Lean Thinking in New Zealand Emergency Departments

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Abstract

Quality and costs of healthcare have become a focus for the public and governments alike. Not only are the public rightly concerned with the relative risk to them of both of these issues; governments and insurers are particularly mindful from a funding and efficacy point of view. This explains the innate attraction of the health system to interventions that enhance quality while simultaneously maintaining value for money. As such, over the last ten years healthcare systems and institutions have begun to employ operations management techniques within their hospitals to better organise work, enhance flows and improve productivity.

Modern manufacturing methods have been led by the globalisation of the Toyota Production System; a system that integrates quality and waste reduction activities into the production tasks as they are performed. Lean Thinking is the generic label that has been given to this combination of a management philosophy and activities that aim to improve quality and reduce waste. Moreover, these manufacturing and service improvement principles are being used in an increasing number of sectors including healthcare services.

This thesis seeks to explore the implementation of Lean Thinking in New Zealand hospital Emergency Departments (EDs). New Zealand’s healthcare system is a recent adopter of Lean Thinking. As this formal roll out of Lean Thinking is new to New Zealand hospitals, it provides an opportunity to examine in detail the implementation sites and discover how the implementation of Lean Thinking progressed and why the resulting outputs and outcomes were achieved.
The research adopts a multiple site design using case studies as the primary research method. Three sites from three different District Health Boards (DHBs) were studied. An analysis framework was developed from key questions posed by the literature and by crafting three best practice exemplar cases from which to compare and contrast the progress of the New Zealand implementations. Thus the analysis was conducted firstly at the case level, then at the cross case level and finally, reviewed against a framework of best practice indicators found in the exemplar cases.

All of the sites achieved a mixture of success in terms of improved patient flow; in effect achieving some form of process redesign. Therefore, Lean Thinking can provide sought after improvements in waiting times and operational waste reductions however, without organisational commitment there is risk of sub-optimisation.

This research concludes that organisations that had an existing continuous quality culture or strategy were able to integrate Lean and achieve inter-department admission initiatives. These hospitals were somewhat more prepared for change and already had structures or processes in place that facilitated the Lean implementation. The thesis concludes by offering a practical range of indicators developed from the best practice exemplars and used for the data analysis, which could be employed by organisations to ascertain their readiness for a system implementation of Lean Thinking within a healthcare environment.
Acknowledgements

There are a number of people that played an important role in the completion of this work.

Firstly I would like to thank my parents, who over recent years have supported me in my return to study and have provided a supportive environment for me to concentrate on this work, with the physical and emotional sustenance to continue my progress.

My sincerest thanks to my supervisor Dr Richard Greatbanks, who encouraged and cajoled me into pursuing a research degree - your guidance and support has not only enabled the completed study, but you have helped me view a complicated and daunting subject with new eyes.

I would like to thank my proof reader Julianne, to whom I gave this unpolished piece and was returned with many ‘i’s dotted and ‘t’s crossed – thanks for the quick turnaround and service with a smile.

This work could not have been completed without the staff of the DHBs and Emergency Department sites, who though busy took the time to share their experiences honestly and without reservation. I hope this work validates the effort that was undertaken across the sites; endeavours represented by the research case studies contained in this work.

Finally, I dedicate this thesis to Ivone, who from afar repeatedly asked how I was progressing, kept me constantly on task and focussed unwaveringly on the completion date; all so I could fly back into her arms.
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List of Abbreviations

Lean production terms and their meanings if not listed below are contained in the Glossary.

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<th>Definition</th>
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<tr>
<td>ADKAR</td>
<td>Awareness – Desire – Knowledge – Ability - Reinforcement Model of Change</td>
</tr>
<tr>
<td>BICS</td>
<td>Bolton Improving Care System – Royal Bolton Hospital (Exemplar Case Two)</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>CLE</td>
<td>Collaborative Learning Event</td>
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<tr>
<td>CMO</td>
<td>Chief Medical Officer</td>
</tr>
<tr>
<td>COO</td>
<td>Chief Operating Officer</td>
</tr>
<tr>
<td>CQI</td>
<td>Continuous Quality Improvement</td>
</tr>
<tr>
<td>CT / CAT</td>
<td>Computed Tomography (CT) or Computed Axial Tomography (CAT) X-ray</td>
</tr>
<tr>
<td>DHB</td>
<td>District Health Board</td>
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<tr>
<td>DVT</td>
<td>Deep Vein Thrombosis</td>
</tr>
<tr>
<td>ED</td>
<td>Emergency Department</td>
</tr>
<tr>
<td>FPS</td>
<td>Ford Production System</td>
</tr>
<tr>
<td>FTE</td>
<td>Full Time Equivalent (Staffing Unit Measure)</td>
</tr>
<tr>
<td>GP</td>
<td>General Practitioner</td>
</tr>
<tr>
<td>IHIP</td>
<td>Intangibility – Heterogeneity – Inseparability – Perishability classification, the distinguishing characteristics between services and goods</td>
</tr>
<tr>
<td>IPEP</td>
<td>Improving the Patient Experience Programme (Hospital Site B – New Zealand)</td>
</tr>
<tr>
<td>MoH</td>
<td>Ministry of Health (New Zealand)</td>
</tr>
<tr>
<td>NHS</td>
<td>National Health Service (United Kingdom)</td>
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<tr>
<td>NPM</td>
<td>New Public Management</td>
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<td>NQC</td>
<td>National Quality Committee (New Zealand)</td>
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<tr>
<td>Abbreviation</td>
<td>Definition</td>
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<tr>
<td>NZ</td>
<td>New Zealand</td>
</tr>
<tr>
<td>OPJ</td>
<td>Optimising Patient Journey Project (New Zealand)</td>
</tr>
<tr>
<td>PDSA / PDCA</td>
<td>Plan – Do – Study / Control – Act improvement cycle or Deming cycle</td>
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<tr>
<td>PSAS</td>
<td>Patient Safety Alert System – Virginia Mason Clinic (Exemplar Case One)</td>
</tr>
<tr>
<td>RIE</td>
<td>Rapid Improvement Event or kaizen</td>
</tr>
<tr>
<td>SMO</td>
<td>Senior Medical Officer</td>
</tr>
<tr>
<td>TPS</td>
<td>Toyota Production System</td>
</tr>
<tr>
<td>TQM</td>
<td>Total Quality Management</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>US/A</td>
<td>United States of America</td>
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<tr>
<td>VMPS</td>
<td>Virginia Mason Production System – Virginia Mason Clinic (Exemplar Case One)</td>
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1. Chapter One

1.1. Introduction

Recent events in the USA and UK have placed the spotlight firmly on healthcare, its costs, the public’s access and the system’s ability to afford what is presently offered. Similarly in New Zealand, political and community concerns over access, costs and quality are regularly reported in the media. While demographic and economic drivers of costs and demand are well known, there seem to be no simple solutions to achieving continuing quality care within predicted future funding streams.

It is now known that, through the globalisation of the Toyota Production System (TPS), product quality and lower costs are no longer mutually exclusive. Formerly, industry norms had checking and quality control as a separate part of the production process. Now the TPS – from where Lean Thinking originates – integrates quality and waste reduction activities into the production tasks. Increasingly, these manufacturing principles are being adopted by other industries including healthcare services. The introduction of modern operations management methods into healthcare is relatively recent, so there is little empirical data on its long-term effectiveness and ability to match the cost minimisation successes that the application of Lean Thinking has achieved for manufacturing and some service industries (Brandao de Souza, 2009; Joosten, Bongers, & Janssen, 2009; Øvretveit, 2009; Young & McClean, 2009). While there are published accounts on how the practices of Lean Thinking within healthcare can secure change in terms of patient flow and wait times, less is known of Lean Thinking’s contribution to safer and better health systems.
Across the world there are mixes of healthcare provision models. Some are market models with payers and insurance companies having commercial relationships with a variety of hospital ownerships, others are socialised systems where healthcare is provided by the state (Gauld, 2009). There is an innate attraction of interventions that create savings while simultaneously maintaining value for money to governments; this allows for an electoral pragmatism that reduces problems with the natural political trade off between a wish for centralised service provision and one of smaller government.

In New Zealand, reform of the public sector has been occurring since the publication of Government Management - the Treasury Department’s advice to the incoming, second term reformist neo liberal leaning Labour government in 1987 (The Treasury, 1987). Throughout the following twenty years, the regime of reform created much instability and uncertainty across the sector (Gauld, 2003). In 2001, the now social democratic Labour Government restructured the health sector developing a system of elected District Health Boards (DHBs), with these entities responsible for the purchasing, delivering and planning for the health needs of their populations (Gauld, 2009). Throughout the period of reform quality was given little attention, being assumed the market would provide (Gauld, 2009) and it is only recently that targets for performance are reasonably clear and published every quarter (Ministry of Health, 2009a). However, the pressure on costs continues unabated (Newton, 2010). Thus the public, the professions and the academic community show significant interest in the performance, the improvement, and the reorganisation of the New Zealand healthcare system.
1.2. The Focus of the Research

Emergency Departments (EDs) have become topical as they have been experiencing demand in excess of population growth and signal a hospital’s ability to respond to the presenting demand (Ardagh, 2010). Typically, in the past, solutions that have gained traction seek to view the presentations of patients themselves as problematic (Richardson, Ardagh, & Hider, 2006). However some DHBs have ventured into seeking a more systemic and sustainable method for quality improvement and enhanced patient flows, through the consideration and implementation of Lean Thinking. In 2008, a National Quality Committee (NQC) project was initiated in part to promote Lean Thinking in the New Zealand healthcare system. This project focussed on a number of hospital environments, including Emergency Departments (Ministry of Health, 2009b).

1.3. The Objectives of the Research

This thesis aims to explore by way of literature analysis and case studies the experiences of three New Zealand Emergency Departments in implementing Lean Thinking. The study seeks to find out why and how things happened as they did. Case studies are an appropriate research method when the researcher seeks to understand processes by which events and actions take place, determine an understanding of the contexts, and be used as an exploratory research tool (Maxwell, 2008). As this thesis is an early academic investigation of Lean Thinking in New Zealand healthcare, it aims not to define or validate Lean Thinking as an answer for New Zealand’s health sector performance and quality issues, but rather aims to cast light on the processes and experiences of the organisations to better understand the
dynamics that affect and effect improvement implementations. The study also seeks to provide practical applications of the knowledge gained.

This thesis has been structured in a way that takes the reader through two interconnected journeys. The first journey is through the literature, where Lean Thinking is initially defined, through the contexts and dimensions by which Lean has been applied, to arrive at Lean in the Emergency Department. The literature then transitions into the conceptualisation by way of three exemplar cases derived from the literature. It is from this broad body of knowledge that the research questions are constructed and an analysis framework is developed. The process of taking a broad and then narrowing view is repeated in the second part of the thesis. Three stand alone cases are developed from the undertaken research, which provide a rich picture of Lean Thinking implementations. These cases are then subjected to cross case analysis, firstly searching for patterns from themselves by using selected dimensions and then again, by referencing back to the exemplars. The study identifies similarities and differences gaining an improved understanding to answer the research questions posed (Eisenhardt, 1989).

The following diagram represents the thesis content and analysis loops (represented as dashed lines) undertaken for this research. The first division is the literature in red, outlining the broad to narrow nature of the analysis. The exemplar cases and their relationship to the research conceptualisation are represented in mauve, followed by the phases of analysis and the conclusion represented in blue.
Figure 1.1: The Construction of the Thesis
1.4. The Research Questions

The research questions developed for this work are in line with the case study method. That is they seek to find out why things occurred as they did and the processes by which the phenomena occurred. Thus the questions are structured to let the cases determine;

1. How are Emergency Departments in New Zealand introducing Lean Thinking and its attendant philosophies and methods?

2. Why are they the same or different? and,

3. Why have they achieved the outcomes that they did?

1.5. Chapter Outline

Chapter Two presents a definition of Lean Thinking, its historical development, application by industry and codification in 1996 by Womak and Jones (1996). The chapter then leads into the service industry marking the introduction of manufacturing paradigms and the uptake of Lean principles. Lean services and the elements that benefit from the application of Lean thinking are reviewed. It is here that we find the first of many contextual debates regarding the applicability of Lean as a manufacturing construct and its applicability or adaptability into a service environment. As healthcare in New Zealand is largely publically operated, a section on Lean public services is presented before the chapter examines the critical view of Lean production. Finally, the Chapter discusses healthcare as an industry and points out a significant differentiator from other industries; that it is comprised of professionals and the hospitals are unique organisations, being professional bureaucracies.
Chapter Three continues the Literature Review, focusing solely on healthcare. This chapter is divided into four sections. The first section, Lean Thinking in Healthcare, begins with a discussion on the introduction of Lean Thinking into healthcare, the relative trajectory compared with other industries, and observes Lean’s implementation. Barriers and enablers are also revealed in this section. Section Two centres on the professional organisations and change. Professional organisations provide for relative roles and power, creating unique cultural dynamics that pose their own forms of resistance and relations. Elements of teamwork and leadership with respect to Lean Thinking are discussed, leading into the third section of the Chapter; Lean in Emergency Departments. This section presents the ED’s traditional operations, current issues and the introduction of manufacturing techniques to solve ED problems. A sub-section is devoted to the different experiences of Lean ED implementations and their attendant outcomes. The chapter ends with Section Four, the conclusion of the Literature Review.

Chapter Four is a linking chapter. Its purpose is to take the reader from the detail of Lean Thinking in Healthcare into the organisational dimension. Three best practice exemplar case studies, found within the extant literature, are presented to initially provide a taste of the case study format, but also used to elucidate the realities of Lean implementation. A tabular summary of these exemplar cases is presented and from this, common best practice indictors are identified. These indicators are grouped and used as the basis for an analysis framework, from which the thesis research questions are defined. The indictor groups become the themes used later in the content analysis.
Chapter Five presents the Research Method. The chapter’s beginning concentrates on the theory underpinning the decision for using the case study and the research method. Relevant issues for investigators to consider for research design and reliability, the content analysis process, and effectual practices that improve the trustworthiness of the findings are reported. This is followed by a description of the process by which the research was conducted. It presents the decision around the case study design and consideration for replication logic (Yin, 2008) and demonstrates adherence to recommended practices to maintain confidence in the study. A discussion on the weakness of the case method and strategies to minimise their effects is the topic of the subsequent section. This is followed by a detailed description of the case development and cross case analysis processes. The chapter ends with a conclusion that provides a segue into the next chapter; the focus of this research the site case studies.

Chapter Six introduces the three research site cases, and outlines the process of case composition, verification and finalisation. The research cases stand alone but are written with the same format and hold information organised by the themes used in the content analysis. The cases provide numerous quotations from the respondents, whose anonymity is preserved using an alphanumeretic system to identify each site and their respective respondents.

Chapter Seven contains the Findings and Discussion. The first chapter is made up of the cross case analysis; by firstly reintroducing the analysis framework and then following through a structured process. The cases are initially compared using the demographic data of the research case sites noting similarities and elements of the units of analysis that are significant. The data is presented as tables followed by discussion. The subsequent sections
provide analysis across the four themes used for organising the exemplar case indicators and
as main themes for the content analysis. These themes are (i) Activities or Lean tools, (ii)
Leadership, (iii) Team development, and (iv) Sustainability. The tables provide bimodal
categorisation for the sub-codes of the themes indicating the presence of the item, neutral, or
the items absence. The discussions identify the similarities or differences and attribute these
to the reasons and situations encountered by case respondents. Chapter Seven then returns to
the table of exemplar case indicators. The research cases are compared with the best practice
indicators from the exemplar cases. The Chapter closes with a suggestion for a practical
application of these findings.

The final chapter, Chapter Eight, reintroduces the research questions and enters into a
discussion with each question being answered. The next section provides a reflection of
limitations of the chosen method and proposes qualitative methodology improvements, which
frame a short section on future research opportunities emanating from the study. The thesis
closes with a short finale summarising the study and with a conclusion.

This closes the introductory chapter. The next chapter begins the Literature Review for
this thesis, opening by focussing on the quality methodology examined in this work, Lean
Thinking.
2. Chapter Two: Literature Review - Lean Thinking and Services

2.1. Introduction

The literature for this thesis is divided into two chapters. In this chapter Lean Thinking is defined, providing the basis on which to examine its application in service industries. Within the chapter is a description of the introduction and popularisation of the production line approach to services and the adoption of Lean Thinking by services following the introduction of Toyota Production System (TPS) derivatives into manufacturing. Next is a summary of the introduction of Lean Thinking in Public Services followed by a critical perspective of Lean Thinking and the TPS. Health systems across the developed world in the past 25 years have undergone reform of one sort or another, so the chapter concludes with an outline of health systems in terms of organisational typology, recent history and drivers for quality, thus preparing for Chapter Two, Lean Thinking and Healthcare.

2.2. Definition of Lean Thinking

The term ‘Lean’ was coined by John Karfcik in 1988 to describe the methods used by Toyota, the Toyota Production System (TPS) (Krafcik, 1988). The term ‘Lean’ production was popularised by Womak, Jones & Roos (1990) in their book, The Machine that Changed the World, revealing the practices of the Toyota Motor Company implemented using Taiichi Ohno’s (1978) adaptation of the Ford Production System (FPS). In Ohno’s TPS both the production system and the qualitative experiences of the employees are considered important for the achievement of quality improvement (Shah & Ward, 2007).
Lean Thinking is a collection of perspectives originating from the TPS that govern the implementation of Lean principles and practices in the workplace. To implement “Lean Thinking”, management begins by specifying value in terms of the customer, and identifying elements that maximise that value through processes such as value streams and flow (Womack & Jones, 1996). Lean Thinking incorporates a number of standardised production analysis methodologies and tools to identify and reduce waste (Arbos, 2002; Womack & Jones, 1996). Some Lean tools are based on, or are derivatives of, statistical control methods, which were introduced into America to ensure wartime production efficiency and quality, latterly popularised by W.E. Deming in post war Japan (Deming, 1986; Walton, 1986).

Holweg (2007) marks the phases of Lean production evolution and introduction into western factories, with Shah and Ward (2007) noting a piecemeal introduction and understanding. Holweg (2007) reports that Sugimori (1977) and Monden (1981) were authors on the TPS and what were to become known as some of the components and techniques of Lean production. Similarly, Schonberger (1982) was revealing differences between Japanese and Western quality techniques (Holweg, 2007; Womack & Jones, 1996). Due to the slow diffusion into western manufacturing, partial views of Lean production existed as well as differences of the interpretation of Lean (Ahlstrom, 2004; Shah & Ward, 2007).

Spear and Bowen (1999) considered the apparent paradox of rigid operational activities and production flows and the ability of Toyota’s operations to be flexible and adaptable. Toyota had uniquely created a process that captured worker tacit knowledge and enabled it to be used in the production process. Spear and Bowen (1999) contend that the TPS captures tacit worker knowledge using four rules that guide the production system’s practice. These
rules link people and their work, their connectivity to the system as a whole, the design of production, and the use of a scientific method to underpin change. The worker is ‘taught to improve their problem solving skills by redesigning their own work’ (Spear & Bowen, 1999, p. 102) thus permitting continuous experiments enabling incremental improvement providing the inherent system flexibility. The end result – Lean – is the methodology and philosophy of achieving more and more with less and less (Womack & Jones, 1996).

So, Lean Thinking is characterised by the notion of the value of a product and that value being created in a continuous flow that captures worker knowledge and skill through the operation of cyclical experiments based on scientific and statistical methods leading to continuous improvement in terms of cost, quality and quantity of the goods or services produced.

Womak & Jones (1996) summarise Lean Thinking in five principles as ‘precisely specify value by specific product, identify the value stream for each product, make value flow without interruptions, let the customer pull value from the producer, and pursue perfection’ (Womack & Jones, 1996, p. 10). Lean production is both conceptual and practical; possessing philosophical characteristics and the methods/tools to measure and monitor the output (Shah & Ward, 2007).

To summarise, Lean production has evolved over time, being an interpretation of Fordist production line manufacturing altered through the particular application of techniques, some based on statistics, which improve the response to variety and reduce costs through the reduction of waste. Its diffusion into western manufacturing occurred inconsistently until a formal description was provided by Womack and Jones (1996). It is this
definition that has taken hold and become the codification of the philosophy and actions to achieve quality, consistently applied by the Toyota Motor Company.

Now that Lean production has been defined, it is relevant to look at developments and the diffusion of manufacturing ideas that have framed and characterised modern service industries.

2.3. Services

Levitt (1972) proposed that service industries needed to adopt paradigms of manufacturing. He viewed the service “mentality” to that of servitude or being at the behest of another and casually creating value leading to his contention that manufacturing’s production line discipline could be prosperously transferred to service industries (Levitt, 1972). Thus Levitt (1972) created a context for the integration of production methodologies and practices into services. A further application of the manufacturing model was the association of scale and cost advantage (Chase, 1978) seen in manufacturing production lines to service industries. Chase (1978) contends more effective service operations can be achieved when managers identify and separate the contact and non-contact functions (also called ‘front’ and ‘back’ office functions respectively) to take advantage of scale efficiencies and rationalisations.

Over the following 20 years divergence from the applicability of manufacturing as a metaphor for services industries evolved. Criticisms of production methods or orientations in services ranged from problems meeting or accommodating unpredictable demand to the application of Taylorist practices on workers (Bowen & Youngdahl, 1998). These Taylorist
“command and control” practices consisted of ‘scripts, procedures, targets, standards, inspection, and compliance’ (Seddon, O’Donovan, & Zokaei, 2009, p. 3) reinforcing the factory view of service work. The effect of these practices was to limit service offerings embedding inefficiencies without providing an environment to seek productivity improvements from employees (Allway & Corbett, 2002).

