open to ideas. Whereas many other lean writers have attempted this task previously (see Poksinska *et al*., 2013; Dombrowski and Mielke, 2013; Aij *et al*., 2017; Laureani and Antony, 2018), their efforts were incomplete. This research goes further and examines why these lean leadership attributes are important to the interaction and support of lean practice to achieve OLT.

Also, in regard to the overall theory of lean being narrowed down to the execution of leans tools and processes, it advances the thinking on what exactly constitutes OLT. The study expands the concept and purports that lean as a concept comprises of lean leadership interacting with a range of lean practice elements in a continuous manner to achieve a level of lean thinking that is understood and practiced throughout the whole organisation. To the best of the researcher's knowledge this is one of the first studies to explore OLT from this perspective illustrating that it is a warranted and valid endeavour. Up to this point, the results of this study would suggest that current conceptions about the implementation of OLT does not correspond with the needs of practice (see Hines *et al*., 2018). Finally, in comparison to the traditional representations of lean, the holistic OLT model developed in this research provides researchers with a means for studying the complex and dynamic nature of lean in organisations and introduces concepts worthy of further exploration.

4.1.2 Practical Contribution

From this study, a number of important practical contributions arise.

This study sets out a blueprint for leadership and lean practice and provides a valuable insight for lean organisations attempting to sustain OLT.

Lean Leadership is the driving force behind lean practice that achieves organisational lean thinking. Indeed, this research has shown that Lean leadership is most effective in this regard if there are elevated levels of self-knowledge of lean and the leaders also have

the ability to lead by example (Holt, 2022). When leaders have the knowledge and spent sufficient time with their followers in the area where they work, dispersing this knowledge through coaching and mentoring and leading by example, lean practice is strengthened. Furthermore, this study expouses the attributes of being respectful, being able to listen and to be open to ideas when a leader is interacting with their followers. The research calls out that it is actions not just attributes that will determine a leader's success as they need to be able to provide a vision, communicate this to their followers and then foster the necessary change to make it happen.

Lean Practice is more than just tools. Lean tools and processes are a particularly important part of lean practice but an over-reliance on this single lean practice element alone will not achieve OLT (Radnor 2011; Netland *et al*., 2019). In addition to the elements of lean practice already identified – lean tools and processes (Dahlgaard *et al.,* 2011), lean culture and principles (Michalska and Szewieczek, 2007) and strategic organisational alignment (Dombrowski and Mielke, 2014), there are additional essential elements also required – these are active communication (van Ruler, 2018) and structured learning (Goodridge *et al*., 2015). Very much tied into the fact that leadership is the driving force to enable lean practice to achieve OLT, it is the primary role of Leadership to support lean practice through active communication and structured learning.

Sustaining organisational lean thinking is a cyclical process. OLT will not be maintained or sustained without constant interactions and support from Lean leadership. It needs to be monitored and nurtured by the leaders in a lean organisation through leader standard work, the PDCA process and through the proper use of the 5S methodology. It is not a destination but a direction that the Lean leadership need to keep the lean organisation pointed towards (Lewis, 2000).

Awareness of Organisational barriers to achieving OLT. Just as this research has indicated to lean practitioners how organisational lean can be achieved and sustained, this research has also highlighted a number of barriers that lean organisations need to be aware of, when it comes to sustaining organisational lean thinking. First and foremost, it must be understood that lean thinking is not the responsibility of a single department but a mindset that needs to be shared by every employee. Whereas lean leadership must understand their role in initiating, driving and monitoring OLT, this is not just their mindset but everyone's mindset in the organisation that is important. Lastly, becoming

complacent or having a single-minded focus on achievement of an award (Shingo or likewise) and then not keeping lean effort up afterwards will also act as a barrier to achieving and sustaining organisational lean thinking.

4.1.3 Methodological Contribution

This research has also made contributions to methodology on two fronts.

Based on lessons learned from a single case study, this research's methodological paper proposes a research framework of directional steps for interpretive researchers conducting case study research within the field of lean leadership. These directional steps are important because while a large body of publications has accumulated on the topic of lean over the last 30 years, the philosophies and methodologies contained within have not been sufficiently challenged and are predominantly positivistic in their research approach (see Crowe *et al*., 2011; Bansal *et al*., 2018). Consequently, interpretive case research investigations are noticeably missing from the lean literature and the discipline has been criticised for the lack of philosophical and theoretical progress (see Flyvbjerg, 2004). The framework presented within this thesis provides legitimisation to lean interpretive case researchers by standardising research practices and potentially enabling greater acceptance of this research approach within the lean academic community.