As manufacturing thinking has changed in the intervening period so has service thinking to include the use of Lean philosophies and methodologies. The introduction of Lean Thinking by service industries is similar to the transition manufacturing experienced. The transition required moving from the FPS production line approach characterised by ‘limited discretionary action of personnel, division of labour, substitution of technology for people and service standardisation’ (Bowen & Youngdahl, 1998, p. 209) to the Lean production view that offers ‘reduced trade-offs, value adding process flow and customer pull, waste elimination, increasing customer focus and the empowering of workers and teams’ (Bowen & Youngdahl, 1998, p. 221).

Moreover a changing view of new service logics in the discipline of marketing reflects a similar shift in outlook from the conventional goods dominant logic typified by the distinguishing between goods and services- the IHIP classification (Vargo & Lusch, 2008) to a movement towards the ‘process of doing something beneficial for and in conjunction with...’ (Vargo & Lusch, 2008, p. 26) implying new focus on the customer’s perspective - seeing them as part of the system not just a passive recipient. They, the customer, are in effect part of a relationship that transcends the actual product or service (Vargo & Lusch, 2008). This is known as Service Dominant Logic.
Therefore there are now two new service paradigms that can be applied to service industries; Lean Thinking, which offers a view of value from the perspective of the consumer, encompassing flow and quality, and from a marketing perspective, Service Dominant Logic that views the customer integral to the value creation.

As this thesis deals with Lean Thinking in a service production context the existence of Service Dominant Logic will not be further explored as it is a marketing construct. It has been mentioned to highlight that system and integral thinking is entering service industry philosophies, and it is not only the modernist production orientations, such as Fordist manufacturing, that are encountering competing post-modern constructs.

2.4. Lean Services

Lean Thinking in service production has been established by managers as a response to rising customer expectations, revenue and competitive pressures, increasing expenses, and regulatory pressures (Allway & Corbett, 2002). Lean Thinking has been introduced into the orthodox or conventional environment of service provision where costs were to be controlled or reduced through scale or decoupling (Chase, 1978; Seddon, et al., 2009) and operated by management measures attuned to that environment. Lean consists of a set of principles – its building blocks – and sets of practices – the activities or tools undertaken to achieve performance improvement (Ahlstrom, 2004; Radnor, Walley, Stephens, & Bucci, 2006). As such, when Lean Thinking is to be implemented in the service production system, the system’s management and measures of its performance are required to be examined (Allway & Corbett, 2002; Seddon, et al., 2009) by diagnosis using tools or techniques such as process
flow, waste identification and the determination of an optimal future state (Allway & Corbett, 2002; Bicheno, 2008).

The view of production as a system was offered by Deming (1986) and this has been taken up and modified by Seddon et al (2009) with the argument that fundamental to Lean service is to view service organisations as a system. By understanding demand and modifying the sequence or compilation of operations that comprise the service improved quality, standardisation and waste reduction can be achieved (Allway & Corbett, 2002; Arbos, 2002; Seddon & Brand, 2008; Seddon, et al., 2009; Swank, 2003). Seddon et al (2009) build off Deming’s (1986) contention that 94 percent of production system problems are a result of the system and therefore the responsibility of management to correct, not by rework or by checking (Seddon, et al., 2009) but through optimising processes linked together that form the ‘production system’ (Allway & Corbett, 2002; Arbos, 2002; Bicheno, 2008).

Deming (1986) was highly critical of the American corporation’s approach to quality and people management, and this is further restated by Seddon et al (2009). Seddon et al’s (2009) view on “Lean service” differs from other authors by reiterating that some organisations implement Lean without changing or considering the inappropriateness of “conventional” service management logics. Instead, they just use Lean tools and methods in an unmodified environment. This reveals an emerging dichotomy between the sides of Lean Thinking in services; an argument between the implementation or tools side and the “new” systems thinking paradigm of which Seddon is a proponent. Seddon et al (2009) are supported in kind by Allway and Corbett (2002) where the authors state ‘They [senior executives] need to realize that the first step is not found in creating a new system, but in
understanding and addressing the fundamentals. Once this is accomplished they can deploy system tools as appropriate’ (Allway & Corbett, 2002, p. 47-48). Bicheno (2008) contends that Lean in a service context is different to that in manufacturing due to the difference of the problems encountered and solutions required in each domain. Therefore, the Lean tools applied in services must be directly relevant and appropriate to the problems at hand.

Standardisation has been implied as a barrier for the effective introduction of Lean into services as standardisation can reduce the ranges of responses that can be provided and their impacts on the cost benefits that scale provides (Arbos, 2002; Bowen & Youngdahl, 1998; Radnor, 2010; Seddon, et al., 2009). Further, Seddon et al (2009) contend that for services to optimise the benefits of Lean Thinking, service businesses must arrange or design their processes to be able to respond to the variety of demand. Rather than trying to predict demand, as the conventional manufacturing paradigm would have, Lean Thinking enables service firms to produce according to the demand they experience. This means that it cannot operate with batch driven or economy of scale principles (Arbos, 2002). The inherent flexibility of Lean comes from the ability to appropriately apply the correct procedures or processes as the demand is presented (Radnor, 2010). In so doing the waste associated by overproduction and set-up times is reduced, thereby achieving more value through the pull of the customer (Ahlstrom, 2004; Arbos, 2002; Womack & Jones, 1996).

Arbos (2002), Seddon et al (2009), Bicheno (2008), Seddon and Brand (2008) and Radnor (2010) all refer to the need to understand variability, determine its span of effect, and to absorb it when excessive. Moreover, Seddon and Brand (2008) see the link between service industry demand variety and the opportunity to encounter and solve problems;
problems that allow learning and therefore an improved ability to design or implement a continuously improving service (Rashman & Radnor, 2005).

Demand in service organisations can be categorised as value demand and failure demand (Seddon, et al., 2009). Value demand is the service attractor or benefit accrued by the customer. Failure demand is represented by returning customers, rework or double handled operations in the service system (Seddon & Brand, 2008) – work not completed ‘right the first time, every time’ (Womack & Jones, 1996, p. 113). ‘Failure demand is waste’ (Seddon, et al., 2009, p. 12) and the reduction of waste is one of the principles of Lean Thinking (Womack & Jones, 1996). Understanding the ratio of the two classifications of demand and having appropriate measures of the work assists the attainment of quality and reduces failure demand impacting on costs (Allway & Corbett, 2002). Reinforcing the counter intuitive nature of Lean Thinking ‘managers often find that many of their company’s favourite metrics actually inhibit productivity’ (Swank, 2003, p. 126). However when performance measures are appropriately orientated they can assist the reduction of failure by focussing on value demand achievement in the first instance (Allway & Corbett, 2002; Seddon, 2005).

The concept of flow is one of the five principles of Lean Thinking (Womack & Jones, 1996). When a production system is organised along the lines of the TPS, it produces what Seddon et al (2009) refer to as economies of flow; a counter intuitive truth that contests the conventional production advantage of scale economies. In services where the value and service utilisation can be intangible, representing the value stream as a diagram, or mapping, substantiates the flow of value of customer pull (Allway & Corbett, 2002; Seddon, et al.,
2009; Womack & Jones, 1996). Mapping allows the semi-tangible or intangible to be made physical on the paper, the value and waste to be determined, actual space where the operations occur to be made proximate, and the use of statistical control methods to gauge and provide data for improved future states (Allway & Corbett, 2002; Arbos, 2002; Bicheno, 2008; Seddon & Brand, 2008; Seddon, et al., 2009; Swank, 2003). In other words, ‘make the remaining value steps flow’ (Womack & Jones, 1996, p. 21).

### 2.5. Lean Public Services

Public services are a range of government owned organisations that deliver services, and may have a mix of governances and operations - some engaged in policy development, others focussed on provision (Cook & Hughes, 2009). Public services where Lean Thinking may be applied range from customer call centres, education and administrative functions or processes of many public entity organisations (Furterer & Elshennawy, 2005), tax services, refuse, public transport and housing (Radnor & Walley, 2008) and sectors such as healthcare, local authorities and the military (Radnor, et al., 2006).

Recent attention from government and policy makers to Lean Thinking in public services is in response to an emphasis on quality and outcomes, especially in healthcare (Ferlie & Shortell, 2001), through to the public sector’s role in economic stimulation and transformation (Cook & Hughes, 2009). Moreover it is generally accepted through analysis that public sector productivity lags behinds the private sector (Radnor & Walley, 2006) and that its structures may not be able to provide any improvement through sector fragmentation and institutionalised requirements (Cook & Hughes, 2009).
Over the past 25 years in the United Kingdom (UK) and New Zealand, public sector reform has been undertaken using a New Public Management ethos (Gauld, 2009; Rashman & Radnor, 2005; Seddon, 2008) which modelled markets, focussed on costs, and relied on a split between policy and operations that resulted in fragmenting some sectors, notably health (Cook & Hughes, 2009). As in the UK, the public in New Zealand is again changing in an attempt to address fragmentation, seeking a focus on outcomes and engaging a local perspective (Rashman & Radnor, 2005), while remediating poor performance through the suggestion of networked institutions, and a drive for continuous improvement and value for money (Cook & Hughes, 2009; Gauld, 2009; Radnor & Walley, 2008).

The attraction of Lean Thinking for the public service is its contribution to reduced costs or efficiency savings (Radnor & Walley, 2006) through its focus on waste and an alignment with “modernisation” approaches that involve continuous improvement and “breakthrough collaborative” or rapid cycle experiments to improve quality (Ferlie & Shortell, 2001; Rashman & Radnor, 2005). However it is also acknowledged that a system that incentivises wide spread change needs a re-orientated sector - especially with respect to leadership, the recognition of the multi party value chains that make up the systems, an emphasis on learning and effective teams and wide use and integrated information technologies (Chapman, 2004; Cook & Hughes, 2009; Ferlie & Shortell, 2001; Rashman & Radnor, 2005; Seddon & Brand, 2008). This is in line with the notion that for the public service to be a fertile ground for Lean Thinking, the whole system needs to have enabling elements including a system wide philosophical approach (Radnor & Walley, 2008) possessing features of the systems thinking management approach rather than the current state - command and control management (Chapman, 2004; Seddon, 2008; Seddon & Brand,
2008). These environmental differences challenge the conventional view of service public management; that is the idea that shared services and cost management will deliver improvements without any focus on service co-creation with the customer, flow, strong value chains or reduced sector fragmentation (Chapman, 2004; Cook & Hughes, 2009; Seddon, 2008).

Similarly, while authors have cautioned against the direct transfer of Lean manufacturing’s tools into the public service (Radnor, 2010; Radnor & Walley, 2008; Seddon & Brand, 2008) they do acknowledge that these tools and techniques provide staff with perspectives that assist to solve problems and configure resources, and that these techniques be deployed to achieve higher output and quality rather than as a means to a reduced cost and head count end (Radnor & Walley, 2006; Radnor, et al., 2006).

While the literature of Lean Thinking in public services is descriptive, rather than analytical, in nature (Radnor & Walley, 2008), there is the view that Lean can be implemented in public services successfully (Furterer & Elshennawy, 2005; Radnor & Walley, 2008; Radnor, et al., 2006) albeit with appropriate adaptations (Radnor & Boaden, 2008). It is also noted that literature on deployment and programme maturity have few public sector examples – the majority of applications of Lean in the literature being in the private sector (Furterer & Elshennawy, 2005; Radnor & Boaden, 2008; Radnor, et al., 2006). Additionally, the public service system and organisation may need to be adjusted to provide productive environments, including the regime of audit and inspection practices and structures for Lean Thinking to be utilised effectively (Cook & Hughes, 2009; Rashman & Radnor, 2005; Seddon, 2008).
So far this chapter has examined Lean Thinking and its applicability to the environments of services and the public sector. It is now pertinent and apposite to this discussion to examine Lean production from a critical perspective contrasting it with the mainstream view that Lean provides benefits and advantages for the organisation and its workers.

2.6. The Critical View of Lean Thinking

Lean production provides variation from the Fordist and neo Fordist production tenets that have come into crisis since the advent of globalised competition in the 1970s (T. Smith, 2000). As such the popularisation of Lean has prompted its analysis in terms of critical theory (Burrell & Morgan, 1979) and of discourse (Gee, Hull, & Lankshear, 1996). This chapter section will discuss some of those perspectives.

In structural terms Japanese or Lean production has been critiqued on the relative power between large and small firms, the cost of capital with respect to utilisation of machines, and Lean production’s weakness to absorb supply and demand extremes (Crowther & Green, 2004; Slack, Chambers, Johnston, & Betts, 2006). Authors have also critiqued (i) the ‘harmonising’ attributes of lean; (ii) the democratising of workplaces through teams, (iii) the improved control of work by workers through enhanced and transferrable skills and (iv) the ability to affect the conditions and contexts of production itself (Joosten, et al., 2009; Knights & Willmott, 2007; Slack, et al., 2006; T. Smith, 2000).

Deskilling is the concept that capital controls work by reducing the levels of skill through the division of labour and new technologies (Braverman, 1974; Heisig, 2009).
Braverman’s (1974) thesis is that scientific management of Taylorism was the main tool for deskilling whereby the craftsman was disassociated from the labour process. As a result work knowledge became concentrated in the hands of management, resulting in their ability to better control work and costs (Heisig, 2009; T. Smith, 2000). However, Braverman’s (1974) thesis is contested in the context of modern production and globalisation, whereby the ‘craftsman’ metaphor does not continue to hold due to the influences of the engineering profession, factory scale and the reliance modern management now has on knowledge and the requirement to remain globally competitive (Heisig, 2009; T. Smith, 2000). Further, the perspectives of deskilling - the reduction of work into repetitive tasks closely adhered to – in modern contexts may not indicate deskilling per se. As Smith (2000) points out a surgeon during an operation follows a rigorous script but would not be considered deskilled.

This change in the contexts of work does not mean that deskilling in Lean conditions does not exist. For as the context of Lean production is different from Fordism, the deskilling and management control effects for Fordism (just in case production) are different from those of Lean (Just In Time production) (T. Smith, 2000). Lean deskilling can be achieved through the de-signification of work (Walker, 2008) and by automation - dissociating the operator from the production itself and by not improving or intellectualising the work (T. Smith, 2000). However, T. Smith (2000) does note that the introduction of automation in some cases may create for the operator new classes of skills. Moreover, the effect of labour market segmentation entrenches the deskilled or unskilled workers in marginal jobs, thus permanently orientating the unskilled towards simple and repetitive jobs in supermarkets or fast food restaurants – the so called ‘M’Jobs’ which can be based on Lean principles (Heisig, 2009, p. 1648). Additionally, the skills gained in these roles may only be relevant to that
firm, thus further ‘deskilling’ the worker in terms of genuine transferable and marketable skills (Knights & Willmott, 2007) required in the modern labour market (Heisig, 2009).

As Lean production aims to eliminate non-value added processes/tasks and the workers who perform them, workforces in Lean environments are referred to as multi-skilled (Heisig, 2009; T. Smith, 2000). However, the drivers for workforce multi skilling may also occur due to imperatives other than Lean (O’Donnell, 1994; Willis, 2005). Key to the critical appraisal of whether workers are multi-skilled depends on the difference between skills and tasks (Knights & Willmott, 2007) and relative perspective on the skill levels. T. Smith (2000, p. 47) discusses ‘The case of the ‘multi-skilled’ operator who performs a variety of tasks in the work process. If each of these tasks taken singly does not involve a high level of skill, does the mere fact that they are combined necessarily result in a more highly skilled worker?’.

Similarly, O’Donnell (1994) found that while management claim staff are multi-skilled, the staff view themselves as multi tasking since ‘these tasks involve common sense and use the skills hospital employees already possessed’ (O’Donnell, 1994, 18). Summarising the findings that multi-tasking was in reality for these workers an enlarging of the range of mundane tasks they already performed (O’Donnell, 1994). Seddon et al (2009) referring to a tools based Lean implementation in the UK public service, allude to this paradox; they reported that tasks within the workplace had become more detailed and repetitive and processes had been standardised and controlled through activity [volume] measurement. On the other hand, it is possible for workers on a Lean factory floor to improve their skill base by developing statistical quality control skills and using problem solving techniques and methods (T. Smith, 2000).
A part of the application of Lean production is the notion of teamwork and pro-democratic workplaces (Knights & Willmott, 2007; Womack & Jones, 1996). The introduction of teams brings with it, in terms of critical analysis process manipulation (Walker, 2008), remuneration confusion (Van Der Weyden, 2008), tapping or utilising the knowledge of workers to maintain management control (Gee, et al., 1996; O’Donnell, 1994; Slack, et al., 2006), little evidence of influence over broader environment in which their work is located (Gee, et al., 1996; Slack, et al., 2006), and peer group surveillance (Hoogvelt & Yuasa, 1994; O’Donnell, 1994). One result of these effects is an increase in worker stress – in its extreme resulting in ‘karoshi or sudden death from over work’ (T. Smith, 2000, p. 52). This increase in physical and emotional workplace stress is created through the reduction in down time between tasks (Willis, 2005), the removal of non-value adding motions from work (T. Smith, 2000), the development of a management by blame culture, and the amplification of conflicts (O’Donnell, 1994) or, summarised as, passing stress down the line. Moreover, the introduction of teams and Lean is also linked to work intensification (Gee, et al., 1996; O’Donnell, 1994; T. Smith, 2000; Willis, 2005).

Work intensification is defined as the ‘Working conditions in which workers are subject to constant pressures to increase output and productivity levels’ (Knights & Willmott, 2007). It is manifest by the carrying the load for other workers (O’Donnell, 1994; Willis, 2005), the addition of tasks (O’Donnell, 1994; Willis, 2005) and the reorganisation of the workforce through the introduction of new classifications of workers (Willis, 2005), and professional confusions (Van Der Weyden, 2008). Willis’ (2005) hospital study outlined a new class of worker who experienced work intensification. The intensification occurred in part due to the removal of unpleasant or repetitive tasks from upper hierarchy occupations.
and adding these tasks to the existing workload and through job redesign innovations - the Just In Time approach to their work (Willis, 2005). Furthermore, relatively unskilled roles may be subject to exploitation, even though they are being managed under the co-operative approach of Lean service (O’Donnell, 1994). Willis (2005) cautions that ‘the intensity for one workforce occupational group will impact on other groups if the work is highly structured around teamwork and where all are committed to the service of care’ (Willis, 2005, p. 572), a sentiment reiterated by Van Der Weyden (2008) and Joosten et al (2009) when discussing the displacement of some traditional doctor’s duties into the roles of other classes of health workers.

Summarising the critical view, while the promoters of Lean production claim there are advantages for the introduction of Lean in terms of competiveness, worker knowledge integration and workplace harmony, there are opposing views of Lean production; namely it is a stage of Fordist production that retains the concept of ‘alienation’, exhibits economic inflexibility, provides for ongoing deskilling, contributes to a partitioned labour market, intensifies work, and allows the continued exploitation of some classes of workers.

The discussion so far provides examples of the effects of Lean in the healthcare industry. The following section will examine healthcare with the framework of a service industry.

2.7. Healthcare Services – Public Service and Quality context

Healthcare as a service is different and complex (Gauld, 2003), not only in terms of the actual services offered but ‘In their most fundamental form, generic public agencies are not
like private ones’ (Gauld, 2003, p. 14). Together with the obvious difference of organisational drive (profit), publicly provided healthcare organisations also differ from other industry groups in terms of independence, control, worker motivators and micro economic forces (Gauld, 2003). These differences include;

- the core fundamental - healthcare is about life and death situations;
- service ethos - the safety and care of people;
- the ability of informed consent and choices - the significant asymmetry of information patients have regarding their care and illnesses; and
- organisational culture aspects - the relationships between the workforce – many are highly specialised in a complex organisational structure (Freedman, 2002; Gauld, 2003; Mintzberg, 1979).

Further, the notion of public ownership and governmental policy provides for political positioning over publically owned services (Ferlie & Steane, 2002; Gauld, 2003) where change can be seen as the attempt to transform healthcare from a citizen’s right (social contract theory) into a customer based service (Knights & Willmott, 2007).

Mintzberg (1989) classifies the general hospital as a professional organisation; a decentralised bureaucracy, with professionals working in the spirit of professional autonomy with wide spans of control where the main purpose of the administrative function is to provide support to the professionals doing the work. Professional training is a long and extensive undertaking and provides for the professional’s instruction and programming (Knights & Willmott, 2007). These professionals, doctors, nurses, medical technicians, and
allied health specialists, exercise considerable discretion in their role and as much control is exerted by their professional bodies as by the organisation itself (Mintzberg, 1979). It is this influence of the profession that differentiates professional ‘bureaucracy’ from the mechanistic bureaucracy. Mechanistic bureaucracy generates its own standards, which are enforced by line managers, whereas standards in the professional bureaucracy largely originate outside of its structure and are adhered to through professional approval and association (Bate, 2000; Mintzberg, 1979). The power and prestige afforded to the medical profession gives doctors considerable professional power, including the power to resist change of the status quo in terms of organisational modernisation (Bate, 2000; Knights & Willmott, 2007).

Mintzberg (1997) further contributes to the literature on health organisation through studies seeking to elucidate the complex interactions within these institutions. The worldviews of the organisation’s participants provide for disengagement ‘to the extent that these four worlds disconnect – see largely past each other due to different perspectives – cleavages arise in the functioning hospitals making them extremely difficult to manage’ (Mintzberg, 1997, p. 11). Additionally, issues such as fragmentation, commitment and deal making provide for strained or ambiguous daily interactions.