Secondly, this research has also provided a contribution to research through the development of an insider case study and represents an example for other researchers of how a complicated phenomenon like the interrelationship between lean leadership, lean practice and organisational thinking can be researched. Indeed, the methodology adopted for this research proved fruitful, in terms, of allowing the researcher to follow a systematic interpretive case study design into a logical design for data collection and analysis, resulting in rich and insightful understanding of a complicated phenomenon.

5.0 Directions for Further Research

As all studies are a reflection of a moment in time, it is always prudent to consider what further research would advance knowledge surrounding the subject area. The interpretive approach to this study in conjunction with the researchers privileged access to participants and their viewpoints, has uncovered a rich and deep understanding into this under-

explored research area. Given that the research organisation is already very aware of what steps are needed to improve and sustain OLT and is taking an active role in the implementation of same, there will no doubt be changes in outcomes deriving from this evolved application of lean at that location in the coming years. What would be extremely valuable is a series of follow-up in-depth interviews with as many of this study's interview population as possible after a sufficient period of time has elapsed. The purpose would be to investigate the progress that these later actions have made to the inhabitants of the lean process at ABC and to determine whether there has been enough progress to develop an organisational lean mindset that can be sustained.

Another future research direction could be to explore this research from a dynamic capabilities perspective and present the progression of an OLT implementation in an organisation and subsequently develop a dynamic capabilities framework for organisational lean thinking. For instance, lean leadership could be considered a dynamic capability (Schoemaker *et. al*., 2018) in its unique position within the OLT model in that it is constantly monitoring levels of organisational lean thinking and taking steps through its engagement with lean practice to inject new life and sustain momentum.

Another research implication of the OLT framework developed in this research concerns the question, of whether these findings apply beyond this research project. Further research could be utilised to refine, modify or confirm the framework by replicating the study in other settings and in a larger case population. Moreover, a quantitative approach to these case findings could also be performed. Future quantitative research could address the impact of lean leadership and practice on OLT. By studying larger populations, reassurance is given that the findings developed in one case are not wholly idiosyncratic.

6.0 A Critical Reflection

Due to the reflective nature of this section, I am going to proceed in the first-person pronoun. It has to be stressed, that it is challenging to be critical of my own work, since I have taken every effort to conduct this research in a professional and honest manner. Nevertheless, I realise that there is always room for improvement and there are things on reflection, that I could have done differently. The discussion contained henceforth is a continuation of the reflection account detailed in the emergence of the research problem

contained with the introduction section of this thesis and the subsequent reflections pieces embedded in the preface sections between papers. First and foremost, I am relieved that I have reached this point in my journey where I am completing my discussion and conclusion and I can reflect on how long ago it seems, since my first workshop when I was introduced to all my DBA colleagues. I can safely say that I am not the same person that I was back then for a myriad of reasons but all radiating from my experiences on this DBA course.

When I reflect on my thoughts, especially around my original research topic which was loosely based on leadership and lean, I am stuck by how naïve and uninformed that I was on both those topics despite completing a master's degree on leadership and working for over twenty years in lean organisations. There was so much I did not know or grasp about academic thinking and writing and what a rigorous process it is – how it could take nearly a day to write one paragraph that is supported by informed and relevant literature. All of our DBA workshops tried to prepare us for this level of scrutiny but the optimist inside me refused to believe that it would be so difficult.

Completing the literature review under the guidance of my two DBA tutors was a steep learning curve and basically a shock to my system and it took a considerable number of rewrites and deeper research to even have the first draft ready for examination. I genuinely felt that the hardest part was over when paper one was submitted and that choosing a methodology and designing the research process would be less exacting but again, I was wrong.

In relation to research methodology, I was happy with my choice and still believe that I have been true to my philosophical positioning in the selection of the interpretive research method. I believe that this is the best research vehicle to conduct an exploration of such a human and complex study of relationships in the working environment.

With regards to the case research, I could have conducted more cases but this would have widened the scope and provided less opportunity for depth. I found that being an insider researcher had a lot of advantages with the primary one being access and the fact that I was employed as a Continuous Improvement coach at the research case site kept me very close to the subject matter being studied. This advantage also became a disadvantage in that I quickly became aware that I had only a finite amount of time where I could have a rational and separate viewpoint of the organisation that was not clouded by my own

involvement in the lean reinvigoration process. Also, I became aware that it was exceedingly difficult to carry out participation observation subjectively when employees were aware of my role as CI coach. Nevertheless, I managed to get through the twenty-four interviews and became quite experienced at conducting these in the most efficient manner for me and the subjects, while being respectful of the participants time and my own commitment to my day-job at the research organisation.

Again, my naivety re-surfaced when it came to allowing time for the transcription and data analysis of the research material. The excessive amount of time required to get this completed was again made clear to me and my colleagues during the DBA workshops but I did not envisage the labour intensity of this process and I was under a lot of pressure to make the paper deadlines. At this juncture in my journey, I can be reflective about the positives and the learning that was afforded to me by the process especially around mastering the NVivo data analysis software and the ability to be able to carry out independent research on any topic. Further, in relation to methodology, I feel this research demonstrates the level of knowledge and experience that I have acquired from conducting and analysing case research. In addition, the instruction from the DBA tutors and classes have provided me with the opportunity to gain experience how to use statistical packages for both quantitative and qualitative data, adding to my research capability with undertaking different research methods, which in essence does not preclude me from investigating any particular future research problem.

Another comment that I want to make is that I am very grateful for the continued support and encouragement that has been made available to me on this journey from my DBA tutors. The workshop and course facilitators has been of the highest level and although the process has been very demanding, it has equally been exciting and stimulating to me on a personal and professional level and has shaped the person who has emerged from this experience.

In regard to my own learning, I have now a greater understanding of the prevailing state of lean thinking from both an academic and a practical aspect and the course has allowed me to acquire a vast amount of information and knowledge about both leadership and lean practice. For instance, when I progressed from my CI coach role at ABC to the CI manager position where I was given the task of implementing lean, I was doing so with the advantage of having completed my research. I now had a model on how to achieve and sustain organisational lean thinking and a blueprint on how to proceed. I was in fact

living my research and actually implementing the model. This has improved my confidence and the knowledge of my value and worth in the lean industry and advanced my career and future prospects.

Finally, the DBA course has been transformational in both my professional and personal life. It has changed the way I approach challenges and shown me where and how to find solutions through peer-reviewed research whilst increasing my knowledge of lean and how organisational lean thinking is achieved in practice. For me, undertaking this research journey has broken down the boundaries between lean theory and lean practice and I am now both, an active lean academic and an active practitioner. With skills, training and knowledge in both domains, I combine scholarly research and practice knowledge in the pursuit of organisational lean thinking - I believe I can now be called a 'Pracademic'.

Section 4

REFLECTIVE LOG EXTRACTS

Reflection Log Extracts

Part of the requirements of the DBA learning curriculum is to become a reflective researcher and I embraced this requirement from the very start and found this task to be very beneficial as a way of thinking out loud about my research during the many stages of the process but especially during the data collection and analysis phases onwards. During this time, I also used the memo feature on the data analysis software, NVivo. The complete reflective log is not contained as it stretches to seventy-two pages with a word count of just under twenty thousand words. For the thesis requirement, I will include the pivotal log entries mainly up to and including the data analysis of the findings as these are an indication on how my thinking was informed during the overall DBA process. The DBA thesis is split into three phases – Workshops, Cumulative Research Paper Series and DBA Submission and the Viva Voca examination. As the reflective log extract is being prepared now for insertion into the thesis only phases one and two are included in this section.

DBA Phase 1-Workshops

The first entry in my reflective log was in September 2018 when I was tasked with generating my initial research question prior to the first workshop.

Sept 26 2018

My initial proposed research question is: 'The Challenges facing Global companies regarding instilling a singular approach to company culture and leadership'. The proposal was arrived at for the following reasons - previous studies into leadership, current and past work experience and general interest in employee engagement and organisational culture.

Sept 27 2018

I proposed my research question at workshop one to tutors and group. Received feedback that scope was too large and to reduce focus. Fellow DBA student (David Olden) in the group suggested investigating the Shingo award process as a possible framework.

Sept 28 2018

Re-presented revised research objective 'The learnings on adapting leadership approaches to support the Shingo Model'.