Management norms within hospitals began to change with the introduction of public policy reforms (Gauld, 2009) in the OECD and Commonwealth countries from the 1980’s, with the introduction of New Public Management (NPM) (Rashman & Radnor, 2005; Seddon, 2008). NPM is underpinned by the notion of the infallibility of the market and introduced managerialism – the desire to implement management systems and create a conflict between the traditional leaders of healthcare (the doctors and nurses) – whom NPM
deemed did not hold sufficient ‘management’ skill – and the ‘new’ administrative management (Gauld, 2009; Kollberg, Dahlgaard, & Brehmer, 2007). Moreover these ‘new’ public sector managers who had skills of running private businesses and mechanistic bureaucracies began applying their experience, sometimes inappropriately, in the different context (Gauld, 2009; Prahalad & Bettis, 1986). The conflict had the effect of undermining trust between the medical professional and the ‘new’ public sector manager; however, a recent shift to a more social democratic policy approach has led to a climate where collaboration between clinicians and managers is more possible (Gauld, 2009; Malcolm, Wright, Barnett, & Hendry, 2003). The social democratic approach also brings with it a new emphasis. Where before NPM had cost management or elimination as a goal, the new social democratic agenda provides for quality improvement, co-operation and monitoring and evaluation of organisation performance (Rashman & Radnor, 2005); performance that is more attuned to outcome attainment (Malcolm, et al., 2003). Recent developments in New Zealand have emphasised the need for patient journeys and clinical pathways to be more defined, consequently sector co-ordination and network models are being recommended and becoming evident (Cook & Hughes, 2009; Gauld, 2009).

It is in this political and organisational landscape that quality has moved to the foreground. Not only is quality enhancement and certainty driven by cost in both the public and private systems (Ferlie & Shortell, 2001; Gauld, 2009), it has led to clinicians becoming increasingly engaged with and responsible for quality and clinical governance (Freedman, 2002; Weiner, Shortell, & Alexander, 1997). While the NHS in the UK has a national framework for quality (Freedman, 2002; Gauld, 2009), New Zealand has largely relied on local responses nestled within the individual District Health Boards (Gauld, 2009). However
the advent of the New Zealand National Quality Committee becoming a Crown Commission (Ryall, 2010) provides a vehicle from which to leverage nationwide quality initiatives.

### 2.8. Chapter Summary and Conclusion

Lean Thinking is the application of processes that aim to maximise production efficacy in terms of quality and cost by maximising value by way of a focus on flow and involves workers in ways conventional Fordist production did not. Lean Thinking is about waste - its identification and reduction.

Lean Thinking is seen, by managers, to be applicable to service industries because of their uptake of production-line organisation and a focus on the customer, and is relevant to public services for similar reasons. Nonetheless, public services are seen to be different from private sector business in that they serve and provide services under a different premise; bringing with it divergent opinions on how best the service is to be operated from both internal and external perspectives.

Moreover, comprehensive beneficial effects of Lean production are able to be contested on a number of grounds such as narrow and non-transferable work skills, increased stress and amplified workplace control. Critique of Lean implementation into the service sector includes the direct implementation of factory floor Lean tools and techniques as well as the accusation that Lean production is simply deskilling and further Taylorising the workplaces using harmony and team work as distractions from the real agenda; namely enabling increased management control of the work.
Lastly, the vast complexity of the health sector, which has a particular organisational form that has constituents who possess different skills, values and professional responsibilities, must coalesce to provide the range of services utilised by the patient. In the UK and New Zealand these organisations have been operating in a changing public management environment, driven by economic ideologies of successive governments since the early 1980s, whereby the post war organising paradigm has been fully replaced by New Public Management and is again entering a phase of re-ordering. It is into this dynamic environment of modern healthcare that Lean Thinking is being introduced.
3. Chapter Three: Literature Review - Healthcare

3.1. Lean Thinking and Healthcare

3.1.1. Introduction

The previous Chapter defined Lean Thinking and framed its development across industries. This Chapter contains the literature relating to Lean Thinking and Healthcare and is made up of four sections. In turn the sections, discuss the introduction of Lean thinking into the healthcare environment, the nature of change in a professional organisation, Lean Thinking in Emergency Departments, and the final section summarises and concludes the chapter.

3.1.2. The Entry and Implementation of Lean Thinking into Healthcare

Healthcare finds itself needing to address rising costs, preventable errors and the recognition of waste impacting on the sector (Ferlie & Shortell, 2001; Graban, 2008; Jones & Mitchell, 2006; Radnor & Walley, 2006). Authors contend that Lean provides a philosophy, a management system and a toolset that organisations can use to lessen error rates, improve quality care and reduce wait times for patients (Graban, 2008; Jones & Mitchell, 2006; Harrison & Kimani, 2009; Spear, 2005; Womack, et al., 2005). Hence it is Lean’s ability to address these issues that is the attraction of Lean for healthcare decision makers. Graban (2008) notes that process improvement is not new to healthcare, as industrial engineers developed some practices that are still used in health care today (Graban, 2008, p. 3) and Womack et al (2005) state that waste is a common problem throughout the healthcare system and therefore the attention to Lean Thinking is appropriate.
While Lean Thinking has been applied to other manufacturing systems and latterly services, its acceptance by healthcare has taken longer. Pre 2000, elements of Lean are reported to have been used in limited ways within healthcare and may not have been regarded as Lean. From 2001 to the present there has been a proliferation of books and guides for practitioners and the emergence of cases and theoretical papers from researchers and academics (Brandao de Souza, 2009; Young & McClean, 2008). From 2005 onwards there is an increase in numbers confirming an increase of interest of Lean in healthcare. Publications by National Healthcare quality and development bodies also began to promote and facilitate the introduction of Lean Thinking for health systems and institutions (Jones & Mitchell, 2006; Womack, Byrne, Fiume, Kaplan, & Toussaint, 2005) or include Lean Thinking in reports on healthcare quality (Boaden, Harvey, Moxham, & Proudlove, 2008).

Many case studies and reported interventions are referred to as Lean. This may be due to one or two Lean tools being utilised while the intervention as a whole may not fit the Womack & Jones (1996) definition of Lean (Brandao de Souza, 2009), or it may have been a quality implementation in the nature of Lean (Young & McClean, 2009); an exacerbation of the problem of the definition Lean identified by Shah & Ward (2007) and Ahlstrom (2004). As the introduction of Lean into healthcare is recent, much of the literature is speculative and in general management literature the promoters of Lean offer Lean’s benefits with little analysis (Young & McClean, 2009) or conclude that while cases provide useful insights they are less able to be generalised and identify subjective elements Joosten et al. (2009). The message being available in such a wide range of publications provides authors the opportunity to suggest further “concrete…works” (Brandao de Souza, 2009 p131), for “more rigorous and balanced research and reporting” (Joosten, et al., 2009 p346) or to comment that
research is limited when evaluating if improving quality saves money (Øvretveit, 2009); seemingly a demand from a research community for improved empirical evidence of Lean effects in the healthcare system.

Lean Thinking is credited with providing direct and attributable savings and reallocating costs within organisations (Graban, 2008; Kaplan & Patterson, 2008; Womack, et al., 2005). Examples from healthcare include reduced lengths of stay or successive financial performance improvements (Ben-Tovim, et al., 2007; Fillingham, 2007; Jones & Mitchell, 2006). While evidence does link avoidable costs to poor quality clinical and administrative processes any cost savings derived from a quality improvement initiative rely on the initiative being at least cost neutral (Øvretveit, 2009). However, the literature cautions that Lean Thinking is different to cost reduction initiatives rather as it aims to provide changes in work and organisation it achieves improved quality output within similar cost boundaries not to rapidly release cash or reduce headcounts (Ben-Tovim, 2007; Jones & Mitchell, 2006; Radnor & Walley, 2006; D. Weber, 2006).

The intractable problems of safety, quality and efficiency impacting on healthcare organisations have acted as catalysts for the acceptance of new thinking, systems and process redesigns in an attempt to achieve permanent solutions (Joosten, et al., 2009; Kim, Spahlinger, Kin, Coffey, & Billi, 2009; Zidel, 2006). Boaden et al (2008) provide a range of quality improvement approaches to ‘enable links to be made between aspects of quality improvement that are often regarded as separate; specifically improvement from clinical and organisational perspectives’ (Boaden, et al., 2008, p. 9). Lean Thinking provides a philosophy and the tools that identify the root causes of problems enabling continuous
improvement cycles. As such Lean has been identified as a viable alternative to the traditional approaches to solving hospital quality problems (Kim, et al., 2009; King, Ben-Tovim, & Bassham, 2006; Walley, Silvester, Steyn, & Conway, 2006). However the translation of Lean into the hospital environment is not without its own distinct processes; sometimes implemented in an ad hoc fashion (Young & McClean, 2009).

Edwards (in Jones & Mitchell, 2006) remarks that Lean must be part of an organisation’s strategy, an opinion supported by Walley & Gowland (2004) who reported that ill defined strategies can contribute to divergence from or impede the intentions of the Lean initiatives. Furthermore, the principles and tools of Lean are tightly connected so to separate them reduces their effectiveness (Ballé & Regnier, 2007; Seddon, 2008) or shifts the problems to adjacent processes (Joosten, et al., 2009). Tying quality improvement implementation into an overall strategy is more likely to lead to sustainable continuous improvement (Radnor, et al., 2006; Shortell, Levin, O'Brien, & Hughes, 1995).

3.1.3. Implementation Patterns and Themes

Burgess, Radnor, & Davies (2009) outline the uptake and implementation of Lean Thinking across the NHS. They find that 5 out of 152 hospitals fitted their category of taking a systematic approach to Lean, and that 53 percent are implementing Lean in some fashion. The study found that a significant number instituted a national programme, the Productive Ward; it being implemented either on its own or being seen as separate initiative from other local Lean activities (Burgess et al, 2009, p. 8). A similar pattern is described by Fillingham (2007) who commented that in 2005 only a few hospitals worldwide were attempting a systematic organisation wide approach. Across the Atlantic Cohen et al (2008) found 6
percent of hospitals surveyed were undertaking Lean Thinking or TPS type activities. The proportion of project type Lean implementations identified in the UK (Burgess, et al., 2009) is upheld by the literature reviewed by Brandao de Souza (2009), who found more cases related to manufacturing like projects, managerial support and patient flow interventions in some departments or areas of the hospital rather than whole of organisation implementations; similar results were found in a 1995 review of Total Quality Management (TQM) literature (Bigelow & Arndt, 1995).

The synchronisation of demand with capacity is a key element for successful lean production (Slack, et al., 2006). Existing hospital systems are an evolution of the original design and the added layers of workarounds that have become entrenched as operational criteria (Bohmer, 2010; Kim, et al., 2009; Spear, 2005). Furthermore, as organisations tend to focus on tangible occurrences, prevention measures can be delayed if problems / symptoms do not surface or are considered not repairable (Zidel, 2006). Redesigning the operational processes requires firstly an understanding of the patterns of demand (Kollberg, et al., 2007; Ryckman, et al., 2009; Seddon, 2008; Walley, Silvester, Steyn, et al., 2006), the different natures and causes of variation in that demand (Ballé & Regnier, 2007; Haraden, Nolan, Resar, & Litvak, 2003; Joosten, et al., 2009), and the weakness of the former methods used to deal with variation (Walley, Silvester, Steyn, et al., 2006). Therefore the acquisition of new outlooks by managers and staff is of importance to limit traditional management actions (Ballé & Regnier, 2007; Walley, Silvester, & Mountford, 2006), to address the controllable factors of variation (determining the natural or artificial variation) (Joosten, et al., 2009; Ryckman, et al., 2009), and to begin to orientate the process towards value and the customer (Kim, et al., 2009).
As health care delivery is a series of complex processes (Kim, et al., 2009; Spear, 2005), there are different expectations of value depending on the actor’s position within the system - clinical, managerial or the patient (Bigelow & Arndt, 1995; Boaden, et al., 2008; Kollberg, et al., 2007; Young & McClean, 2008). The evidence basis required for a change of clinical practice is likely to be more rigorous than for a factory, therefore when undertaking a “leaning” of clinical processes the existence of conflicting beliefs and traditions makes it difficult to moderate a combined view (Walley, Silvester, & Mountford, 2006; Young & McClean, 2009). A result of these tradeoffs is that a more accessible value criteria is adopted, one that is less subjective or feelings based or that relies on specialist medical knowledge resulting in the adoption of a middle ground – the ‘leaning’ of the hospital’s operational processes or non patient contact areas (Radnor & Boaden, 2008). These focal points for Lean improvements may not be of the greatest strategic priority for the organisation i.e. keeping people well (Shortell, et al., 1995), but one that most actors can align with (Young & McClean, 2008). This manifestation is similar for TQM into healthcare where ‘the vast majority of applications [of CQI in healthcare] to date have been in functions providing administrative support to patient care activities rather than directly addressing clinical processes themselves’ (Shortell, et al., 1995, p. 16) and reiterated for Lean that ‘operational value is likely to be the effectiveness of the service... that most if not all Lean Healthcare has been driven by an Operational view of value’ (Young & McClean, 2008, p. 385). But this pragmatic approach is challenged by Bevan (in Boaden, et al., 2008) who emphasises a holistic view of quality; one that encompasses the managerial and clinically led domains.
3.1.4. The Use of Lean Tools and Techniques

The range of tools used in Lean Healthcare implementation are the set of standard solutions associated with Lean Thinking (de Koning, Verver, van den Heuvel, Bisgaard, & Does, 2006) and relate to problem solving and waste identification (Deming, 1986; Womack & Jones, 1996; Zidel, 2006). Further, Øvretveit (2009) finds tools used as part of Lean Thinking as effective in respect to quality and costs.

The following table lists the tools or Lean techniques and the article in which they appear.

<table>
<thead>
<tr>
<th>Lean Tool Featured</th>
<th>Article</th>
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<tr>
<td>Visual control</td>
<td>Ballé &amp; Regnier (2007)</td>
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The literature of Lean implementation tends to contain favourable reports of the outcomes of the implementation of Lean tools and less examination of its effect on the work force (Joosten, et al., 2009) or the potential for the introduction of work intensification into
healthcare (Young, et al., 2004). The participative environment required by Lean teams requires a shift from traditional western industrial breakthrough or ‘step’ change methodology driven by capital or technology and led by management to that of ‘Japanese’ style of change management, one of continuous improvement or Kaizen led by the work teams themselves (Walley & Gowland, 2004). Managers are obliged to come to the realisation they are not there to control processes and resources but to improve the environment for people and teams to progress (Ballé & Regnier, 2007; Joosten, et al., 2009). Furthermore, fiscal drivers or incentives within the health system itself provide a difficulty for managers to change their view of the workplace system (Hellström, Lifvergren, & Quist, 2009). These incentives encourage managers to distort either the system or choose measures / metrics contra to the performance improvement activities continuing symptom relieving solutions rather than promoting new thinking in the way healthcare is managed and monitored (Kollberg, et al., 2007; Walley, Silvester, & Mountford, 2006).

### 3.1.5. Barriers and Enablers for Lean Healthcare

While the literature on Lean implementation in healthcare lacks empirical data there are a number of cases and evaluations that provide observations and evidence regarding obstacles and facilitators for implementation. An analogous experience for Lean healthcare implementation can be found in the literature reviewing the effectiveness of the introduction of Continuous Quality Improvement (CQI) in to healthcare in the 1990s. Shortell et al (1995) reveals challenges to CQI in healthcare based on cultural, technical and strategic dimensions that are similar to what the literature on Lean healthcare present.
Radnor et al (2006) provide a review of Lean implementation in the public service, and identify success factors including organisational culture and ownership, organisational readiness, management capability, resource provision, access to external support, effective communication, a strategic approach to teamwork, realistic timeframes, and systems thinking. More particular to healthcare, a number of authors found that nurses after training or awareness sessions were more readily able to accept Lean as it is surmised that process management fits with their work organising principles (Hellström, et al., 2009; Laursen, Gertsen, & Johansen, 2003; Weeks & Keen, 2009).

Hellström et al (2009) point to the organisation itself as a barrier to the implementation of Lean. A hospital being a professional organisation (Mintzberg, 1979), it has operating structures and cultures based on the standardisation of skills and knowledge in direct opposition to the standardisation of work processes and delegation that continuous improvement offers (Hellström, et al., 2009; Laursen, et al., 2003). Therefore the existing orientations of clinicians and managers to act in functionalist and deterministic ways impede the thorough and correct application of Lean techniques e.g. the PDSA cycle (Walley & Gowland, 2004). Furthermore, cross boundary work such as a patient pathway presents ambiguity; a challenge to staff that seeks affirmation through hierarchy or function based organisation (Brandao de Souza & Pidd, in press; Hellström, et al., 2009). Even when there are improvements to flow and outcomes agreement gaps exist; ‘the dichotomy between operations management and professionalism must be studied in order to get to the bottom of some of the opposition to lean thinking’ (Laursen, et al., 2003, p. 14) and within the operations management construct whereby ‘the functional manager and the process owner have different cognitive structures’ (Hellström, et al., 2009, p. 5). Thus the warning of Bevan
(in Boaden, et al., 2008) that ‘when we treat clinically-led improvement (audit, clinical governance, etc) as a separate entity from managerially-led performance, we do so at our peril’ (Boaden, et al., 2008, p. 1) requires some reconciliation.

Bevan’s (in Boaden, et al., 2008) referral to a separation can be qualified in part through hospital power differentials (Bate, 2000) and the shift from medical towards managerial power, due to New Public Management (NPM). This created an inherent conflict into which Lean, which also requires adaptation of management practices, must attempt to change how people perceive and manage healthcare organisations (Drummond-Hay & Bamford, 2009; Kollberg, et al., 2007; Radnor, et al., 2006). Similarly, the rules of funding and managing performance in public healthcare entities being different from market based manufacturing and services can fail to make Lean production viable in this environment due to the organisational logic and the lack of market incentives (Hellström, et al., 2009; Walley, Silvester, & Mountford, 2006).

Brandao de Souza & Pidd (in press) offer barriers typical of Lean implementations, some that are particular to healthcare. Firstly the perceptions of Lean by healthcare staff are identified as a barrier. Lean coming from manufacturing is associated with Taylorist work conditions (Brandao de Souza & Pidd, in press; Langabeer, DelliFraine, Heineke, & Abbass, 2009). Lean is therefore seen as inappropriate due to the identity of uniqueness healthcare possesses and a perceived inapplicability of the manufacturing paradigm (Hellström, et al., 2009; Laursen, et al., 2003). Secondly, the skills and orientations of staff are identified, for not only, indicated above, does industry and the organisation imprint management behaviours, these operating behaviours can be incompatible with those now needed to
successfully implement Lean (Brandao de Souza & Pidd, in press; Walley & Gowland, 2004; Walley, Silvester, Steyn, et al., 2006). The last barrier identified unique to healthcare is that of the hierarchy of management roles and clinical professionalism - characteristics of a professional service (Boaden, et al., 2008).

Other Lean implementation barriers found across industries include;

- Terminology - the introduction of manufacturing and in particular Japanese words into the workplace,
- Organisational momentum - the need for a strategy and preparedness to maintain the continuous improvement cycle including training and learning (Ballé & Regnier, 2007; Esain, et al., 2008, Radnor, 2010 #1),
- Data collection and performance measurement – where new metrics need to be identified associated with flow and tools used to assist with informing continuous improvement activities (Graban, 2008; Haraden, et al., 2003; Kollberg, et al., 2007; Walley, Silvester, Steyn, et al., 2006), and,
- People factors (Radnor, et al., 2006).

Finally, the last significant barrier to change identified by Brandao de Souza & Pidd (in press) is that of resistance to change. It features in most of the cases reviewed for this literature review. It is important and multifaceted, so much so, that it will comprise the next part of this chapter.
3. Chapter Three: Literature Review - Healthcare

3.2. Organisational Change and Lean Healthcare

3.2.1. Introduction

This section reviews the complexities of organisational change in the healthcare context. It identifies the unique nature of the professional service organisation and the tensions that are apparent through the different professional practices that exist. Finally, this section provides a context for the last section of the chapter, that of the Emergency Department.

Mintzberg (1979) frames the professional bureaucracy as a structure that provides stability and order; it is not a vehicle designed for change (Bate, 2000). Change in the context of these types of organisation provides for resistance even if the strategy is to provide for increased creativity and teamwork (Crowther & Green, 2004; Knights & Willmott, 2007). In New Zealand, where the health sector has been under almost constant change since the 1980s (Gauld, 2003), change managers have been challenged to overcome organisational resistance based on staff’s previous experiences with change (Pardo del Val & Fuentes, 2003) and they have met with issues generally associated with change such as conflict with an existing organisational culture and unforeseen events that have resulted from the planned changes (Gauld, 2003). Furthermore, the destabilising effects of breaking existing routines, status’ and power constructs (Bate, 2000; Crowther & Green, 2004; Knights & Willmott, 2007) create resistance through challenging what is in effect the cultural web of the organisation.
3.2.2. Culture of Professional Organisations

Johnson and Scholes (2002) present a cultural web of the NHS developed by managers in the 1990s that documents the symbols, routines and power groups within the UK National Health System and comment that this construct and the ‘taken for granted’ assumptions it represents are valid for other state owned health care systems. The existing organisational culture is challenged by the introduction of Lean Thinking through the offering of a new context of operations; one that undoes the rigidities of operational and professional boundaries and exposes the range of cultural mindsets within hospitals, which can be expressed as resistance (Bate, 2000; Knights & Willmott, 2007; Waring & Bishop, 2010; V. Weber & Joshi, 2000). An understanding of these factors assists managers to moderate the negative results of organisational resistance or necessarily view organisational change as contingent (Pardo del Val & Fuentes, 2003; Waring & Bishop, 2010). Pardo del Val & Fuentes (2003) offer a range of sources of resistance from their research including deep rooted values, departmental politics, low motivation due to past failures, communication barriers, change values opposite to organisational values, and leadership inaction. Further they found these source’s intensities were less for an evolutionary change than for a revolutionary change (Pardo del Val & Fuentes, 2003, p. 153).

By understanding the type of change (planned or emergent, evolutionary or revolutionary), the factors that improve change performance and the stickiness of new knowledge or practices, managers can prepare for implementation (Esain, et al., 2008, Weber, 2000 #208; Ginsburg, 2003; Pardo del Val & Fuentes, 2003; Szulanski, 1996). Besides, the use of Lean work practices such as team-based organisation, continuing training
and learning and standardisation, discipline and control (Olivella, Cuatrecasas, & Gavilan, 2008) can assist in overcoming change resistance (Bamford & Griffin, 2008; Lodge & Bamford, 2007). Awareness and training of new ideas about Lean and its processes helps to create a critical mass of workers important for the organisation to have, before the change becomes self sustaining (Radnor, et al., 2006).

3.2.3. Team Working and Lean Implementation

Research shows that team working in hospitals provides for improved mortality rates for patients and for these teams to be effective they need organisational support (Bamford & Griffin, 2008; Olivella, et al., 2008). Further, the teams do not necessarily organise across the organisational or functional boundaries, but may respond to inter-departmental patient pathways in terms of multi disciplinary networks or a web of sub unit teams to share information easily (Bamford & Griffin, 2008; Weeks & Keen, 2009). This being so, an awareness of the whole patient journey and a performance framework that integrates the speciality outputs for each team was found to be required (Bamford & Griffin, 2008). The clarity and effectiveness of performance frameworks, the relevance and usefulness for work and the data performance monitoring it produces is influential for action (Ginsburg, 2003; Walley, Silvester, & Mountford, 2006; Young & McClean, 2009) and for team-working within the organisation (Bamford & Griffin, 2008). Weak organisational commitment to performance of the teams and their managers can exacerbate issues of ambiguity of power, responsibility and authority (Bamford & Griffin, 2008; Ginsburg, 2003).

The effectiveness of the teams is founded on inter-personal dynamics, communication and leadership (Bamford & Griffin, 2008; Olivella, et al., 2008). The role of leaders in Lean
organisations is seen as different to the role in traditional organisations. The style and roles of Lean team leaders is more than the functional authoritarian; Lean leaders utilise other skills such as facilitation and create a climate of encouragement (Joosten, et al., 2009; Olivella, et al., 2008). While the team members can acquire additional skills (communication and problem solving), team effectiveness is also linked to diversity in composition, which if managed well increases available information and perspectives, counters status differences, and mitigates power differentials (Radnor, et al., 2006; Weeks & Keen, 2009).

3.2.4. Leadership and Lean Implementation

Who the leader is, is important as people pay attention to them and how they react to or frame the challenge of change (Edmondson, 2003). Team leaders who approach teams as genuine leaders rather than experts and therefore frame the team members as partners not subordinates improve implementation sustainability and encourage innovation, (Edmondson, 2003; Gawande, 2010; V. Weber & Joshi, 2000; Weeks & Keen, 2009). Moreover, the traditional role of the clinician as being the ‘hero’ is seen as less relevant where teams need co-operative communication, where leadership is becoming a collective responsibility and where the patient pathway is becoming a more accepted operational organisational model (Bamford & Griffin, 2008; Bate, 2000; Bohmer, 2010; Gawande, 2010). However, training to re-orientate clinicians in this regard may be lacking (Gawande, 2010).

The visibility and presence of managers or organisational leaders is vital to support Lean initiatives (Olivella, et al., 2008; Radnor, et al., 2006); and has a multiplier effect when there is consensus of clinical staff as to the senior leadership’s commitment to improvement (Dückers, et al., 2009). However, success in service outcomes is more than the visibility of
the leader and agreement on their commitment. Engagement in improvement activities by senior doctors is also an essential role of senior hospital leadership (Øvretveit, 2005) and the implementation of Lean is situated within the interplay of managerial and professional practices (Waring & Bishop, 2010).

Success also relies on methodologies of relating to the employees and teams that result in employee involvement and a closer alignment with the organisational strategy, policies and performance (Anderson, 2006; Radnor, et al., 2006). To maintain quality in hospitals, workers can often be placed under conditions of stress (Gittell, 2008). Gittell (2008) advances the premise that relational work practices aid worker resilience and staff can, in modern organisations, foster relationships and communication that aid task integration; an enabling environment, due in part, to the choices made by leaders in the form of their workplace engagement approaches.

By choosing a strategic approach to change and organisational transformation, Kotter (2007) contends there are a number of steps, which if undertaken as a whole will provide sustainable outcomes. Leaders may choose only to undertake some of Kotter’s phases, but ‘skipping creates an illusion of speed and never produces a satisfying result’ (Kotter, 2007, p. 59). Adopting a learning approach may assist leaders to adapt their change plans to account for developing dynamics (Edmondson, 2003), better linking any points of change to develop into systemic improvement rather than to remain as points of functional problem resolution and to take advantage of spontaneity within the organisation (Esain, et al., 2008).

To summarise, the organisational context for change in healthcare is complex. Not only are these professional organisations – replete with tribes and their particular cultural
orientations – they are in essence service organisations where the staff and the patient co-create the value experience, where there is a considerable level of emotional labour and in which functional teams assist with improved quality and safety. Further, the orientation to Lean challenges the traditional structures of service delivery and asks for new skills and learning to become organisational norms, replacing the understood notions of hierarchy and relationships and reconstructing practices within the hospital. Thus, without supportive structures and strong organisational commitments from the leaders, clinical and managerial, of the organisation it is unlikely that Lean will ‘take’; rather Lean Thinking’s introductions could result in isolated points of change.

Up to this point, previous parts of the chapter have revealed Lean Thinking’s relevance, application and introductions into healthcare. To conclude this Literature Review chapter the last part outlines literature relevant to the situational context of this thesis, that of the Emergency Department in a hospital.
3. Chapter Three – Literature Review - Healthcare

3.3. Lean Thinking in Emergency Departments

3.3.1. Introduction

This section begins with a discussion framing the typical situation of Emergency Departments. The section then describes the model of operations and the emergence of industrial applications into this workplace. This is followed by a review of the introduction of Lean Thinking into Emergency Departments, summarising the literature on implementations and providing a section on the New Zealand situation. Lastly the chapter closes with a summary of Lean Thinking in Healthcare.

A prevailing reason for the introduction of Lean Thinking into Emergency Departments is the problem of overcrowding, the problems of quality and cost that this brings and the seemingly inability of traditional management responses to provide sustainable solutions (Jones & Mitchell, 2006). Overcrowding at Emergency Departments (EDs) is a worldwide problem (Ardagh & Richardson, 2004; Wilson, 2005) and is attributed to a range of reasons from within and outside of the hospitals’ span of control (Baumlin, et al., 2010; Dickson, Anguelov, Vetterick, Eller, & Singh, 2009; Fatovich, 2002; George, Jell, & Todd, 2006). In an attempt to provide answers or model responses to this phenomenon, an operations research and management approach has been undertaken by some researchers (Banerjee, Mbamalu, & Hinchley, 2008; Ceglowski, Churilov, & Wassertheil, 2005; Khurma, Bacioiu, & Pasek, 2008; Walley, 2003). Recently EDs have tackled the problems of long wait times, patients leaving before being seen, lengths of stay within the department, and the time being taken before the patient progresses further to other hospital based services, by using Lean
philosophies. Techniques such as value stream mapping, statistical analysis, standardised procedures and empowering the workforce have been used (Baumlin, et al., 2010; Dickson, Anguelov, et al., 2009; Dickson, Singh, Cheung, Wyatt, & Nugent, 2009; Ieraci, Digiusto, Sonntag, Dann, & Fox, 2008; Kelly, Bryant, Cox, & Jolley, 2007; King, et al., 2006; Ng, Vail, Thomas, & Schmidt, 2010).

3.3.2. Traditional Model of ED Patient Management

Before Lean Thinking is discussed in the context of Emergency Department work, it is relevant to outline the traditional method of patient assignment and management. The traditional model is based on an undifferentiated single arrival stream entering a system that may not have been specifically designed to address the current demand volumes (Ardagh & Richardson, 2004). When the patients arrive they are sorted into categories using the triage system (Ardagh & Richardson, 2004; Baumlin, et al., 2010; King, et al., 2006). Triage is a tool used to estimate urgency (Working Group for Achieving Quality in Emergency Departments, 2008) and as such it classifies patients into groups (1-5 – with 1 being the most urgent and 5 being the least) with each group assigned recommended times that they need to be attended to by a doctor. Triage thereby assists to allocate the medical team’s attention to those in most need (Windle & Mackway-Jones, 2003; Working Group for Achieving Quality in Emergency Departments, 2008). A by-product of triage’s operation is that the lesser need groups (classification 4 -5) tend to be wait-listed in the single queue, because as the more urgent cases take precedence these lower groups lose their places (in order of arrival) to the more urgent cases; increasing wait-times, contributing to overcrowding and encouraging workarounds and push practices (Ben-Tovim, et al., 2007; Leaman, 2003; Windle &
Mackway-Jones, 2003). Walley (2003) also found that staffing was not synchronised with the pattern of attendances in terms of both volume and acuity and this contributed to backlogs.

Overcrowding and deteriorating patient care in Emergency Departments have been attributed to a range of complex causes (Fatovich, 2002) including, rising admissions and presentations (Baumlin, et al., 2010; Ieraci, et al., 2008), difficulty in accessing healthcare (Baumlin, et al., 2010), increasing acuity and numbers of older patients (George, et al., 2006), and reducing resources in the healthcare sector (Ceglowski, et al., 2005; Steel, 1995). Typical responses have been to divert attendances of low acuity patients or looking for segments of these attendances that are seen as not deserving and then diverting these to more appropriate services (Steel, 1995; Wilson, 2005; Working Group for Achieving Quality in Emergency Departments, 2008). However any simplistic diagnosis of inappropriate presentation and its attendant solutions fails to acknowledge the complex nature of the reasons for a patient choosing an ED over a GP, nor has it contributed to the notion that the ED is part of a wider system, and that health professionals have not yet agreed on what is a definition for an inappropriate attendance (Ardagh & Richardson, 2004; Richardson, et al., 2006; Steel, 1995; Walley, 2003). Further, rather than bringing institutional and general practice medicine together, the debate over who is an emergency patient or not, has provided for additional friction and for solutions being derived and implemented by management (Wilson, 2005).

3.3.3. Applying Manufacturing Processes to Emergency Departments

The healthcare sector has been slower than other service industries to adopt process improvement methodologies from manufacturing (Brandao de Souza, 2009; Walley, 2003, Dickson, 2009 #66). While Lean Thinking is not intended to change clinical practice it is
about improving the system of care (McGrath, et al., 2008) and having clinicians roles expand to not only take care of patients but also to be finding better ways of providing that care (Dickson, Anguelov, et al., 2009). Advances in process theory and design have enabled the application of operations management and research approaches to be applied to healthcare processes (Khurma, et al., 2008; Walley, 2003), noting that the processes are complex in themselves, so may require simulation to reduce risk (Young, et al., 2004) or that sometimes the simulation models do not represent the flows uniformly (Ceglowski, et al., 2005). A number of studies have attempted to model ED flow dynamics using software to assist with flow planning and design (Ceglowski, et al., 2005; Khurma, et al., 2008), while other studies have utilised improved information technologies to inform metrics and design new patient flows (Baumlin, et al., 2010; Nagula, 2006). Other authors recognise that health professionals may not be trained in process improvement methodologies (Dickson, Singh, et al., 2009) or that medical personnel may be wary of overly complicated solutions offered by way of computer simulation (Ben-Tovim, 2004).

### 3.3.4. Introducing Lean into Emergency Departments

In the early 2000s the NHS Modernisation Agency undertook a programme, the Emergency Services Collaborative, to address the UK’s impaired EDs (Banerjee, et al., 2008; Department of Health, 2007). While some of the approaches recommended for improving the productivity of the EDs were contested by clinicians (Castille & Cooke, 2003; Leaman, 2003), the Collaborative Project did reinforce the notion that system wide approaches and solutions were needed (Windle & Mackway-Jones, 2003). Around this time academic assessments on alternatives to the single stream triage model were becoming available.
The solutions recommended by the Modernisation Agency were variously applied and note was being taken that a system or Lean Thinking approach to affecting hospital block and overcrowding could be applied (Ben-Tovim, Bassham, et al., 2008; Dickson, Anguelov, et al., 2009; Jones & Mitchell, 2006). Thus ED’s became the portals through which Lean Thinking was introduced into some hospitals either as part of a transformation initiative or as stand-alone projects (Ben-Tovim, et al., 2007; Fillingham, 2007; Kelly, et al., 2007). These authors have made the point that Lean is a philosophy and an attendant tool set and as such it is advised to apply its principles and practices in a manner appropriate to the circumstances (Dickson, Anguelov, et al., 2009; Radnor & Walley, 2006; Walley, 2003).

**3.3.5. Examples of Lean Implementation in Emergency Departments**

The Lean ED cases reviewed for this work provide evidence of localisation and adaptation. Firstly, UK EDs through the Emergency Services Collaborative, implemented a model of streaming - ‘see and treat’ (Castille & Cooke, 2003). A number of variations were possible due to the four key patient flows that were identified for the programme (Banerjee, et al., 2008).

Secondly, a different approach was taken by Flinders Medical Centre, whereby the patients were separated into two streams as part of triage (likely to be discharged and likely to be admitted), and then seen in order of arrival by the separate teams. Further flow management was implemented throughout the hospital to take advantage of the gains made at the front end (Ben-Tovim, et al., 2007; Ben-Tovim, Dougherty, O’Connell, & McGrath, 2008; King, et al., 2006).
Thirdly, another Australian hospital (Ieraci, et al., 2008) applied a different assumption set to their streaming – maintaining twin streaming (Fast Track and Standard ED) but allocating the groups in terms of the complexity of the ED intervention and care needed. A patient could be fast tracked and admitted to a ward if their diagnosis was evident at triage (Ieraci, et al., 2008).

Meanwhile other hospitals have been applying Lean Thinking in the ED by focussing on the largest group of their presentations - in this case non admitted patients (Ng, et al., 2010). This approach achieved productivity and quality improvements through a redesigned patient pathway and assigned care teams to maximise the efficiency offered by dual flows (Ng, et al., 2010).

King et al (2006), identify that value stream decisions are governed by certain conditions. For example the Hotel-Dieu Grace Hospital (as reported in Ng, et al., 2010) has a 15 percent admission to hospital rate, while the Flinders Medical Centre (as reported in Ben-Tovim, Bassham, et al., 2008) has an admission to hospital rate of over 40 percent. These differences of the emergency admission flow frame the demand in terms of allocation and care stream configurations. Regardless of differences, each hospital has reported benefits in terms of length of stay reductions and reductions in the category of patients leaving the ED before seeing a doctor (Ben-Tovim, Bassham, et al., 2008; Ng, et al., 2010).

The implementation of new value streams require the involvement of staff from a multitude of levels and the use of Lean techniques such as Value Stream Mapping – seeing the non value practices, Kaizen – to learning Lean Thinking and new views of flow, and assigning New Metrics of Value to monitor and measure improvement (Baumlin, et al., 2010;
Ieraci, et al., 2008; King, et al., 2006). Other cases provide the observation that frontline staff and clinician involvement is necessary to gain commitment to the changes (Dickson, Singh, et al., 2009; Kelly, et al., 2007; King, et al., 2006; McGrath, et al., 2008).

3.3.6. **Lean Thinking in New Zealand Emergency Departments**

In New Zealand two drivers have contributed to the introduction of Lean Thinking into Emergency Departments across the country. Firstly, the National Quality Committee’s (NQC) Optimising the Patient Journey (OPJ) project (Ministry of Health, 2009b), initiated in 2007 undertook a breakthrough collaborative approach, and involved four pilot ED sites. The OPJ project was lead by the Counties Manakau District Health Board which, along with the Canterbury District Health Board, had independently initiated projects to reduce ED gridlock, and improve patient journeys. These initiatives had used Lean Thinking (Working Group for Achieving Quality in Emergency Departments, 2008).

Secondly, a Ministerial Working Group presented their report to the incoming government in 2008, which contained a range of recommendations to improve quality and its measurement in New Zealand EDs (Working Group for Achieving Quality in Emergency Departments, 2008). The government adopted a recommended performance target aimed to reduce ED waiting times and times for admission from the ED into hospital wards (Ardagh, 2010; Ministry of Health, 2009a). These two events have placed ED flow and wait time issues into the public domain, targets performances of District Health Boards (DHBs) requiring quarterly reporting, and making the DHBs and their Chief Executives responsible for the target (Working Group for Achieving Quality in Emergency Departments, 2008).
In conclusion, the Literature presents a number of cases demonstrating how different Emergency Department sites applied Lean Thinking to improve flow, staff and patient experiences within the ED and in some cases through the wider hospital. These cases are generally positive with only one author (Dickson, Anguelov, et al., 2009) noting a failure to achieve the anticipated improvements in an implementing hospital. Some institutions independently adopted the Lean Thinking and value stream mapping methodologies to address serious problems they were experiencing, while others, especially in the UK, implemented Lean Thinking projects through a nationally sponsored programme aimed to address the reported problems and to put into effect a new performance target (Department of Health, 2007). Moreover the literature shows that Lean Thinking in Emergency Departments produces different solutions in terms of implementation and flow models reflecting the EDs particular circumstances, resources and demand characteristics. The pattern of Lean Thinking’s introduction into New Zealand is similar to that of other jurisdictions whereby a few early adopters or whole of hospital Lean organisations led a more generalised or national programme introducing Lean into the health system as whole.
3. Chapter Three: Literature Review - Healthcare

3.4. Chapter Conclusion

This chapter has provided a background and insight of the development and implementation of Lean Thinking into healthcare. Lean Thinking has taken longer to enter the healthcare industry following Lean’s introduction into services in the mid 1990s and thus there are few long-term studies. Much of the literature portrays Lean Thinking as successful, yet provides little detail that would enable more certainty of Lean’s benefits. However, it is evident from the collection of Lean healthcare case studies that improvements in patient flow, a reduction of waste and improved staff morale has been achieved.

Healthcare’s processes seem to hold an abundance of waste; Fillingham remarks ‘waste was everywhere, it was endemic, you were falling over it – you didn’t need to look for it...’ (The Lean Enterprise Academy, 2009). This waste is not an intrinsic feature of healthcare industrial design. Rather it exists due in part to the range of professionals who when working to optimise patient care and processes make improvements to the existing configurations in an ad hoc manner. These uncoordinated additions result in the waste described by various authors.

Just as waste in healthcare is a function of the operation of the professional organisation, so are the trajectories of change implementation. For not only is the manufacturing view of process improvement a challenge to the professional paradigms of clinical improvement, there are already implicit tensions between administrative and clinical staff. This provides an environment where any introductions or implementations require
sensitivity and perseverance. Thus, as the case authors have documented, the involvement of all staff at Lean activity sessions have a dual role. These sessions firstly solve problems and propose solutions, but also act as learning events; meetings where the philosophical underpinnings of Lean Thinking may be gained as well as a wider understanding of the organisation’s processes.

Lean implementers are required to consider a balance between adaptation and adoption when introducing a Lean healthcare programme. Adopting the principles and creating a climate and knowledge base for implementation is advised as is the adaptation of the tools to meet the local conditions. ‘Seeing’ the situation or problem with new eyes enables the use of Lean tools, and as a result the deriving and analysis of local data, applying the results to suit the organisation and optimising flow is discussed throughout the literature [see Table 3.1].

The following table presents generalised outcomes of Lean Thinking implementations for Emergency Department operations discussed in the literature.

**Table 3.2: Outcome Prevalence in the Literature**

<table>
<thead>
<tr>
<th><strong>Outcome or improvement</strong></th>
<th><strong>Author</strong></th>
</tr>
</thead>
</table>
The literature listed above also provides the local context of the implementations with descriptions of key metrics or conditions that act as limiters or accelerators for the activities.

Equally critical to Lean implementations are the roles of organisation’s leaders and those of the teams that interact through the processes which are the patient journey; for change is required from the personnel in the hospital from viewing the speciality or silo approach to care to being orientated to the patient’s experience - a reframe for a Lean Thinking workplace. Less autocratic leadership interactions and more participative engagements seem to enable Lean Thinking practices to embed, as does a reflection on the appropriateness of the hierarchies of the various roles that exist in healthcare. Hence, the literature identifies that an organisation that acknowledges the ramifications and complexities of a change agenda contributes to the reduction of the barriers to implement Lean.

Emergency Departments seem to be the healthcare industry’s canaries in the coalmine. These departments face continuous demand, but it is not so variable and random that patterns cannot be discerned. Similarly, knowledge of these patterns assists in the introduction of Plan-Do-Study-Act (PDSA) experiments for patient management and flow improvement. These results coupled with improved technologies mean patient journeys can be streamlined and when synchronised throughout the organisation efficiencies can be optimised. Each of the ED case sites began its Lean journey as a result of different circumstances and achieved various configurations, but the results seem to be analogous; that targets and improvements to journeys can be achieved through the reorganisation of work by using Lean Thinking.

This part concludes the formal Literature Review for this thesis. The next chapter reviews three case studies developed from the literature. These cases summarise the
decisions, overview implementations and present realised outcomes of each of the featured institution’s application of Lean Thinking. These cases are then examined for indicators that may be signifiers of effective Lean Thinking implementation. These indicators are then used to conceptualise the research questions of this theses, enabling the design and conduct of a research programme.
4. Chapter Four: From the Literature to the Research Questions

4.1. Introduction

Fillingham (2007) notes, few hospitals were undertaking Lean implementations when he began an organisational transformation in 2004 and Cohen et al (2008) found only 6 percent of US hospital were undertaking Lean or TPS like activities in the US. As covered within the previous chapter, the literature provides details of early adopter sites that now have multiple accounts published. This chapter bridges the literature per se by using and developing three exemplar cases from the literature to expand on the process of implementing Lean Thinking in a healthcare organisation. These cases provide a cue for how New Zealand healthcare organisations may be studied. The following section looks in detail at three case studies, triangulating information and tracking the implementation’s progress. The cases draw out four common themes that appear to be representative of Lean initiative implementation, and so the chapter closes by using these discovered themes to provide a basis for the conceptualisation and statement of the research questions for this thesis.