Nov 25 2018

Except from 'Refining your research focus' workshop assignment is interesting as below; *The interest of my research is to determine what motivates an organisation to try and obtain the Shingo Prize. What leadership challenges arise and are successful applicants satisfied with their achievement and why are there so few successful Irish holders of this prize?*

21 Mar 2019

Workshop II: Business Theory Development and application. If I am being 100% truthful, I found the pace of this second workshop very fast as it forces me straight into the literature review on a research topic, I have not fully committed to.

25 Oct 2019

Workshop III: Thoughts…is my RQ question already answered through the works of others? Need to research this extensively before I go too far down the road with this particular research question.

13 Nov 2019

On a wet and rainy day in my 'DBA office' in Dunhill, working on generating the outline of my conceptual framework due in on Nov 26th 2019. I am on the 6th attempt at reframing the overall research objective.

DBA Phase 2 - Cumulative Research Paper Series

5 Feb 2020

Met my course supervisors, Dr's Patrick Lynch and Anne-Marie Ivers to discuss research proposal and next steps.

Both Supervisors had questions and comments regarding the direction of my research

- Was the proposal directed at lean implementation in organisations or the sustenance of lean at organisations who already implemented lean?

- The supervisors had questions about utilising the Shingo Prize criteria as a benchmark for determining the success of a lean organisation. For the organisation to be deemed 'successful' by the Shingo organisation, there is an implication that a certain set of leadership traits are embedded in that organisation.
- They questioned if there is there enough literature available on lean leadership and commented that as the academic quality of the published material on lean leadership is 'very light' and lacks gravitas – there is an opportunity to make an academic contribution on the subject.

I concluded that my proposal was to explore whether there was a certain set of leadership traits or leadership style that supported the success of a lean organisation. I left the meeting feeling encouraged and ready to continue my research. Meeting was concluded with an agreement to meet again the following week.

4 Mar 2020

Met supervisors at the WIT building in Waterford IDA. Reviewed the new proposed conceptual framework. We discussed the chosen lean elements and their interaction with each other - leadership, strategic alignment, culture, continuous learning, lean tools and processes. Agreed that culture is a very important element that gels the rest of the elements together.

Next meeting is proposed for Wednesday 18th Mar at 1pm in the same location. Little did I know on that date what was about to embrace the world and that I would never see my DBA supervisors again in a face-to-face meeting for at least three years!

PLEASE NOTE: COVID-19 VIRUS STARTS TO IMPACT ALL ASPECTS OF NORMAL LIFE DURING THIS TIMEFRAME. ZOOM MEETINGS FROM THIS POINT ONWARDS DUE TO C-19 SOCIAL DISTANCING MEASURES.

20 Mar 2020

Had zoom meeting – lots of technical difficulties but this was to be expected due to my lack of familiarity with virtual meetings. I had sent on 1st draft of paper one earlier.

25 Mar 2020

Late evening zoom meeting (6pm) with Patrick and Anne-Marie – new conceptual framework accepted albeit with a few adjustments. Sent on research objectives and updated conceptual framework

5 Apr 2020

Rewriting paper one with new focus. After working with my DBA supervisors and critically thinking about the research objective and where I hoped it would bring me and the anticipated outcomes, my final research objective in May 2020 was ‘to explore the relationship between Lean Leadership and Lean practice to achieve OLT’.

On reflection, I believe I wasted a lot of time research and analysing the Shingo Model and also despite feedback I kept my research objective scope too wide without considering how I would frame my literature review and my research plan. However, I fully believe that this was all part of the learning process on my behalf and also that I was very fortunate with the level of patience displayed by my DBA supervisors during this learning process.

25 May 2020

I have started to evaluate the feedback thoroughly on paper one from the external examiners - my key learning outcomes are centred around the quality of academic writing and to ensure a proper flow exists within my writing.

20 Nov 2020

Learning and adapting to a higher level of academic was challenging but eventually, the paper was brought to a sufficient standard to be submitted. What was also helpful to the researcher was the attendance and the supporting notes from a series of ‘Generic research skills’ classes held at the college campus and the formal DBA workshops also played a vital role in the production of the conceptual paper.

15 Feb 2021

Where am I on the philosophical positioning question? I am definitely leaning towards the realism viewpoint as I do believe the social world is an external environment that can be studied and also a shared experience so my philosophical positioning is Nominalism, Anti-positivism, Voluntarism and Ideographic.