4.2. Exemplar Cases from Early Adopter Organisations

For this thesis a case from each of the USA, the UK and Australia have been chosen due to their frequency of appearance and referral in the general Lean healthcare literature (Graban, 2008; Jones & Mitchell, 2006; Spear, 2005; Womack, et al., 2005). The exemplar case sites that have been selected are:

- Virginia Mason Medical Center, Seattle USA,
- Royal Bolton Hospital, Bolton, UK, and
• Flinders Hospital, Adelaide, Australia.

These exemplar cases are summarised in an attempt to frame the implementation of Lean Thinking, source commonalities and to provide context for the New Zealand sites being researched.

4.2.1. Exemplar One - Virginia Mason Medical Center

Virginia Mason Medical Center is an integrated health care system with its 336 bed hospital situated in Seattle. The organisation has 400 physicians and 5000 employees across the organisation’s 9 sites (D. Weber, 2006; Womack, et al., 2005). In the early 2000s Virginia Mason faced economic and cultural difficulties that the Board of Directors and management chose to address by implementing a variation of the Toyota Production System (TPS) and partnered with a former Boeing executive as mentor and consultant who continues to assist the organisation. Following a 2002 visit to Japan by the senior executive team lead by the CEO, the organisation began to adopt TPS practices. The executives as part of their immersion participated in activities on the factory floor under the ‘jidoka’ operating rules (D. Weber, 2006; Womack, et al., 2005).

Previously, Virginia Mason operated under traditional US healthcare management and quality practices, which in terms of defects and business outcomes had been ineffectual to achieve the changes necessary (Kaplan & Patterson, 2008; D. Weber, 2006). To undertake the organisation transformation Virginia Mason created a strategic plan that places the patient [customer] at the top being supported by strategies of people, quality, service, and innovation. These strategies are underpinned by the operational method, the Virginia Mason
Production System (VMPS), focussed on reducing waste and improved patient safety (Womack, et al., 2005).

Virginia Mason implemented the VMPS by the senior staff becoming certified leaders in TPS tools and these TPS leaders training other managers within the organisation. The implementation featured staged applications of the lean tools and thinking within test sites, learning while furthering the dissemination using Kaizen (continuous improvement) events (Kaplan & Patterson, 2008).

Underpinning the success of Virginia Mason to tackle errors and profitability is the implementation of continuous improvement and the Patient Safety Alert System (PSAS). The PSAS is modelled on Toyota’s ‘jikoda’ system whereby any worker can halt production process when a quality problem is encountered. Likewise it is expected that staff will use the alert procedures when they encounter a safety alert situation. The system uses three codes for the seriousness of the safety breach, whereby Red is the most serious and immediately stops the procedure, with Orange and Yellow alerts requiring less serious interventions by staff. In 2002, when the system was first implemented, 3 safety alerts per month were recorded and in 2007, 222 per month were being received. The rise in alerts is indicative of a safety culture becoming embedded through the physiological safety of knowing that patient safety is a leadership priority (Edmondson, 2004; Garvin, Edmondson, & Gino, 2008; Kaplan & Patterson, 2008).

The VMPS also has as part of its six areas of focus the encouragement of innovation based on PDCA experimentation cycles (Kaplan & Patterson, 2008; Spear, 2005, Spear, 1999 #52; Womack, et al., 2005). Operational changes that have been implemented relate to
standardised work and the investigation and realignment of processes to reduce waste and improve productivity. Further, 5S and 3P techniques are used for organising work for improved flow and reduced waste and new process and physical planning respectively (D. Weber, 2006; Womack, et al., 2005).

Virginia Mason achieved tangible improvements throughout the Lean Thinking implementation including; reduced walking by staff – 60 miles per day, reduced inventory – 51 percent, inventory lead times reduced by 708 days, reduced defects - 47 percent, the freeing up of 77 FTE’s and building redesign savings of $12M (Kaplan & Patterson, 2008; D. Weber, 2006). Further, the intangible features of the VMPS can be grouped as a change in culture – putting the patient first, evidenced by changed routines and the acceptance of standardised work, increased reporting of errors and potential errors through the PSAS and the stated recognition that improvement and cost management does not mean staff layoffs (Kaplan & Patterson, 2008; Womack, et al., 2005).

Kaplan (2008) notes that while recognising that change can be difficult, having a culture that supports transparency and honesty (psychologically safe), the visibility of senior management leadership, and a whole of organisation commitment to change supports the implementation of Lean Thinking into healthcare.

4.2.2. Exemplar Two - Royal Bolton Hospital

The Royal Bolton Hospital is the major hospital of the Bolton Hospitals’ NHS Trust on the north-west edge of Manchester. It has just under 800 beds with over 3000 staff, providing general hospital needs to a population with high levels of sickness. It houses a busy
emergency department that receives 30,000 ambulance attendances per year of which 1500 are complex bone fractures. In 2004 the hospital was facing financial problems along with lengthening wait lists for diagnostic and many treatments (Fillingham, 2007). While Lean Thinking had been promoted and facilitated by the NHS Modernisation Agency, it was implemented programme by programme across multiple sites until Royal Bolton hospital uniquely embarked on a large scale long-term implementation (Fillingham, 2007; Radnor & Walley, 2006) led by a new CEO. Bolton engaged a consultancy firm experienced in Lean to assist with execution due to the lack of existing models and the additional work of translating and adapting Lean into a healthcare setting including the creation of language (Fillingham, 2007).

Bolton used Kaizen events as the method for embedding change including the work culture. The Kaizen or Rapid Improvement Events (RIEs) as they are termed at Bolton are weeklong proceedings and occur in a seven week cycle of ongoing improvement. RIEs are typically attended by a multi disciplinary team, who take the week out of their respective roles to focus on an improvement area; having the outcomes of improved access to services for patients, shorter wait times, improved flow, efficient stocking and increased staff morale (Martin & Maxwell, 2009; Radnor & Walley, 2006; B. Smith, 2009). Bolton also understood that work patterns grow to be deep-seated and it becomes hard to ‘see’ the problems themselves, the result being waste or the work-arounds used by staff to temporarily alleviate problem symptoms. ‘Learning to see’ involved the application of the TPS 5S tool and Bolton subsequently added another ‘S’ – Safety – providing an additional daily focus on this for staff. Further, Bolton began to codify the method it was employing and the approach has
become systematised as the Bolton Improving Care System (BICS) (Fillingham, 2007; B. Smith, 2009).

Underpinning the BICS is the notion of seeing value in terms of the patient, provided by direct observation, questionnaires, diaries, interviews, and focus groups of patients and staff enabling the visualisation of flow from beginning to end, throughout the hospital system (Fillingham, 2007). Value Stream Mapping – including current, ideal and future states – supported by data, assists the staff to see their misconceptions of the processes efficiency and enables the multi professional RIE team to redesign the services, including communication and handover bottlenecks or inefficiencies (Fillingham, 2007; Jones & Mitchell, 2006; Martin & Maxwell, 2009; B. Smith, 2009). Further, standardised work was introduced to minimise the risks at handover times now issues are identified and addressed. It is thought that this communication and revised process is contributing to reduced mortalities (Jones & Mitchell, 2006).

Across the hospital tangible improvements were recorded; a reduced length of stay – 33 percent, reduced relative risk adjusted mortality - 36 percent (Graban, 2008) and within the first year decreases in hip fracture surgery wait times - 38 percent, pathology staff walking distances – 80 percent and paperwork – 42 percent were experienced (Fillingham, 2007; Jones & Mitchell, 2006), with the pharmacy experiencing a 30 percent reduction in turnaround times, significant errors, and rework (B. Smith, 2009). Intangible gains identified were improved multidisciplinary team work, and letting staff solve the problems they are encountering (Fillingham, 2007; Martin & Maxwell, 2009; Radnor & Walley, 2006). In particular, the radiology department streamlined patient journeys over a number of RIEs,
resulting in less walking and fewer queues for the patient, a maximum wait time of 40 minutes, maximum orthopaedic clinic time of 2 hours, and the clinics finishing on time. Further RIEs in this department focussing on Ultrasound and CT scanning achieved similar results in terms of process flow and removed waste.

While the improvements seem to have occurred in a short time, Fillingham (2007) notes the first cycle makes large percentage improvements, but so can further cycles and that clear aims at the outset is key for achievement. Furthermore while the actual cash outlay is small the effort and energy expended by staff to firstly make and sustain change is extensive. Reflecting on the people side of Lean implementation, Fillingham (2007) regards as critical the shift once staff understand that work is a process and processes can be improved upon. However, Fillingham also reiterates Lean and the improvement it brings must be pursued consistently and with perseverance concluding that Lean production itself cannot simply be adopted into the healthcare environment.

4.2.3. Exemplar Three - Flinders Medical Centre

Flinders Medical Centre is a 500 bed teaching general hospital situated in south Adelaide providing a range of secondary and tertiary services, but its main focus is on urgent complex care. In 2003 the Emergency Department (ED) saw approximately 45,000 patients, 40 percent of whom were admitted to the hospital. Congestion at the ED had become severe and safe care was under threat, with staff relationships suffering from bitter conflicts (Ben-Tovim, Bassham, et al., 2008; Jones & Mitchell, 2006). Faced with this situation, members of Flinders staff visited UK hospitals that had participated in NHS modernisation initiatives for EDs in 2003 (Ben-Tovim, 2004) and followed up on the development of a change process
that involved the development of improvement teams as well as the interventions themselves (Ben-Tovim, Bassham, et al., 2008). The Flinders ‘Redesigning Care’ team then gained the technical knowledge and information from institutions within and outside of healthcare. The team developed a new view; one different from the ‘craft–group skill base (e.g. medical care or nursing) or a body system orientation (e.g. cardiovascular, respiratory) towards a process view where care is seen as the outcome of a sequential series of steps through a sectional and hierarchically organised institution or service’ (Ben-Tovim, Bassham, et al., 2008. p27). The team instituted a redesign process round the acknowledgement that this was an institutional change process and began to work with senior staff documenting processes and determining value for customers. Flinders determined there are two customers in their system, one the patient for whom care is provided, and the other, the next set of staff in the care process. The change processes were modelled on PDCA cycles with measures being oriented to assessing improvements being made accounting for both customer groups (Ben-Tovim, Bassham, et al., 2008).

Flow change within the hospital was executed by firstly analysing and then changing flow patterns in the ED by a multidisciplinary team facilitated by a member of the Redesigning Care team (Ben-Tovim, et al., 2007). Similar activities were conducted in the medical and surgical in-patient services and changes in these areas accumulated as a continuous improvements process over longer periods. The principal change was the designation of patients into long and short care ‘patient families’, moving away from the triage queuing system after realising that there are two value streams (Jones & Mitchell, 2006). The patient families flow journeys were separately mapped; the Short Care groups being relatively more clinically straight forward and consisting of less processing steps.
Patient streaming upon entry to the ED and the management of the streams by separate treatment teams resulted in improved flows for both patient families (Ben-Tovim, 2004; Ben-Tovim, et al., 2007) with the Short Care group likely to be discharged, resulting in more capacity and time to deal with the likely to be admitted to hospital Long Care group (Ben-Tovim, Bassham, et al., 2008; Ben-Tovim, et al., 2007).

Consequently, the Flinders team addressed two sequencing issues; Medical Take and Bed Management. Medical Take is when a patient is ‘taken’ and treated by a medical team and hence is part of patient flow through the system. The Medical Take issue was one of inappropriate assignment and work balancing for the teams. If a case was not clearly able to be allocated to correct ward and team, intermediate steps were introduced to reduce ambiguity and make sure the patient reached an optimum treatment pathway as soon as possible and to ensure every patient was correctly assigned and allocated to the correct ward and medical team. Processes were introduced to ensure balancing of workload across the medical teams.

The change from push bed management to pull bed management was achieved by reorienting responsibility for bed allocations from the central point to the ward staff enabling the pulling of patients, who ‘fit’ that ward’s profile or care speciality from the ED or acute medical assessment area, into the wards (Ben-Tovim, Bassham, et al., 2008).

The Redesigning Care team also implemented lean tools such as 5S and standardised work for medicine labelling, storage and ward rounds. New sequences of work protected staff time for particular duties, including discharge procedures, and allowed administrative processes to be completed in a timely manner (Ben-Tovim, et al., 2007).
Flinders has realised improvements in ED wait times of 25 percent with 70 percent of attendees discharged within 4 hours and the numbers of ‘left before being seen’ category reducing from 7 percent of attendances to approx 3 percent. Discharge summary completion within 24 hours has moved from 40 percent to 80 percent, a significant reduction in insurer notification for serious adverse events, and a bed-day saving of 15,000 units has been achieved since the Redesign programme began. Emergency Department admissions have increased during this Redesigning Care programme from 1,200 per month to 1,600 per month, with rates of unplanned admission remaining relatively unchanged and improved staff stability (Ben-Tovim, 2007; Ben-Tovim, Bassham, et al., 2008; Jones & Mitchell, 2006).

Flinders acknowledges that its Redesigning Care programme is a major change programme and as such it faces difficulties in terms of management’s skills and work practices, the challenging of traditional medical views of care and treatment organisation and the translation of process improvement methodologies into the medical context (Ben-Tovim, 2004; Ben-Tovim, Bassham, et al., 2008; Ben-Tovim, et al., 2007). Ben-Tovim (2006) reiterates the need to have all staff involved, especially those who have the power or ability to derail projects or initiatives. Furthermore, the long term nature of change tests the organisation not to regress back into quick fixes. The change process is aimed at making the transformation sustainable in the long run by attempting to embed change into a ‘way we do things’ and not to be a crisis driven process (McGrath, et al., 2008). Additionally, the programme has built organisational support through ‘Lean Thinking’ days introducing staff to Lean concepts (Ben-Tovim, et al., 2007).
4.3. Summary of the Exemplar Cases

The cases studies summarised present key similarities around themes. In the cases management all had a moment of clarity where it was acknowledged something new was required. Visible leadership combined with constancy of purpose was evident throughout the cases. Staff at all levels were engaged and put into practice Lean tools and learning and lastly, the organisations had a strategy for continuity, and while point change occurred it was conducted as part of a wider programme allowing the mapping of entire patient journeys.

These emergent themes, which are important in terms of Lean culture and change management, are summarised by the common indicators contained within the cases outlined in the table below.
Table 4.1: Exemplar Case Themes and Indicators

<table>
<thead>
<tr>
<th>Theme</th>
<th>Commonalities or Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities of Process Improvement&lt;br&gt;Using the right tool to solve the problem.</td>
<td>● Similar Lean tools were used across the sites, including PDSA cycles, value stream mapping, 5S and standardisation of work and processes.  ● Some adjustment or resetting of activity and performance measures was made to better calculate and monitor the effects of the changes.</td>
</tr>
<tr>
<td>Leadership&lt;br&gt;Creating a climate for change and facilitating progress.</td>
<td>● There was an identified problem and an agreed commitment to have it addressed by not using or continuing to use the tools and techniques that were failing to deliver.  ● The requirement for new skills and knowledge coupled with new orientations for managers or supervisors was also alluded to.  ● Visible affirmation by senior leadership was a case feature as was the acknowledgement improving work or processes is achieved by those who do the work and know it best.  ● The changes were led from the top and once agreed upon were implemented.</td>
</tr>
<tr>
<td>Team development&lt;br&gt;Allowing work teams to learn to improve their work to meet quality improvement goals.</td>
<td>● Outside support and technical input assisted the initial stages of implementation.  ● An internal team was tasked with facilitating and developing staff awareness and understanding assisting with training and dissemination.  ● Teamwork and the involvement of all staff to redesign processes and provide insights into waste and improved flow improves acceptance of the change and optimises interpersonal and professional relationships.  ● It is acknowledged that organisational change is not easy to achieve.</td>
</tr>
<tr>
<td>Sustainability&lt;br&gt;Applying a constancy of purpose and binding the new methods to become work as usual.</td>
<td>● A key feature of the cases was the implementation to effect continuous improvement, by either setting a cycle or programming the next unit on the patient journey to undertake Lean activities.  ● Progressing Lean across the organisation to capture the patient journey end-to-end, with the units undertaking Lean activities as part of their daily work.  ● The importance of a new culture, with all of the cases branding 'their' improvement methodology.  ● The costs of the case study implementations are not widely detailed, including the costs of staff redeployment or additional commitments for the periods where they are participating in Kaizen or RIE activities.</td>
</tr>
</tbody>
</table>

The above themes are variously discussed in other Lean healthcare implementations (Ballé & Regnier, 2007; Baumlin, et al., 2010; Dickson, Anguelov, et al., 2009; Ieraci, et al.,
and are representative themes in Lean healthcare literature in one form or another.

In conclusion, there are four common themes that have emerged from an analysis of these exemplar cases. These represent;

- Activities, work undertaken and tools employed by Lean teams and facilitators,
- The role of leadership from the top of the organisation through to the workplace champions,
- The development of teams and a team approach to devise, implement and continue with the Lean Thinking progress, and
- The techniques employed to ensure sustainability - not just the maintenance of tasks and skills learned by staff, but the embedding of an ethic of continuous improvement.

These themes contain essential elements that the literature considers important for Lean implementation and organisational change to be successful in general and therefore these themes may be helpful to consider as a basis for conceptualising a research project.

4.4. From the Exemplar Cases to Research Conceptualisation

The four themes that emerged from the exemplar case summaries; Activities of Process Improvement, Leadership, Team development and Sustainability are generally associated with Lean workplaces and Lean Thinking itself (Jones & Mitchell, 2006; Olivella, et al., 2008; Radnor, et al., 2006; Seddon, et al., 2009).
Radnor & Boaden (2008) identified People, Process and Sustainability as challenges that have not been fully addressed, with respect to Lean, in the public service. The point of view of Radnor & Boaden (2008) is that Lean in public services is not the ‘pure’ form that exists in manufacturing. It has been adapted to the public service environment and evidentially, it has in its adaptive form, provided benefits and impacts on implementing organisations. Further, it is also pointed out that some organisations adopt Lean as a solution or a set of tools removed from the underpinning principles.

It is possible to align the four themes from the exemplar cases with the Radnor and Boaden (2008) three challenges. Thus;

- the People issue - the potentials for exploitative or harmonisation practices link to Team development and Leadership,
- the Processes – the applicability of administrative, scheduling, care or clinical processes link to Activities of Process Improvement and Team development, and
- the Sustainability issue – how lean becomes a way of working and not a tool kit link to Sustainability and Leadership.

Øvretveit (2009) uses the following framework to summarise his research on evidence that quality improvements in healthcare lead to cost reductions. The equation relies on three addends to achieve the sum of Improvement.

\[
\text{Evidence of an effective change} + \text{Effective implementation} + \text{Supportive environment} = \text{Improvement}
\]

(Øvretveit, 2009, p. x)
Øvretveit’s argument is that effective improvement is achieved by the choice of a proven change or activity from elsewhere and by implementing it effectively within a context or organisation that is supportive (Øvretveit, 2009).

The three parts of the equations that produce an improvement in quality seem to represent all or in part the themes from the cases and how they may combine to produce outcomes. Therefore an alignment of the Øvretveit (2009) equation and the four themes from the exemplar cases may be presented as;

- Effective change is associated with Activities of Process Improvement,
- Effective implementation method is equated to Team development and Leadership, and
- Supportive environment can be associated with the themes of Leadership and Sustainability.

Thus by synthesising the case themes with the Radnor and Boaden (2008) challenges and the Øvretveit (2009) equation the result is a matrix for case analysis; a conceptual framework for this thesis represented by the following table.
Table 4.2: Conceptualisation Framework: selected Literature positions and Exemplar Themes

<table>
<thead>
<tr>
<th>Framework</th>
<th>Indicators / Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Themes from the Exemplar Cases</td>
<td>• Activities for Process Improvement</td>
</tr>
<tr>
<td></td>
<td>• Team development</td>
</tr>
<tr>
<td>(Øvretveit, 2009)</td>
<td>Evidence of an Effective change</td>
</tr>
</tbody>
</table>

The above table conceptualises a research objective that is to be used to frame a set of research questions. It proposes that process and evidence of effectiveness, people and their role and influences in the implementation and sustainability and environment of the changes will be evident when examining Lean implementations in the units of analysis. The literature positions will be used as the basis to further explore the exemplar themes in New Zealand sites by firstly developing research questions and then settling on and engaging in a research method and design for this thesis.

4.5. Research Questions

The literature reveals that the introduction of Lean requires attention to issues of leadership, the development of teams and teamwork, the learning of new techniques or problem solving skills and the embedding of these for continuous improvement. The above matrix for analysis [Table 4.2] assists to structure questions that are able to explore Lean Thinking implementation.
As Lean Thinking is relatively new to healthcare, especially in New Zealand, it is appropriate that research questions be broad; to attempt to reveal information and insight into the experiences of the organisations and people who work there, before focussing on specifics such as a how many or how much type examination of the industry (Yin, 2008).

Thus, the research questions for this thesis are of the ‘why’ and ‘how’, rather than who, what or where type questions. These questions allow exploration and enough latitude to gain an initial understanding of the context of the organisation where Lean Thinking is being introduced and people’s responses to it. Any questions will be seeking an explanation to the series of events that have known to have occurred; events that the researcher cannot effect in any way.

4.6. The Research Questions for this Thesis

The following section presents the research questions for this thesis with sub questions that allow focus for the methods of enquiry. The research questions for this thesis are,

1. How are Emergency Departments in New Zealand introducing Lean Thinking and its attendant philosophies and methods?

2. Why are they the same or different? and,

3. Why have they achieved the outcomes that they did?

The type of questions and expected outcomes for research lead the researcher to choose and develop an appropriate research method. It is this to which the thesis now turns its
attention. The following chapter firstly outlines quantitative research as a research methodology and then provides the rationale for the choice of an appropriate research methodology, leading towards the explanation and discussion on the research itself.
5. Chapter Five: Methodology

5.1. Introduction

This chapter will discuss the research methods undertaken for this thesis. The chapter begins with sections and discussions on the theory and advised practices concerned with the type of research used in this thesis. The latter sections of the chapter contain discussions about the actual research methods employed and actions taken to ensure the integrity of the research process.

5.2. Choosing a Qualitative Research Method

Qualitative research has been gaining momentum from the late 20th century as it meets an interpretive, rather than a positivist orientation for the examination of phenomena (McCouat & Peile, 1995). The choice of using a qualitative research method for this thesis was in part determined by the topic itself. Lean Thinking in healthcare is a new field in the operations and health management literature (Brandao de Souza, 2009), and as such the processes employed by organisations on Lean Thinking’s introduction, the contexts of ‘early adopter’ organisations, and the influence on the behaviour on staff lend themselves to be examined using qualitative techniques (Maxwell, 2008; Tharenou, Donohue, & Cooper, 2007; Yin, 2008).

Maxwell (2008) outlines a number of goals for which qualitative studies are useful, of which the following are relevant for this thesis;

- The understanding of processes by which events and actions take place,
• The understanding of a particular context in which the participants act, and
• The use as an exploratory research tool to help design quantitative studies or identify variables for further investigation.

Firstly, as Lean Thinking has only recently been introduced into the New Zealand healthcare system, it is relevant to seek to understand how or if Lean Thinking is becoming established. In addition, the recent completion of a nationally implemented healthcare quality project provided a contemporary opportunity to examine how different hospitals introduced and applied the concepts and principles of Lean Thinking.

Secondly, with reference to the context of a professional bureaucracy, a hospital has a number of embedded cultures, norms and structures that could react differently to Lean Thinking and whose actions could provide influence on how and why some projects worked or some possibly failed.

Thirdly, in terms of exploratory research and as an early academic investigation into Lean Thinking in New Zealand hospitals this thesis may point to relevant information and situations for researchers to further advance or define research goals regarding the application of Lean Thinking to New Zealand healthcare’s environment.

Thus, as the decision was made to undertake a qualitative research programme a compatible research design was required.
5.3. The Case Study as a Research Method

In general, case studies are considered an appropriate research method when the explanation of a phenomenon is needed to be analysed within a context (Tharenou, et al., 2007). Case studies can utilise a mix of quantitative and qualitative data to develop an answer to a given research question, and are the preferred strategy when a ‘how or ’why’ question is being posed (Yin, 2008). Furthermore, Yin (2008) recommends that case studies are appropriate when these questions are ‘being asked about a contemporary set of events over which the investigator has little or no control’ (Yin, 2008, p. 13)

While case studies offer the ability of a researcher to seek answers in sociological a context it is this process that draws a significant criticism. Yin (2008) notes that rigor and bias are required to be accounted for in the research design, as these provide for some disapproval of this inquiry method. Reliability of the data can be compromised by a number of factors, importantly one being historical recall – where the memories of respondents may not be reliable (Tharenou, et al., 2007). Recall reliability can be minimised through triangulating the data across other interviews or through the use of secondary data such as reports and records. Researcher bias exists through the researcher’s opinions and perspectives, even their conduct in experimentation or interviewing can provide bias (Tharenou, et al., 2007; Yin, 2008). Effective actions to reduce researcher and interview bias are its acknowledgement in the design, provision for multiple interviewers to conduct the study, validation of data analysis, coding by creating templates or frameworks for data analysis, and to use independent researchers to authenticate the interpretations (Tharenou, et al., 2007; Yin, 2008).
Another significant limitation of the case study is the difficulty to generalise the results into other cases or situations (Tharenou, et al., 2007). This lack of generalisability has also been commented on by Øvretveit (2009), who maintains that some studies on quality improvement lack a consistency to provide confidence and do not provide the identification of the particular factors that caused particular results (Øvretveit, 2009). Øvretveit and other authors have commented on the need for increasing rigorous research to support the exploratory and descriptive nature of the Lean healthcare cases published so far (Brandao de Souza, 2009; Joosten, et al., 2009; Øvretveit, 2009; Young & McClean, 2009).

The intuitive response for generalisability would follow the pattern for empirical tests or experiments – statistical generalisation – where the sample population outcome represents the population as a whole. However, for case replication it is not the universality of the results that is to be replicable, but the transference of the theory or the theory formulation, which Yin (2008) refers to as analytic generalisability.

For analytic generalisability the case results contribute to theoretical transference by affirmation or falsification into other situations; a theory developed through research on case situations is expected to support or counter the particular phenomenon being studied (Maxwell, 2008; Yin, 2008). This practice, analytic generalisability, developed by Yin is the main difference of the replicability of case studies as distinct from other empirical research methods (Smaling, 2003; Yin, 2008).

Yin (2008) notes, that when considering multiple case research design a basic understanding of the following two concepts is required:
• The counter intuitive nature of replication of case studies compared with traditional empirical research; there are differing logics needing to be applied, and

• The understanding of and importance of contemplating research design and ensuring appropriate choices are made, so that the cases selected provide for the reasons why the cases hold or contrast to the predicted results,

Maxwell (2008) reinforces these considerations of case study design and method by indicating that rigour improves process and activity planning to ensure improved validation opportunities at case sites.

5.4. **Research Design**

The case study design to be used for this research follows the method provided by Yin (2008) and is pictured below.
The three phases of Define and Design, Prepare, Collect and Analyse, and Analyse and Conclude are to be followed and this will be expanded upon in following sections that discuss the research method employed. By following the above phases of the case study method rigour and consistency are ensured for the conduct and analysis activities to be undertaken.

5.5. **Multiple Case Design and Replication Logic**

Yin (2008) provides a detailed graphic [below] that represents the research design of this thesis, the holistic (single unit of analysis) multiple-case design.
The logic used for the design for this multiple case research proceeds as follows. The key themes conceptualised from literature that require further examination were from Radnor and Boaden (2008) being process, people and sustainability and Øvretveit’s (2009) premise that quality improvement is a function of effective quality methods, an effective implementation and a supportive environment. Both constructs were:

- Contained in the literature and featured in the exemplar cases,
- Used to further develop the research questions through the conceptualisation process.

Therefore it is reasonable to expect that these factors will have an influence on the outcomes of the implementations or on the choices made throughout the introduction of Lean Thinking into the case sites.
These theoretical positions on the introduction and effective implementation of Lean Thinking are supported and evidenced for effective point change as well as organisational transformation (Esain, et al., 2008; Hines, Found, Griffiths, & Harrison, 2008; Joosten, et al., 2009; Kim, et al., 2009; Olivella, et al., 2008). Therefore it is expected that the cases that have a positive implementation experience will have, at the unit of analysis level, evidence of the existence of these factors, and any counter results should have evidence of localised reasons that may explain divergence from the expected outcomes.

5.6. Case Study Validity

Yin (2008) considers four tests, which commonly provide for quality in empirical research, should be applicable to case study research design. These tests are: construct validity, internal and external validity and reliability. Construct reliability is the establishment of correct measures for the study.

Internal validity is provided by the processes utilised to ascertain the quality of phenomena. Techniques employed are to reduce error through interpretation and assumptions. Using templates and pattern matching provides for increased rigor and is easier for independent researchers to validate the findings, as do techniques to validate data such as triangulation and the use of multiple researchers (Tharenou, et al., 2007; Yin, 2008). External validation is the ability to generalise the findings. As indicated earlier, generalisation is extended by way of theory rather than the universality of the findings. The application of a case study method with a tested and defensible replication logic assists to enhance external validity (Tharenou, et al., 2007; Yin, 2008).
Reliability can be assured by the codification or standardisation of the method and processes for the conduct of case research. To improve the likelihood of reliability, Yin (2008) suggests the documentation of procedures that would assist future researchers repeat the work and Tharenou (2007) suggests multiple collection tools, and more than one researcher for the collection, analysis and interpretation of the data.

In summary, the case study is a useful research method when the questions being asked are of the ‘how’ and ‘why’ typology and when the phenomena to be studied is situated in a certain context. Further, cases studies are appropriate when it is the sociological processes that are of interest rather than any statistical or empirically measurable data. While case studies are seen as having bias and reliability problems these can be reduced by following sound research design principles and practices together with the understanding of analytical generalisability providing for case study replication.

As the planning for replicability is important for retaining the integrity of the research so are the procedures and approaches to processing the data. The following section describes acceptable practices as to the analysis and interpretation of qualitative data.

5.7. Content Analysis

Content analysis is the method employed to analyse qualitative data, specifically the written or spoken word deriving thematic information from the materials, and may be analytic or interpretative in nature (Tharenou, et al., 2007). While there are a number of approaches to analysis, underpinning them all is the activity of coding the data. Coding is the process whereby passages or text or dialogue are labelled or sorted into segments or
categories (Maxwell, 2008; Miles & Huberman, 1994; Tharenou, et al., 2007). The codes can be prescribed by the research design, theories or questioning strategies to be undertaken (Maxwell, 2008), can be built from the first reading of data (Tharenou, et al., 2007), or can be an iterative process involving both methods (Miles & Huberman, 1994). The purpose of coding is to arrange the data into categories that facilitates comparison (Maxwell, 2008; Miles & Huberman, 1994; Tharenou, et al., 2007), which allows the researcher to more easily ‘see’ what is going on or to test or support ideas (Maxwell, 2008). Miles and Huberman (1994) offer descriptive, interpretive and pattern as a coding typology based on a more practical orientation towards the analysis and sorting of the data. Ideally, however the codes are developed, they need some form of structure or order. The codes are a means to elucidate a theory or conceptual structure and therefore the codes should be coherent and meaningful to the study (Miles & Huberman, 1994).

The focus of the interpretation of the results is to answer the research questions (Tharenou, et al., 2007). Commonly validation by another researcher, triangulation and following up on crucial events of markers in the text aid to confirm the understanding gained for the analysis. Semi-statistical methods or the use of text matching computer programmes are becoming increasingly common, however the use of these aids to qualitative analysis are not automated, they require the researcher to become involved with the text and contexts of the data; the purpose of undertaking qualitative research (Maxwell, 2008; Tharenou, et al., 2007).
In short rigor applied to case design, planning for the conduct of the research that informs the method of analysis and provides the ability to demonstrate consistency with validation will provide for and offset the common criticisms of qualitative research.

To summarise therefore qualitative research is effective when a study wishes to examine relationships and processes rather than collect data to assess the relationships between variables. As case study methods and their replicability differ from quantitative study in that it is nonrepresentational and based on theoretical transference, the acknowledgment of this in research planning and design ensures appropriate replicability, thus providing for study repetition. Accurate repetition can be achieved through documenting the procedures and research activities throughout the study and following these at subsequent sites. Improved reliability can also be gained by addressing validation concerns at the planning stage and if the research is a multiple case study, reliable models are readily available for researchers to adapt.

This section of the Methodology Chapter has outlined the selection of the qualitative research method, the case study, noting its appropriate use, theoretical underpinnings and concepts, sound methodological approaches and issues of integrity. The next sections record the research method used for this thesis; the procedures and decisions used to design, collect and analyse the case study data.
5.8. Topic of the Research

The research topic for this thesis is Lean Thinking in Emergency Departments, with the domain being Hospitals in New Zealand and the units of analysis the Emergency Departments nested within each hospital site.

The research questions were developed and justified at the close of the Chapter Four but for completeness are restated here;

1. How are Emergency Departments in New Zealand introducing Lean Thinking and its attendant philosophies and methods?,

2. Why are they the same or different? and,

3. Why have they achieved the outcomes that they did?

The hospital sites concerned were all involved with a New Zealand Government funded project administered by the National Quality Committee that was initiated in 2008 (Ministry of Health, 2009b). The aim of this quality enhancement project was to improve hospital processes and achieve enhancement in patient flow by introducing Lean Thinking to New Zealand hospitals (Ministry of Health, 2009b).

This thesis is not intending to evaluate the National Quality Committee project either in whole or in part. The hospitals that participated in this project are attractive for a research event as the project had been recently completed and a common approach to the training and monitoring of the project sites was undertaken. Further, as Lean Thinking in healthcare is an
emerging research area, the topic and the sites were considered to be attractive for exploration.

By focusing on a number of Emergency Departments who participated in the national quality project, the researcher gained access to three sites that recently introduced Lean Thinking. The researcher interviewed people who had undertaken staff training and development and deployed Lean processes and tools that were offered in a similar fashion across the sites, achieving a range of results from the activities undertaken. These processes, social interactions and quantifiable results, as well as data and perspectives on the organisational and situational contexts are the investigative targets to be used to answer the research questions.

This research developed opportunistically as an offshoot of another research project examining quality improvement processes at one of the sites. The original research therefore provided the basis to create the first case, (Case A) and as a method to validate the theory to be generalised and to test the research instruments. The original research used a three stage iterative enquiry process and provided a framework for the expectations of replication at other sites. It also served as a model for the collection of data and for the repetition of the interview procedures and instruments used by the researcher.

5.9. Definition and Design of the Research

The theory for the definition and design of case based research has been discussed above. The generalisable theory that is likely to be replicable has been also identified. The key themes conceptualised from literature were from Radnor and Boaden (2008) and
Øvretveit’s (2009). The theories that are expected to hold across the sites, based on the conceptualisation, are:

- Effectiveness of Interventions or processes - that common Lean Processes and tools will be used as they are documented as being effective for producing change and quality improvement. These variously consist of PDCA cycles or experiments, Kaizen or Rapid Improvement Events (RIE) to identify improvement needed activities, and the use of problem solving techniques or work change tools such as Value stream mapping, 5S, standard work, work levelling, and statistical process control or monitoring.

- The need for supportive or team environments and effective leadership that allows improvements to happen – evidence that supports this theory could be the existence and articulation of a case for change, leadership visibility and action supporting change events and the involvement of all staff. Other evidential indicators can be cultural for example, the preparedness of the organisation to change, a focus on the patient and their journey and an open / non blame culture that would facilitate a supportive environment.

- The requirement for effective implementation that creates a sustainable change leading to the embedding of the Lean Thinking. This is evidence of the stickiness or embedding of new practices and work through capability development, the normalisation of project activities and evidence of adoption or adaption processes that contextually localise the improvements.
Therefore it is reasonable to expect that the above factors will have an influence on the outcomes of the implementations or on the choices made throughout the introduction of Lean Thinking into the research case sites.

5.10. Preparation, Collection and Case Analysis

The following paragraphs detail the steps the researcher undertook to adhere to the case study design, collect the data and develop the research cases and undertake case analysis.

Access was gained to the sites through previous association and a third party introduction. The researcher was fortunate to have met a key informant from Site B at a conference on Lean Thinking in New Zealand Healthcare, and was invited to utilise this site for further research. A Lean facilitator from Site A, known through a previous study assisted the researcher to gain access to Site C through a professional network. Once contacts had been made through email and telephone introductions, a co-ordination contact for each site was contacted by the researcher using email and the telephone to discuss the purpose and potential impacts for participants. Upon receiving agreement for co-operation and timeframes; participant availability authorities were obtained by each site co-ordinator to begin to plan for the conduct of the research. The site co-ordinators arranged a draft timetable for prospective respondents and site visits. The respondents were contacted and interviewed over a week in May 2010. The interviewees were thanked on site and site co-ordinators agreed to further contact to progress the validation of the written cases.
The prospective respondents were selected to provide a balanced and representative view across the unit of analysis and the organisation. The roles of the respondents are contained in the table below.

Table 5.1: Respondent Roles by Site

<table>
<thead>
<tr>
<th>Role</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Manager</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Quality Manager</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Clinician</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Nurse</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Allied Health</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>House Keeping</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Clerical</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Lean facilitator</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Respondents</strong></td>
<td><strong>11</strong></td>
<td><strong>7</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>

Particular roles that these people may have undertaken during the Lean Thinking deployment were as a Lean activity champion, a team member, a participant in a Lean event, or having the responsibility for ensuring the progress of a Lean activity.

As identified previously, the theoretical framework chosen are the implementation factors or processes that support Lean Thinking. These theories are largely based on theories of change and therefore account for people, processes and sustainability variables (Radnor & Boaden, 2008), while seeking to align with the formula of quality improvement being a function of effectiveness, environment, and implementation per Øvretveit (2009). The findings are expected to be similar across the case sites A, B and C, producing a literal replication (Yin, 2008).
Data was gathered from for the cases in three ways. Firstly, summary reports about the site’s Lean Thinking project were collected. These provided summary information on the activities, timelines and outcomes of the site implementations of the National Quality Committee Project (NQC). Secondly, an internet search was undertaken to gain basic information on the hospital and ED sites. The information is publicly accessible and descriptive. The internet search also gained additional data on the NQC project to seek to confirm timeframes and resources available to the sites. Lastly a series of semi-structured interviews were conducted with a number of respondents using the same question script with follow up or clarifying questions conducted either during or at the close of the interviews.

Questioning is not the simple translation of the research questions into interview questions; more thought needs to be put into this for the purpose of quantitative research (Maxwell, 2008). The script was used not only to provide regularity of the data collection, but the open ended questions also provided adequate responses enabling theory to be built for replication and is therefore part of repetition of the procedures used when conducting the first case. Respondents were selected to provide symmetry of occupation and Lean involvement across the sites and with a small variation in actual numbers interviewed. Respondents who were timetabled, but unable to attend interviews on the site were interviewed by telephone later, using the same procedures as for the face to face interviews.

As research at Site A was extensive, a sample of respondents corresponding in terms of occupation and Lean involvement was taken as Site A’s data to be analysed. Notes and observations taken at the sites and throughout the research were used to assist the initial sorting and coding. Data was recorded on a digital recorder with the files being
professionally transcribed verbatim. Data was backed up in secure computers and on memory sticks and written on to compact disk. A set of copies were stored with the researcher’s supervisor.

Analysis of the data consisted of thoroughly reading the transcripts. Following the first reading, notes were taken regarding each of the sites and draft outlines of the case summaries were prepared. Data was further analysed using codes sourced from the second and third readings required to develop the draft case summaries. The codes were matched with themes originated from the conceptualisation. The data was analysed detecting relevancies and local variations. At this point the cases were written up and offered to the Site Co-ordinators for verification and validation by key informants at each site and finalised.

Chapter Five to this point has described in detail the processes and activities undertaken to plan, conduct and analyse case based data. The remainder of the chapter will summarise the process undertaken by providing a graphical representation followed by discussions on elements of the research process that provide weaknesses and bias and how the research mitigated these, before a ending the chapter with a short conclusion.

The diagram that follows represents the research methodology adhered to.
Figure 5.3: Flow Diagram of the Research Process for this Thesis
5.11. Interviewing

Interviews were the method for gaining most of the data for this study. The interview provides for a number of weaknesses or points of bias. These can be grouped into the categories of the interview questions, the interview questioning, and the role of the interviewer.

The interviews were conducted in a manner to put the respondent at ease, meeting within the hospital sites in rooms familiar to staff and using engagement aimed to have respondents to be able to fully answer the questions to their own satisfaction. As small numbers of Emergency Department staff were being interviewed, anonymity was assured and this undertaking has been reflected in the layout of the written cases. To reduce recall bias, using uniform questions, along with the ability to follow up on certain points made, created data where respondent answers verified each other’s accounts. Further, particular points made by some respondents were noted in the researcher’s field journal to be used later for coding.

The role of the interviewer also provides for bias (Tharenou, et al., 2007; Yin, 2008). The bias of the interviewer can be minimised in situations where the process being studied has been completed and there is little effect of the researcher on the outcomes (Yin, 2008). In the case of this research the phenomena being studied, the NQC project had been completed. The interviewer therefore had little if any influence on the project’s outcomes. The interviews were digitally recorded with transcriptions being undertaken by a third party, produced verbatim. This helped to reduce data recording bias.
The researcher found that being part of an independent study affected some interviewees in terms of the provision of criticism of the organisation or the Lean implementation process. Cues to this effect were gained from the interviewee’s responses, for when the interviewer sensed some reluctance to answer, and following further reassurance of anonymity, the interviewee felt able to provide critical comments of the process and people’s actions in question.

5.12. Data Management and Analysis

Tharenou (2007) and Yin (2008) offer comparable advice and processes to improve the reliability and credibility of the data and its analysis. This study has used the strategies of rich data, respondent validation and triangulation to mitigate data management weaknesses.

Rich Data is data that provides a detailed and varied picture of the phenomena being studied. In-depth interviewing, with verbatim transcripts, affords more than just the answers to the questions; it provides for the countering of duplicity and support for a mistaken conclusion (Maxwell, 2008). This thesis used a number of interviews across a range persons at each site, transcribed these interviews verbatim, and used these as the basis of a case data bank.

Respondent validation was used through the verification of the cases by soliciting feedback from the participating research sites. The written cases were provided to the research sites for comment and verification. Further verification was obtained through the validation of analysis codes from researchers involved in the more extensive study previously conducted at Case Site A. Validation and feedback on the codes, the interview questions and
types of interviewees to be selected was provided by these other researchers and the researcher’s academic supervisor. The researcher’s academic supervisor also provided advice and direction for further modification of the research instruments and possible avenues for the triangulation of data.

Triangulation was affected through the researcher verifying accounts on the actions and processes through secondary data obtained from reports, websites and printed results from PDSA trials. This data provides for a convergence of evidence that supports the identification of factual happenings (Yin, 2008). Data on organisational strategies, timelines and external occurrences that may have affected the project’s outcomes was gained through newspaper accounts and internal newsletters, which when added to the interview data became each site’s data bank, in Yin’s terminology a Case Study database – the data that enables the authoring and analysis of cases (Yin, 2008).

5.13. Case Development and Analysis

The cases were written as drafts and discussed with the researcher’s academic supervisor. The cases had been written up using manual coding of the case data banks. The cases were then provided for respondent validation to the case site personnel. These cases were examined further to produce cross case analysis results.

The comparative examination of the case findings was undertaken using a thematic analysis. The analysis consisted of coding the case data and organising in such a way that enabled each of the case’s findings to be compared. This was achieved by firstly reviewing the codes and notes made in the margins of each of the case data banks and developing these
into a sub-code table. This table was then used as the basis for the development of a tree node coding structure in NVivo. NVivo8 was selected as the computer aided qualitative data analysis software due to student licences being available at the business school. Following the site case study verifications being received, the data was then entered into NVivo. By using a deeper rereading, coding was undertaken within NVivo8 posting data at appropriate codes and themes; matching the code in both terms of context and actual reference to the code title.