16 Mar 2021

This is a busy time in my life as in addition to studying for my DBA, I had also changed careers and employers and was now a Continuous Improvement coach!

30 Mar 2021

Delighted, relieved and in general disbelief to receive formal (and signed) consent today from the research organization that I can progress with using the organization as a research candidate for the case study. It is exciting that I am now on the precipice of the next stage of my DBA journey, and I am eager to move forward.

17 May 2021

Started interviews today – did three – started with CI team who were also up to recently, in leadership roles in the organization.

During the writing of paper three, as I was heavily using the NVivo software, a lot of the memo from the cumulative paper phase was contained with the memo section of the software. These insertions were particularly insightful to me as my analysis was occurring simultaneously with the data collection and it was important for me to reflect and think about the data I was gathering.

NVivo Memo Extracts

20/05/2021 21:28

Not 100% satisfied with the interview guide now that I am using it for 'real interviews. Definite lack of flow and seem to be repeating areas and questions and generally confusing the interviewees.

I am going to revise the guide before next interview.

20/05/2021 21:29

First analysis of data during 'cleaning up' of transcript.

Leadership discussion covered the move from manager to leader but "In-consistencies in the degree of leadership support for CI over the last 6 years", "we weren't established in our practices, but we were living the philosophies and we were established in our culture"

Communication is seen as a strong leadership trait that is required. The lean tools and processes and the culture is mentioned. The leader needs to be knowledgeable about lean, themselves. They need to see the bigger picture – have a vision, have emotional intelligence when speaking to people.

Interviewee mentions that lean is part of the induction for all employees and that the organisation has gone through a lot of change in the recent past, moving from a family-owned company to a global organisation.

25/05/2021 22:04

Progressing with research interviews at case study site.

Beginning to see possibilities in regard to dividing organisation into separate units of analysis for internal comparisons by using organisational value streams.
Some recurring themes emerging during re-reading of interview notes and transcript generation with respect to empowerment at middle stage leadership, lean training and lean resourcing.

31/05/2021 22:32

Realising the truth behind the literature when it warned about the time it takes to analyse the data in comparison to completing the actual interviews.
Will use the priori coding of Lean Leadership, Lean Practice, Organisational Lean Thinking as hierarchical 'folders' when I start coding just to get some initial analysing completed

03/06/2021 20:52

I have decided to split unit of analysis into 3 different areas-depending on the senior leadership.
As I move through the levels of the organisation, I am noticing a distinct difference in lean awareness and attitudes to lean culture, depending on the level the employee is at.
Followers at the production associate regard lean as just the tools but there is a near uniform response that lean site culture has deteriorated since the company was taken over previously before the current organisation took the company over.

24/06/2021 23:20

Some trends starting to emerge in the area of lean practice-the need for training and lean training beyond the employee induction stages
Organisational planning / Strategic organisational alignment also being mentioned as important
Communication skills also emerging as a required lean leadership trait and leader self-knowledge also featuring

03/08/2021 23:43

My initial findings are interesting and appeared even at the outset to highlight some gaps in my research through the literature revie.
Even though training was mentioned in a lot of articles and publications, I did not determine this to be a key factor of lean practice although it was covered as part of the lean leadership traits in the form of people development.
There is one exception in the Continuous Improvement value-stream but it is important to know that members of this group are employed to carry out process improvements and a pre-requisite of this role is to have a level of lean knowledge.
Data analysis is also showing that there appears to be a gap in the training of lean within the organisation – there is an introduction to lean at the employee's induction but there appears to be no follow-on training after this point apart from some training documents that are associated with lean tools and processes.