During the assignation of the data to the sub codes, the researcher found that some passages were relevant to multiple codes and were therefore assigned to each of those appropriate creating a rich tapestry of issues encountered by the sites throughout their implementations of Lean Thinking.

Finally the themes and sub codes were tabularised and they are presented in summary form. These tables are used to represent the data and analyse against the criteria of the two theoretical constructs of this thesis. Further, the cross case analysis from NVivo became helpful for signifying relationships and identifying future research opportunities.

This concludes Chapter Five’s discussion on the conduct of this case study research. The following paragraph concludes the chapter and provides a lead into the first part of the findings chapter, the cases themselves.
5.14. Chapter Conclusion

This chapter has described the process for the decisions to select the method of research- the case study – with particular reference to a research programme across three case sites.

The case study is relevant to this research due to it being exploratory. Further, replicability could be affected through literal replication of the conceptualised theory by repeating a standardised format of case enquiry at the chosen sites. Reliability was gained by following Yin’s (2008) case study method.

The researcher was fortunate to have access to a previous investigation at Site A that could be used to frame the progress of this research. Moreover, the timing of completion of the NQC project provided the availability of a number of potential sites. The choice of site focussed on achieving scope and scale similarity, having Lean Thinking ED projects and a range of outcomes that supported theories of Lean Thinking to successfully ‘take’.

The researcher’s logic derivation provided by Yin’s (2008) replicability and by using the features of quality design permits each of the case sites to be addressed using a methodical and systematic process. Research that collects primary and secondary data, follows similar procedures at each site, and balances the respondent types, provides confidence for the findings as a whole. The respondent selection and numbers, and the method of data collection – including question scripts – was standardised to assist with the synthesis of data. Further, by following a sequence of recommended steps for case study
conduct the researcher improves acceptability of the findings, whereby systematic data collection, undertaking accepted analysis procedures, provides for objectivity.

However there are inherent weaknesses in the quantitative research methods and these are acknowledged as being the translation of the research questions into data collection instruments, the process of the interview and interviewer, and the analysis and verification of data.

Appropriate counter measures were applied for each of these known biases using a number of strategies. To address research question translation bias, process questioning was chosen, thus aligning the principles of case study enquiry with an appropriate question type. For the weaknesses in conducting interviews the use of validated interview questions, selecting similar interview subjects at each site - including key informants – and a repeatable process across the sites provided some remedy. Interviewer bias was lessened by choosing a study where the researcher would have little opportunity to affect the outcomes of the phenomena being studied. Lastly, bias associated with data management and analysis was minimised through having the research instruments validated, sharing and accepting feedback from other researchers and applying verified codes consistently across the data through the use of NVivo8. Data validation was secured through triangulation and seeking feedback on the written cases from respondents.

Codes for cross case analysis were gained through an iterative approach, by re-reading the transcripts and noting new themes occurring across the sites. Commonalities were analysed as were instances of discrepancies in the data.
This research fulfils the requirements of the case study method by following the recommended approach for conducting a case study. The following two chapters provide the findings of the research; firstly, by presenting the three case summaries, and then discussing the findings as a whole.
6. Chapter Six: The Case Studies

6.1. Introduction

This chapter contains the narratives of the case studies used for this research. The cases were developed from primary and secondary data. The primary data was derived from the interviews and the secondary data was found through such sources such as Site websites, progress reports, presentation scripts and slides from collaborative events, internal memos and staff newsletters. General organisation information was recovered from project reports, local newspaper reports, hospital and health sector websites. The data was compiled into data banks (loose leafs of printed data bound into workbooks) for each site that were used as the basis for writing the case narratives. The data was initially coded against the conceptualisation themes with additional codes becoming apparent with resultant re-readings as the case narrative was composed. These additional codes were used as signals that are further developed at the cross case analysis stage. Coding was managed through NVivo 8 software.

6.1.1. Case Writing Process and Structure

The cases are structured following a common format. This format provides a common set of signposts so readers can navigate the cases individually and it further enables site similarities and differences to become readily apparent.

The cases begin with an introduction to the case and the site in question, the organisation’s history with Lean Thinking and a short description of the Emergency Department, the unit of analysis for each case. This is followed by a discussion of the method
of implementation and processes each site used to introduce Lean Thinking into their ED as part of the National Quality Committee (NQC) project (Ministry of Health, 2009b). The next section follows the four conceptualisation themes; Activities, Leadership, Team development, and Sustainability. These themes are discussed in the light of the respondent experiences and processes undertaken, and allude to strategies and organisational policies that may have affected the project. This section reveals the range of occupational perspectives as well as the site’s responses to implementation challenges. The activities that were undertaken at each site are then presented in a table, ordered by the Lean techniques or tool employed. The table presents data in a “before and after” style, which assists to identify and distinguish the outcomes achieved. The table is followed by a short outcome discussion on the progress and implementation of each of the activities, discussing the type of Lean method or tool utilised and the apparent result of its use. Lastly, to conclude the case, the sustainability or continuity pathways for Lean Thinking for each of the sites are considered, signalling an intensity of embedding or stickiness that the ED experienced.

6.1.2. Case Study Verification and Finalisation

Following the completion of the written case drafts, this draft case narrative was presented to the researcher’s academic supervisor for review and critical appraisal. The supervisor’s comments and recommendations were addressed, which resulted in a final draft narrative. This final draft narrative of the case was made available to the respective site coordinators who provided respondent verification and feedback to the researcher. The verified case was re-edited in form and style to obtain consistency in drafting across the cases. The next part contains the cases, each as a separate section.
6.2. Case Study A

6.2.1. Introduction

Site A is the main public hospital of a District Health Board, serving a population of 300,000 people and providing secondary and tertiary services for its region. The local urban catchment for the facility is approximately 125,000. It has 388 beds with a total number of staff of 3,100. The district has a Maori population of 8 percent\(^1\) significantly lower than the national average of 14.6 percent. Maori are a significant population in health terms as this ethnic group has worse health outcomes than the population as a whole. The hospital contains the region’s specialties and receives transfers for care from five district hospital units.

6.2.2. Lean Thinking and Site A

Site A had no prior history of Lean Thinking. It appears that the implementation of this project is Site A’s first foray into Lean. However, like many hospitals in New Zealand there are a number of overseas clinical practitioners employed (Zurn & Dumont, 2008) who, due to their experience in their own country, may have experienced Lean thinking; doctors from the UK in particular due to the introduction of industrial techniques into the NHS circa 2002 (Banerjee, et al., 2008). Therefore, it is possible that there is a latent understanding or experience of Lean Thinking within this hospital setting and perhaps some Lean implementation occurring in small pockets isolated from the wider system creating unrecognised point change and process innovation (Burgelman, 1984).

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\(^1\) Population figures are derived from the New Zealand Census 2006. Numbers are rounded. Maori are a significant population in health terms as this ethnic group has worse health outcomes than the population as a whole.
6.2.3. The Emergency Department

Site A’s ED is a 21 bed facility that provides for resuscitation, sub-acute, acute and paediatric care spaces. The total staffing is 41.5 FTE’s with 23 senior and resident doctors and a nursing and care team of 47, but experiences staff shortages with seasonal fluctuations in role turnovers exacerbating the understaffing. The ED receives 37,000 attendances per year of which 25-30 percent are admitted into the hospital. Site A has experienced significant congestion over a number of years with various solutions being proposed from co-location of GP services to social marketing in an attempt to reduce attendances and congestion. None of these solutions were either acted upon or provided significant relief to the problems. Triage targets were consistently not being met and staff morale was low, with some staff believing the standard of care was inadequate.

6.2.4. Implementation Methods

In 2007 the Clinical Director of the ED and Service Manager attended a meeting where Lean Thinking in an ED context was a topic, and with this raised awareness, Site A made an application to the National Quality Committee (NQC) project with its Emergency Department designated as the priority area. The implementation of Site A’s project began with attendance at an initial Collaborative Learning Event (CLE) in August 2008. The CLE’s were the method of linking participating sites and promoting learning through the provision of a centralised knowledge setting held periodically throughout the NQC project. The Clinical Champion and Service Manager attended these events with the Lean facilitators, who had been appointed by July 2008.
The project was implemented using project management methodologies, with a Project Manager in charge of the execution. The Project Manager reported directly to the Chief Operating Officer, thus the approach structurally circumvented the organisation’s existing lines of authority while retaining an ‘on the floor’ contribution through significant input from the ED Service Manager, Clinical Champion and the Lean facilitators. An external consultant who had been appointed as a mentor / technical adviser to the NQC project joined the local project team on a predetermined schedule providing important on site and remote support throughout.

6.2.5. Implementation Process

Site A’s Lean ED project, which began in October 2008, had as its core aim using Lean business practices to improve patient care processes. An initial assessment found that Site A’s ED had an average length of stay of 4:39 hours, however this increased for low acuity patients through ‘bumping’ down the order due to their triage priority, there were hold ups through the ED for X-Ray services, there were stock and equipment inefficiencies, and there were few management tools or the confidence to tackle enduring problems. An expectation of the project was the empowerment of staff to solve problems and implement change. The project set targets to reduce average length of stays for low acuity patients and reduce the average ‘in process or work in progress’ times for patients when the ED is busy to better meet recommended guidelines.

The project began with sessions that introduced the project, its principles and some of the underpinning methods. At a Blue Sky event, (the name for the brainstorming and involvement exercise used by the NQC project’s consultants) a wide range of processes and
effects were identified, indicating that a number of activities could be undertaken. These activities were allocated into groups and prioritised so the Lean facilitators could provide due attention as they progressed. There were a number of 5S or workplace control activities that featured including reorganising stock, introducing signage de-cluttering, and the introduction of new communications methods including the setting of key performance indicators. The facilitators were present within the ED environment, working closely with each activity group as timetables and project progress dictated. A significant activity was the reorganisation of the resuscitation room, which included physically changing the orientation of the bed and layout of equipment. Further 5S activities were the drug room – for pharmaceutical holdings – and the Central Station – the main information and department control area.

A number of activities were identified from the reasons for attendance at the ED. Some patients were attending in preparation to be seen at later hospital clinics or for pre diagnostic treatments that required clinical or care observation. Improved Clinical pathways were developed through A3 problem solving, resulting in activities that piloted reduced wait-times and a better process for cellulitus pathways and the development of a DVT referral pathway.

Departmental patient flows were addressed through the use of Value Stream Mapping (VSM) with the X-ray referral and low acuity patients. The X-ray pathway activity was based on a PDSA cycle whereby the present and future states were mapped and the solutions identified. The solution set, which aimed to reduce the average wait time from 44 minutes and to create a pull rather than push flow, was documented as a business case to provide an additional diagnostic room, utilising existing equipment and new sets of standardised work
and processing. This case was approved and the new X-ray facility became operational in September 2009, assisting with overall flow improvements for the ED and a measured improvement for delivery of acute X-ray services to all ED patients with an average time of 26 minutes.

The other patient flow activity sought to reduce the waiting times for low acuity attendances. A Value Stream Map based on the NSW Model of Emergency Care (NSW Health, 2006) and a simulation of patient flows using ProModel tested and refined the adaption of the selected solution. The model was realised into an experiment to collect real data over a 20 hour period (4 hours per day over 5 days). The low acuity stream, Fast Track as it was designated, required a senior clinician and nurses to be dedicated to the service and identified the remodelling of a suitable area with a waiting room. The policies and procedures for patient streaming at triage were developed and implemented during the trial. The initial overall wait time reduction was 30 percent for the trial patients indicating sustained patient flow improvements could be realised by adopting the patient streaming process. The project was documented in a business case as further resources, in the form of an additional senior clinician, are required to operate this service. The Fast Track process was approved and was implemented for 8 hours per day for the 5 working weekdays in February 2010. The activity limitation was set due to department budgetary considerations, so permanent extension of the service to span 7 days of the week is future resource dependant.

Some staff found the changes in work, procedures and processes – especially for Fast Track – challenging, as new judgements were required for streaming patients correctly “the biggest one [change to work] would be around selecting and trying to get the right patients
down there [Fast Track], and if they don’t meet the criteria, identifying it so they can be moved earlier” [Respondent A11]. Further, while staff may state that their roles haven’t changed in terms of the clinical duties, they can cite workplace improvements in terms of;

Locating items;

“just having what we need, the right amount of stock – not things busting off the shelves – and probably having things more standardised having the same stock in both Resus rooms would probably be where the main change is, sort of decluttering things” [Respondent A11], and

“the staff seems to find things better” [Respondent A4],

The general tidiness of workspaces;

“at least there’s a designated place for everything and everything’s marked out and Resus has things streamlined and clearly marked out so it looks great. Much easier for staff” [Respondent A8], and

“like the drug room you go in heaps of times a day, and to have it more effective and easier to use - it’s definitely easier, and probably beneficial in the long run” [Respondent A11].

Reduced future costs associated with supplies and pharmaceuticals – a $2000 return rebate for returned drugs from the resuscitation area and lowered department drug stocks by $2,480.

The floor changes were generally related to processes to improve the throughput of patients rather than modifying or changing actual clinical procedures;

“process the patients more effectively: as in medically and faster to get them through those doors, and either home or up to a ward.” [Respondent A4].
6.2.6. **Theme: Team Development**

The reallocation of staff and equipment to new spaces as part of the activities resulted in new work environments, improved interdepartmental communications and understandings of the ‘inner’ working of the respective areas;

“I’ve learned so much just from being involved with the ED” [Respondent A3], and

“when new staff members come on... they actually come and spend half a day with one of the ED nurses so they understand the role” [Respondent A3].

Staff generally felt involved and included, with clinicians, nurses, clerical, stores and allied health workers all being part of various activity teams;

“there’s a lot more willingness on both sides to try and trial things than what there used to be” [Respondent A3], and

“they had meetings and were sending stuff all the time and had notices up” [Respondent A4].

However, comments were made that relate to the challenge of full or comprehensive communication and involvement in a 24/7 -3 shift per day environment;

“we had a communication type board but it didn’t work very well, people are too busy to read it – but there’s email and there’s team meetings and things like that to circulate it’ [Respondent A10], and

“It wasn’t always communicated that things were on... it didn’t always come together” [Respondent A6].
Other staff though were more direct about barriers to communication and teamwork, indicating that the influence of hierarchies remained;

“we are part of a team but the bottom line is, you can say what you like, there is a pecking order” [Respondent A8],

And that while open and inclusive teamwork was signalled the reality in their view was that some were more equal than others;

“and you just know your place. You just know. You get to know when not to overstep the mark... if you’re asked to go in, different story” [Respondent A8], and

“a lot of doctors... they do work in teams but they are individuals” [Respondent A9].

Additionally, the success and effects of the project’s improvements are recognised by staff, however some were unclear as the actual quantifiable levels achieved;

“has it [the project] actually helped getting the patients through the department quicker?” [Respondent A8].

As the project was introduced at low ebb in morale, staff have been able to reflect and state the workplace has improved; communication is better and people are happier;

“I think the morale of the department is better than it was about a year, a year and a half ago... things were so bad here...” [Respondent A6], and

“The department was an absolute basket case. Morale was at a shocking low...that’s not the department now, I’d say it’s a much happier and friendlier place to work than it was, a lot less moaning and stress generally” [Respondent A5].
As morale can be attributed to many factors it is difficult to imply that Lean Thinking is the causal factor for workplace morale improvement. However it is reasonable to assume that improved interactions, improvements to physical workspaces and the general sense of achievement from the Lean activities has contributed, alongside departmental leadership changes, to an improved departmental morale. One respondent speaking of a colleague remarked;

“[They have] gained a lot from that, probably being part of that project. Um, and [their] morale is certainly a lot better” [Respondent A6].

6.2.7. Theme: Leadership

Staff were generally supportive of the methods and focus of the changes, however the activity leaders or champions reported increased workloads to maintain the project’s momentum;

“it’s certainly a handicap. It certainly means you’re reliant on people catching some time in clinical downtime, or goodwill, or paying people overtime” [Respondent A5].

With hierarchy seeming to be a contributor in respect of non-clinical time;

“The SMO’s do... get quite a lot. Nursing staff, actually not much, if any. Junior staff none” [Respondent A5].

Staff routinely referred to having to complete Lean tasks either in their own time or struggle to find time to achieve timeframes;

“it’s just having to find the time on top of everything like um, for me... all of us are just trying to do it in our normal daily work so not that I’m afraid more
work is going to be better for us but it’s hard to find that extra time” [Respondent A3].

“[the manager would say] if we need to pay then we can, but there was the innuendo from higher up, say I shouldn’t be paid for doing things, it should be done on your own time, or done on the time in, you know when you are working... that’s the subtleness from the organisation” [Respondent A10].

Furthermore, staff who are continuing to use Lean tools and methods to improve their ongoing work seem to accept that this is part of their role;

“I’m still struggling to find the time” [Respondent A3].

However, some staff note that this is becoming less of the norm in Site A with younger staff expecting remuneration or time to be allocated for any additional duties or for projects;

“today’s generation has said oh I need to be paid for my time. It’s one of those generational things” [Respondent A10].

A number of elements existed that created ambiguity with respect to the leadership of the project in terms of its implementation and its place within the organisation. Site A implemented this project as an adjunct, using a Project Manager by passing the managerial and clinical lines of authority. This provided for some confusion from staff and the principals themselves. Respondents suggested that the clinical sponsor, being different from the clinical leader, led to a murkiness of authority as to responsibility of moving ahead with the Lean activities;

“we had a person taking over that nobody took notice of because [they weren’t] a clinical leader” [Respondent A9], and
“But in terms of who’s leading it otherwise, I don’t know really, I sort of think the senior nursing staff are the most motivated and capable group to make any change in the department, to be honest” [Respondent A5].

Further, staffing changes from the start and throughout the project at the nurse manager level lead to nurse leadership being transitional;

“We had no charge nurse” [Respondent A9],

“there’s been no consistent nurse leadership, in the form of a charge nurse, who’s a real key management thing... we’ve had four different charge nurses in the year we’ve been doing it” [Respondent A1], and

“the staff were certainly apprehensive about what’s actually happening, who’s leading us, we’ve got yet another person in the back office to learn what they’re doing” [Respondent A10].

Nurse leadership and stability was therefore unsatisfactory in some regards due to uncertainty and the ‘shared’ role solution that was in place for some of the project for example, “there were at times a bit of confusion around the responsibilities” [Respondent A10]. However, the department accommodated these issues and the impediments these leadership matters caused were navigated, in so far that activities were completed and progress was achieved.

Comments were also made regarding the apparent lack of engagement from the senior leadership of the organisation;

“I’m not absolutely convinced of the buy-in yet at the top level to actually sort the problems out” [Respondent A6],

“This is a huge opportunity for executive managers to come down and talk to some of the real experts, and no one ever did, and they were actually offered
some coaching – customised to how they want it – and they didn’t take up that offer” [Respondent A5].

However, while staff may have revealed a frustration with higher management, it seems to be a perception of the lack of active support or visible involvement rather than from the lack of decisions being made to progress the suggested improvements, as observed by the approvals of the two business cases for the Fast Track and X-ray activities. Although the visibility of these business cases may have been improved by the Project Manager’s direct line to the Chief Operating Officer – “I don’t think if Radiology asked for it [without being part of the project] we would have got it” [Respondent A3]. Also, the perceived lack of upper management support was not universal;

“because this has been led from the top of the hospital has helped us and we got a second X-ray room down here now and that has been a massive thing” [Respondent A3].

“It’s less likely to be derailed with time I think because this time I’m seeing CEO’s buy in” [Respondent A7].

6.2.8. Theme: Sustainability

Many respondents referred to an intransigent organisational culture and high number of long serving staff, which reflected a pessimistic view of the sustainability of the project and gains made. Respondents cited a prevailing attitude of an organisation that has tried much and succeeded in little; that this project is suffering from the attitudes reinforced by failures of past change / improvement programmes;

“I think one of the cultures in the hospital is the fact there have been so many failed projects. There’s never been an end.” [Respondent A9],
“The organisational buy-in isn’t there.” [Respondent A6],

“Other people have said, ‘Oh this [project] is a total waste of time, hasn’t done anything for the department rah rah rah’, and I think oh come on don’t be so negative, you know it has helped, it has changed.” [Respondent A8],

“Some staff have been here for I don’t know 30 or 40 years in the same job day in day out, and if you change something they’ve been doing for years they’re not going to be happy about it anyway. And some people have the mind ‘why change something that’s working fine as it is’, even if there is a better way or a more effective way of doing it” [Respondent A11], and

“They just could recollect some one in a million thing that would make this not work” [Respondent A2].

This had led some respondents to reflect on the change dimension of the Lean project;

“There’s always that perception I think, that we’re too busy fire fighting, we haven’t got time to do that and that’s going to be the change in culture is getting people to think if I do this, my life might actually be easier and the patients lives might be better.” [Respondent A7],

“one of my greatest learning’s in this, in trying to get change done, was trying to reason change, and people not wanting to change, and never getting to the real reason why they don’t want to change” [Respondent A5], and

“we first got an insight into the challenge that culture faces, when you introduce change” [Respondent A1].

However, staff referred to the Lean process as being somewhat different from the change programmes and processes they had experienced before; importantly the staff were supported by on site facilitators, who had clinical backgrounds and with whom some staff still remain in contact with even though the project has ended;

“I have a good rapport with [the facilitator] and there is a lot of other people who have been here for a while... it easier to deal with them because I know
them and I’ve worked with them and I know you’re going to get the best. So I think having people you know makes life much easier” [Respondent A4],

“It’s hugely important that [the facilitators] have some clinical background, even from the depths, and that you don’t use too much manufacturing [words] because health people do feel precious about things” [Respondent A2],

“They know who to contact and we know who to contact. [They’re] pretty open” [Respondent A3], and

“They’ve generally always around and approachable and they’re easy to find…” [Respondent A11].