Appendix 1 – Sample of Lean Literature

Authors	Year	Title	Content
Hersey, P. and Blanchard, K. H	1969	Life Cycle Theory of Leadership'	Leadership Theory
Greenleaf, R. K.	1970	The servant as leader Atlanta	Leadership Theory
Burns, J. M.	1978	Leadership	Leadership Theory
Peters, T. and Waterman, R.	1982	In Search of Excellence	Leadership Theory
Bass, B. M.	1985	Leadership and performance beyond expectations	Leadership Theory
Krafcik, J. F.	1988	Triumph of the Lean Production System	Early Lean Manuf.
Ohno, T.	1988	Toyota Production System – Beyond Large-scale Production	Early Lean Manuf.
Bass, B. M.	1990	From transactional to transformational leadership: Learning to share the vision	Leadership Theory
Womack et al.,	1990	The Machine that Changed the World	Early Lean Manuf.
Jaques, E and Clement, S. D.	1991	Executive Leadership	Leadership Theory
Cusumano, M. A.	1994	Japanese technology management: innovations	Early Lean Manuf.
Sohal, A. S. and Eggleston, A.	1994	Lean production: Experience amongst Australian Organisations'	Early Lean Manuf.
Lowry, D.	1995	Focusing on time and teams to eliminate waste	Early Lean Manuf.
Lloyd, B.	1996	A new approach to leadership'	Leadership Theory
Northouse, P. G.	1996	Leadership: theory and practice	Leadership Theory
Spears, L. C.,	1996	Reflections on Robert K. Greenleaf and servant-leadership'	Leadership Theory
Womack J. P. and Jones D. T.	1996	Lean thinking: Banish Waste and Create Wealth in Your Corporation	Conceptual Lean
Mitki, Y., Shani, A. B., &	1997	Organizational learning mechanisms and continuous improvement	Lean Learning
Wilkinson, A.	1998	Empowerment: theory and practice	Leadership Theory
Spear, S. J. and Bowen, K.	1999	Decoding the DNA of the Toyota Production System	Early Lean Manuf.
Lewis, M. A.	2000	Lean Production and Sustainable Competitive Advantage	Sustaining Lean
Carroll, B.	2001	Leadership in Lean	Lean Leadership
MacKenzie, S. B., Podsakoff, P	2001	Transformational and transactional leadership and salesperson performance'	Leadership Theory
Baker, P.	2002	Why is lean so far off?	Sustaining Lean
Russell, R. and Stone, G.A.	2002	A review of servant leadership attributes: developing a practical model'	Leadership Theory
Emiliani, M. L.	2003	Linking leaders' beliefs to their behaviors and competencies.	LL Attributes
Hines et al.	2004	Learning To Evolve	Lean Learning
Liker, J. K.	2004	The Toyota Way	Conceptual Lean
Spear, S. J.	2004	Learning to lead at Toyota	Lean Leadership
Mann, D.	2005	Creating A Lean Culture: Tools to Sustain Lean Conversions	Sustaining Lean
Melton, T.	2005	The Benefits of Lean Manufacturing: What Lean Thinking has to Offer the Proc	Conceptual Lean
Achanga *et al* .	2006	Critical Success Factors for Lean Implementation within SME's	Lean Leadership
Bhasin, S. and Burcher, P.	2006	Lean viewed as a philosophy	Conceptual Lean
Dahlgaard, J. J., & Dahlgaard-	2006	Lean production	Conceptual Lean
Roth, G.	2006	Distributing Lean leadership Practices for Lean Transformation	Lean Leadership
Emiliani, B.	2007	Better thinking, Better results	Conceptual Lean
Holweg, M.	2007	The Genealogy of Lean Production	Conceptual Lean
Manos, A.	2007	Lean Lessons - The benefits of kaizen and kaizen events	Conceptual Lean
Bodek, N.	2008	Leadership is critical to lean	Lean Leadership
Proudlove, N., Moxham, C.	2008	Lessons for Lean in Healthcare from using Six Sigma in the NHS	Conceptual Lean
Mann, D.	2009	The missing link: lean leadership	Lean Leadership
Pettersen, J.	2009	Defining Lean Production: Some Conceptual and Practical Issues	Conceptual Lean
Kimsey, DB.	2010	Lean methodology in health care	Conceptual Lean
Rother, M.	2010	Toyota kata: Managing people for continuous improvement and superior result	Lean Learning
Yukl, G.	2010	Leadership in Organisations	Leadership Theory
Bhasin, S.	2011	Measuring the Leanness of an organisation	Sustaining Lean
Dahlgaard *et al* .	2011	Quality and lean health care	Conceptual Lean
Liker and Rothar	2011	Why lean programs fail'	Lean Learning
Pedersen, E.R.G and Huniche,	2011	Determinants of Lean Success and Failure in the Danish public Sector	Conceptual Lean
Radnor, Z. J.	2011	Implementing Lean in Healthcare: Making the link	Sustaining Lean
Liker and Convis	2012	The Toyota way to Lean leadership	Lean Leadership
Pham and Thomas	2012	Fit Manufacturing: a framework for sustainability	Lean Leadership
Gupta, S. and Jain, S. J.	2013	A literature review of lean manufacturing	Conceptual Lean
Miller, R.	2013	A continuing Lean Journey: The Shingo Prize at 25	Lean Leadership
Poksinska, B., Swartling, D.,	2013	The daily work of lean leaders – lessons from manufacturing and healthcare	LL Attributes
Dinh, J. E., Lord, R. G.,	2014	Leadership theory and research in the new millennium	Leadership Theory
Dombrowski and Mielke	2014	Lean leadership – 15 rules for a sustainable lean implementation	LL Attributes
Drotz and Poksinska	2014	Lean in Healthcare from employees perspectives	Conceptual Lean
Lawal *et al* .	2014	Lean management in health care: Definition	Conceptual Lean
Nesensohn, C., Bryde, D.,	2014	Assessing Lean Construction Maturity	Conceptual Lean
Aij *et al* . (2015a)	2015	A literature review of lean leadership attributes	LL Attributes
Aij *et al* . (2015b)	2015	Lean leadership: an ethnographic study	LL Attributes
Goodridge, D., Westhorp, G.,	2015	Lean and leadership practices: Development of an initial realist program theory	Conceptual Lean
Li *et al* .	2015	A study of transformational leadership, trust and security in lean manufacturing	Lean Leadership
Rother, Mike	2015	Improvement Kata Handbook	Lean Learning
Samual, D., Found, P. and	2015	How did the publication of the book the machine that changed the world?	Conceptual Lean
Sisson and Elshennawy	2015	Achieving Success with lean - key factors in lean transformation and beyond	Sustaining Lean
Bicheno, J. and Holweg, M.	2016	The Lean Toolbox: A Handbook for Lean Transformation	Conceptual Lean
Holmemo and Ingvaldsen	2016	Bypassing the dinosaurs? – How middle managers become the missing link	Lean Leadership
Holmemo *et al* .	2016	Lean thinking: outside-in, bottom-up?	Lean Learning
Ingvaldsen and Benders	2016	Lost in translation? The role of supervisors in lean production.	Lean Leadership
Willis *et al* .	2016	Sustaining organizational culture change in health systems	Sustaining Lean
Aij and Teunissen	2017	Lean leadership attributes: a systematic review of the literature	LL Attributes
Anderson and Sun	2017	Reviewing Leadership Styles: Overlaps and the Need for a New 'Full-Range'	LL Attributes
Laureani and Antony	2017	Leadership characteristics for lean six sigma	LL Attributes
Seidel *et al* .	2017	Lean Leadership competencies	LL Attributes
Tortorella and Fogliatto	2017	Implementation of lean manufacturing and situational lean leadership styles	Lean Leadership
Garza-Reyes *et al* .	2018	Lean Readiness	Lean Sustain
Hines, P. *et al* .	2018	The Lean Journey: have we got it wrong?	Lean Sustain
Holmemo et al. van Assen, M.	2018	Exploring the impact of higher management's leadership styles on lean manage	LL Attributes
Laureani, A. and Antony, J.	2018	Leadership - A critical success factor	LL Attributes
Maijala, R., Eloranta, S.,	2018	Successful implementation of lean as a managerial principle in health care: a cor	Conceptual Lean
Tortorella, G. L., de Castro	2018	Lean manufacturing implementation: Leadership styles and contextual variables	LL Attributes
Gaiardelli *et al* .	2019	Exploring the role of human factors in Lean management	Lean Sustain
Knol, W. A., Slomp, J.,	2019	The relative importance of improvement rountines for implementing lean practic	Lean Learning
Martensson, A., Snyder, K.	2019	Interlinking Lean and sustainability	LL Attributes
Netland, T. H., Powell, D. J.,	2019	Demystifying lean leadership	LL Attributes
Seidel, A., Saurin, T. A.,	2019	How can general leadership theories help to expand the knowledge of lean lea	LL Attributes
Sisson, J. A.	2019	Maturing the lean capability of front-line operations supervisors	Lean Leadership
Enterprise Ireland, Local	2020	Lean implementation in micro & small enterprises; Book of cases	Conceptual Lean
Ingelsson, P., Bäckström, I.,	2020	Adapting a lean leadership-training program within a health care organization	LL Attributes
Powell, D. J., & Coughlan, P.	2020	Rethinking lean supplier development as a learning system	Lean Learning

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