However as to cultural stickiness of the skills and a sustainable continuous improvement culture, there is less evidence, even though there may have been an understanding of Lean tools;

“I think it will be interesting to see if we can keep up the momentum, and how the – the challenge is to how we’re going to keep that, that momentum now” [Respondent A10],

“if there isn’t the engagement, we’re just going to end up with a temporarily tidier emergency department. I think perhaps we might’ve got over that, I’m optimistic around that we’ve embedded some of the change, but we’ve also got some more resource” [Respondent A5],

“The culture’s not been embedded to have the continuous improvement” [Respondent A9],

“I think there’s actually some understanding as to, some common ideas. But I’m not convinced yet that – there’s still a feeling in this town that the patients are the problem” [Respondent A6],

“I guess it’s enabled me to critique things; given me some skills to tidy up fast track and those sorts of skills; certainly looking at problem solving, investigating” [Respondent A10], and
“I think there are other things underlying engaging staff to focus on best practice, outside of lean methodology, I think there’s a lot of other management practices and principles, and personal behaviours that needs to be addressed along that pathway to an ideal healthcare setting” [Respondent A1].

This feeling of lack of continuity is probably most stark when the ownership of Lean or patient journey processes becomes a talking point;

“The organisational buy-in isn’t there... money gets mentioned – there’s no money. And it’s coming from [clinical manager]. Everything’s negative. Everything’s, no, you can’t do that no, don’t do that. So um the way ahead, I suppose is this clinical governance thing, I suppose” [Respondent A6],

“They want to think about patient safety and that was my criticism... recently. You know, I haven’t heard the words ‘Patient safety’ once. Not once. I’ve heard cost reduction, I’ve heard – you know if you go out there and talk like that then forget it because people will see this as, ‘You’re threatening me, this is my job we’re talking about and why the hell should I, you want me to do all this work so you can make me redundant’, you know” [Respondent A7],

“I’m always amazed that people will ring me up and say ‘We’ve got 5 or 7 or ten of your outliers on the... floor, and I’ll say ‘Uh no, they’re not mine they’re our patients’ you know. They’re patients, patients are patients” [Respondent A9].

Being complicated by the need to address clinical buy in to support Lean Thinking and ideas on how to bring this buy in about;

“Doctors are very sensitive to incentives; then you can, sort of make the job easier and you can appeal to their sense of pride, so they can do a better job; or you can shame them... it’s a really interesting and powerful thing. Not just metrics to shame but metrics to perform...” [Respondent A5].

In spite of this the staff made changes occur, and while not perfect – “I’m not saying this is humming, like a totally lean thinking department” [Respondent A5], a number of simple and minor changes took place that previously had not been addressed. Respondents
lamented that fact that the gains made by the ED were unlikely to progress in the near future from the department through to admitting wards;

“I guess a lot of us thought it would be addressing issues such as bed block, issues such as how we’re going to resolve issues with the [receiving] service who seemed always to be in theatre, can we look at those sorts of things” [Respondent A10],

“but clearly the [project] has not gone to that next value stream mapping beyond” [Respondent A6],

6.2.9. **Theme: Activities**

In the face of a challenging culture and lack of visibility of the senior management the project undertook a large number of activities that engaged a significant number of staff in teams and champion roles. Below is a table of the activities undertaken at Site A’s ED.

6.2.10. **Summary of Lean Activities - Site A**

The following table summarises the Lean activities implemented at Site A’s Emergency Department in terms of the activity or tool used against the situation encountered and results of the tool’s application.
Table 6.1: Table of Activities undertaken as part of Lean Implementation at Site A

<table>
<thead>
<tr>
<th>Lean Activity / (Tool)</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A3 Problem Solving</strong></td>
<td>● Return attendances by Cellulitus pathway patients.  &lt;br&gt;  ● Deep Vein Thrombosis (DVT) scan attendances are admitted through the ED – (not Emergency attendance).</td>
<td>● New referral paperwork and Improved liaison with District Nurses,  &lt;br&gt;  ● Reduced Cellulitus rework,  &lt;br&gt;  ● New patient pathway – follow-up by ED not required.  &lt;br&gt;  ● New DVT pathway developed,  &lt;br&gt;  ● Reduced attendances of 7-8 per week of DVT patients,  &lt;br&gt;  ● Improved positive scan ration – (14 – 33 percent) – less rework / misdiagnosis.</td>
</tr>
<tr>
<td><strong>Value Stream Mapping</strong></td>
<td>● X-ray / ED pathway delays average 44 minutes.  &lt;br&gt;  ● Low acuity patients wait times average 3:20 hrs.</td>
<td>● Improved X-ray / ED patient journey - average 26 minutes;  &lt;br&gt;  ● X-ray room providing additional server capacity,  &lt;br&gt;  ● Standardised X-ray request process – patient pull,  &lt;br&gt;  ● 50 percent reduction in misplaced X-ray forms.  &lt;br&gt;  ● Patient streaming introduced,  &lt;br&gt;  ● Fast Track wait times lowered to average 2:16 hrs (November 2008).  &lt;br&gt;  ● Fast Track wait times further lowered to average 1:52 hrs (May 2010).  &lt;br&gt;  ● Daily time checks by nurses reduced by 175 hrs per annum,  &lt;br&gt;  ● Returned Drugs achieve $2000 rebate,  &lt;br&gt;  ● Reduced ED pharmaceutical budget - $6,000,  &lt;br&gt;  ● Central Pharmacy stocking instituted,  &lt;br&gt;  ● Central stocking of IV equipment,  &lt;br&gt;  ● Improved access and locating stocks.  &lt;br&gt;  ● Reorientation of Bed in Resuscitation room – mixed responses as to improvement.  &lt;br&gt;  ● Standardised work introduced and staff trained to standards.  &lt;br&gt;  ● Data collected shows haemolysis occurrence within control limits.  &lt;br&gt;  ● New skill matrix form developed,  &lt;br&gt;  ● Implementation focuses professional development activities more effectively.</td>
</tr>
<tr>
<td><strong>Workplace Control</strong></td>
<td>● Resuscitation Room, Drug Room and central station cluttered and ad hoc.  &lt;br&gt;  ● Patterns in haemolysis of samples in blood tests and consistent documentation errors  &lt;br&gt;  ● Incomplete competency mapping to aid nurse workforce development.</td>
<td></td>
</tr>
</tbody>
</table>
6.2.11. Outcome Discussion

The above summary of work undertaken provides an indication of a significant amount of effort and engagement by the department. Firstly, using the A3 problem solving method a number of ancillary services provided by the ED were reviewed. These services, Cellulitis and Deep Vein Thrombosis, use the ED as a staging or pre-check post for the diagnostic or out-patient services; the patients absorb resources and staff time effectively competing with ED attendees. Root causes were identified and solutions implemented creating alternative pathways that place the patients in safe and closer positions to the services for which they are attending. The Cellulitis and DVT pathways resulted in fewer returns to the ED and improved diagnostic outcomes for the tests undertaken.

Secondly, a review of the relationships between the ED and X-ray departments were undertaken. Some patients were waiting a significant time for either X-ray diagnosis or consultation. Further there was a patient push type flow process and an incompatibility with forms and procedures. The project formed a new patient journey and developed a business case for the provision of existing X-ray equipment to be housed in a separate area, in effect creating a new server for the queues forming for the radiological services. Additionally, a single form and a pull type flow processes were initiated. Both ED and X-ray staff were involved with the problem solving and solution implementation creating improved understandings of each department’s needs.

Thirdly a Value Stream Mapping project of the sub-acute patient flow through the department was undertaken. The VSM revealed non-value added activities, made the time patients spent waiting to become visible in the process, and validated a case for process
change. The Fast Track service was instituted permanently from February 2010 with continuing wait-time reductions being recorded. The service area was set out according to 5S principles regarding flow and waste reduction in terms of stock and perambulation within the department.

Lastly, the table shows that a number of 5S activities were undertaken. Typically the focus was to order and identify inefficiencies in terms of time for checking and stock taking through order and visual control. Moreover real dollar savings were experienced with drugs and equipment being standardised in rooms with comments of ease of access and expired stock removed. Standardised work activities were also undertaken to reduce blood test errors and rework, as was a project to improve the effectiveness of nurse education services.

6.2.12. Conclusion of Case A

In terms of sustainability, the inability for the ED Lean outcomes to synchronise into the hospital or with receiving departments isolates the potential for an improved in-patient journey. The significant wait time reduction for low acuity patients can be seen as a significant success and, coupled with the X-ray department improvements, provides an example as a process and resource utilisation improvement model for other departments in the hospital. The limit of work week operation of the Fast Track stream confines its overall impact through not being available to consistently address flow dynamics across the weekly fluctuations and also to account for seasonal variation throughout the year.
Regardless, these improvements represent impressive departmental point change; perhaps because of the management decision to implement it as a project outside of regular clinical and managerial authorities.

In terms of work outstanding, the department has set a focus on maintaining the capability and culture to progress and embed the Lean Thinking skills. But the lack of senior management hands-on engagement leave the ED staff with the prospect of continuing Lean projects largely in their own time; only reinforcing the ambivalent nature of the organisation; an attitude and culture which was alluded to by staff interviewed;

“but again its creating the connectivity right through the – you know from the CEO, right down to like the people, the value adding people at the bottom, it’s connecting those things isn’t it and we’re totally disconnected at the moment, totally disconnected” [Respondent A5],

“but actually everybody knows about the 6 hour target, the rest, the inpatient side hasn’t quite got into it yet” [Respondent A6]

Further complicated by ongoing encouragement to engender clinical buy-in to the prospect of change or continuous improvement;

“one of the things about trying to impose things from the top on doctors is, they’ll find a reason not to do it” [Respondent A5], and

“The process stuff is probably easier for people to fix and then you get into the clinical procedures, you’ve got, I mean you try and get three surgeons in a room who all agree on you know, what’s what. Everybody always has the research to back them up that they’re right – you know the right way to do this. So there’s a definite barrier I think” [Respondent A7]

Finally, Site A achieved a remarkable amount of change and engagement during this project. Significant morale benefits were accrued, as were wait and treatment time benefits
for the low acuity patient journeys. While the Quality and Risk function of Site A was not
directly involved with the project, senior Quality Unit staff were copied into reports of the
project’s progress. Elements of Lean Thinking have been incorporated into Site A’s quality
plan covering the next five years, however the status of the Lean facilitators is uncertain now
the national project has finished, but it is likely they will be incorporated into the Quality and
Risk Unit.
6.3. Case Study B

6.3.1. Introduction

Site B is a secondary level hospital providing some specialist services to the District Health Board region and for other DHB populations in close proximity. The hospital serves a population of approximately 136,000, with 16 percent of this being of Maori descent which is close to the national proportion for New Zealand\(^2\). Site B provides surgical and medical, including mental health, services having five operating theatres with day surgery being provided by a ‘clip-on’ theatre unit. Site B has 260 beds allocated across the services with a staff of 1,500. Site B is undergoing a building programme due for completion in 2011/2012 that will result in an expanded facility in terms of permanent operating theatres and Emergency Department.

6.3.2. Lean Thinking and Site B

The management of patient flows is not new for Site B’s DHB. Programmes to address bottlenecks by introducing new processes and acknowledging flow issues have been the focus of Site B’s redesign activities. This focus on improving the patient journey has existed for more than 5 years across the hospital site. Staff gained exposure to Lean Thinking through attendances at Australian Lean Healthcare conferences, one that was hosted by Flinders Medical Centre in Adelaide, with some staff taking on responsibility for improving their awareness and education regarding the principles and practices of Lean Thinking they

\(^2\) Population figures are derived from the New Zealand Census 2006. Numbers are rounded. Maori are a significant population in health terms as this ethnic group has worse health outcomes than the population as a whole.
had been exposed to. A staff member from the Quality Unit has been trained in Lean principles as part of the NHS modernisation programme in the UK. A gradual programme of change was endorsed and championed by former and current Chief Executives and Chief Medical Officers and provides the basis for a set of values and a culture supportive of Lean; described as “it’s not even a policy, it’s just the way we do it...” [Respondent B1].

However, the adoption of Lean in Site B it was not a rapid. Rather service level and floor staff initiated improvements and made presentations that provided senior leadership with the opportunity to contemplate alternatives to the then hospital flow and work designs. This occurred over a 5-6 year period.

Site B’s present commitment to patient flow is termed the Improving the Patient Experience Programme (IPEP) and it is through this programme that further Lean Thinking / patient improvement initiatives have been undertaken.

6.3.3. The Emergency Department

Site B’s Emergency Department is a 14 bed facility with an adjoining 4 bed short stay unit used for stabilisation and observation. The ED experiences an annual demand of approximately 40,000 attendances of which about 23 percent require admission. Full staffing for the unit is budgeted for 68.2 FTE (48.8 nursing and 19.4 medical FTEs), with a stable staffing pattern. Patient feedback revealed that ED patients were concerned about wait-times.

The ED facility has been described as small and unsuited for the demand and flows it experiences. In response to congestion, a social marketing campaign aimed to reduce
attendances was undertaken. However, congestion problems remained as did the problems with the ED’s synchronisation with the rest of the hospital. The short stay area attached to the ED seems to have become a buffer for admission rather than for its intended use, releasing an ED bed when observation is required or for a patient who is capable of some form of self-care. In the last decade a sentinel event was recorded at the ED. This event resulted in significant stimulus for the redevelopment of the ED and operating theatres.

### 6.3.4. Implementation Method

The implementation of Lean Thinking into Site B’s ED occurred over time motivated by staff responding to patient feedback and research that suggested that current wait-times could be reduced through the introduction of alternative processes or pathways. The first patient flow improvement project, introduced circa 2002, was a nurse led minor injury stream, which is now embedded as a minor injury clinic in the ED. Latterly, with the adoption of the IPEP as the acute patient management strategy a range of projects and patient flow activities have been undertaken across the hospital. In 2008, as part of the IPEP work, a National Quality Committee (NQC) project (Ministry of Health, 2009b) was secured, its focus being on applying Lean Thinking to a medical ward.

As a result of the NQC project’s intention to improve patient journeys the ED co-developed a sub-project to improve the patient flows between the ED and the Medical Ward. The sub-project was engineered to take advantage of the resources made available from the

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3 A serious or sentinel event has, or has the potential to result in, serious lasting disability or death, not related to the natural course of the patient’s illness or underlying condition. (Source – National Quality Committee, Ministry of Health Website (2009), accessed 21 August 2010 from [http://www.qic.health.govt.nz/moh.nsf/indexcm/qic-sentinel-and-serious-events-report-0708](http://www.qic.health.govt.nz/moh.nsf/indexcm/qic-sentinel-and-serious-events-report-0708))
NQC project and to leverage improved organisational value in terms of additional outcomes and synergy by way of simultaneous activity.

These projects were developed and configured by service managers and clinical staff and to provide improved integration a project co-ordinator was introduced to the organisation in 2009, around the time of new DHB performance targets (Ministry of Health, 2009a). This role brought a sense of cross organisational purpose and organisational ownership for these new targets. For example by simply referring to the ED target as ‘the Ministry of Health 6 Hour target’, this opened the opportunity for other areas in the hospital to become involved.

6.3.5. Implementation Process

The sub-project was part of the IPEP work stream of unplanned care commenced in March 2008. The sub-project was implemented by a small project team of five, consisting of the Nurse Manager ED, Service Managers and a Quality and Risk Unit adviser. The project team undertook a Value Stream Map (VSM), defining patient contact and management processes modelling the current state and identifying potential improvements or bottlenecks to flow. The project team tested current state process map against patient journeys by following patients through their admissions seeing the actual discrepancies. The identified issues were categorised for immediate review, further review and areas that require unit level review. These categorisations provided for prioritisation of which the focus became the process likely to reduce delayed admission and subsequent treatment, avoid inappropriate disposition, and decrease risks in third party handover.
Practical considerations of the above priorities revealed that bed acquisition and patient transfer from the ED to other areas of the hospital was a problem. The processes that were in place utilised a central co-ordination department who arranged admission beds on behalf of the ED with the receiving wards. The admission process sometimes took a considerable time and the potential for miscommunication and information handover error was significant. Further, when some wards were full, patients could find themselves in wards that were not of the speciality for the condition they were admitted. It was decided to investigate a new system of safe and reliable admission to the wards in terms of improving handovers and wait-times. The current admission process worked well when there was moderate demand, however as acuity and / or hospital activity increased the system became progressively more unreliable.

The project team initiated a round of consultation meetings where staff from affected areas were invited and where the idea of new processes was introduced and explained. The feedback received assisted the project team to design and develop a process map for new admission procedures. The solution was framed in terms of improving the patient’s experience, reducing load for the Central Co-ordination function and to assist with improved workflows during the night-time ‘After Hours’ period. The project proposed a two stream process, one a direct contact system for simple admissions when beds were available and an alternative for those admissions that became complex as a result of no bed being available.

The simple or ‘Straightforward’ admission defined responsibilities for personnel with the ED staff notifying the pending admissions and the Ward staff accepting the patient and facilitating an appropriate patient handover.
For the ‘Complex’ procedure the Ward must still ‘accept’ the patient from the ED, but the Ward staff then undertake a process that creates space for the admission. The process aims to create an available bed in the appropriate ward. A decanting process is undertaken whereby stable or pending discharges are identified and placed in alternative care or if this is not possible, following an approval by the admitting team, the patient may be placed in an alternative ward. The Ward staff are responsible for the admitting process and meeting the hospital target of 60 minutes for an admission.

A consultation and agreement phase was undertaken with an agreement for the process to be trialled. This trial occurred in February 2009 for the month’s duration. The trial occurred during the general ‘open’ hours of 7 am to 3.30 pm, Monday to Friday, when sufficient staff were available. Senior staff were allocated liaison roles for the trial’s implementation, with the usual hospital practices resuming each day following the trial end time. Normal routines such as daily bed availability meetings and senior nurse communications were continued throughout the trial.

The trial used formative processes whereby changes could be made following feedback. Meetings were held weekly with ward staff and stakeholders to provide this feedback. Flow charts and visual planning tools were implemented by the wards and ED to facilitate communication and collect data related to the trial.

The trial provided data on the times and processes for patient admission from the ED. The average time for obtaining a bed has been reduced to 5 minutes, the bed availability time for a patient once they leave the ED is 31 minutes with an average admission time (bed request to patient leaving department) being 36 minutes. Staff reported improved reciprocal
communication providing awareness of each areas’ roles resulting in improved professional
respect. On the basis of these results the pilot continued as a standard operating procedure.

While this project was being undertaken, other IPEP projects were progressing across
the hospital. A medical ward that had significant flow from the ED engaged in a discharge
process review, as were the Orthopaedic Ward, which participated in the NQC project. These
projects focusing on the patient journey enacted the philosophy of pulling the patient from
the ED so that treatments can begin.

Site B staff engaged with other sites across the country by participating in the National
Collaboratives, – the centralised knowledge fora organised by the NQC project office,
including the presentation of the pilot’s results.

6.3.6. Theme: Team Development

At Site B the staff talked less of unit based teamwork and the actual activity
implementation but more of the team or collaborative approach across the organisation, areas
or disciplines to enable patients to move the best place for their treatment and care;

“It’s not about getting the patients out of ED in a timely fashion for ED, it’s
about getting the patients up here and getting their treatments started”
[Respondent B4],

“ED is merely the front door. They’re not ED patients, they’re medical patients
that need to get to your wards - how can you get them there the quickest and
simplest way.” [Respondent B2],
“I guess it was trying to raise awareness that the problems with overcrowding in ED is not just an ED problem, its everyone’s problem and if everyone does their bit then they can all make a difference” [Respondent B3],

“We pulled together a lot of the clinical area, but then pulled together IT, communications and that sort of thing and I think perhaps in my experience this was the first time that actually the business, drove change rather than in isolation” [Respondent B2], and

“It was quite obvious to us and to the other management at the time that the ED bottleneck is not an ED problem... it’s the ED just shows the symptoms of what’s happening in the rest of the hospital” [Respondent B5].

But the people who did reflect on the teamwork at the implementation level picked up on staff involvement at the ‘blue sky’s (name used for the NQC project’s initial multi disciplinary / site group meeting) or working on problem solving. At Site B, nurses tended to dominate improvement activities;

“Whether it was the first time they’ve actually felt that they did feel empowered to put whatever they wanted up on the wall... we’re talking about a very stable ward was predominantly older nurses... And they made jokes along the way and what have you and were a bit cynical but the bottom, the end result was that nearly all of them climbed on board with the process and became part of the change” [Respondent B7],

“If something comes up on the table and they want a multi-disciplinary approach, inevitably it will be nurses who take it up and run with it...” [Respondent B6],

“The main things we’re working on with teams to ensure that if they’ve decided someone’s going home that they’ve got their paper work and everything sorted and they can be out the door by 11 o’clock” [Respondent B4].

“I think certainly from a co-ordinator charge nurse level, that is one of their key responsibilities is to manage patient flows. And so they’re going to be looking for those patients as opposed to the nurses who are going to be caught up in their workloads and don’t often see that so easily” [Respondent B3], and
“Within [Site B] ED, it’s mostly driven by the nurses, it must be said. [they’re] very motivated, looking at different ways in which to maximise treatments and the patient’s experience, there were actually several projects, small projects going on at the time... I think it’s a reflection of the culture within the ED rather than any push from outside.” [Respondent B6].

However the changes in processes were not taken on easily by some staff, with resistance to adhering to the ‘new’ processes or procedures. Changes in where responsibility lay also took time to stick;

“they didn’t feel it was their responsibility. They tried initially to decant that responsibility back to ED or over to the duty managers, where we were actually saying well this patient has been accepted to your service... this patient actually comes under your care, it’s up to you to put the processes in place.” [Respondent B6],

“The wards are taking more ownership of their patients now. They’re looking onto our map view to see what’s in the department and what might be coming their way. So they’re anticipating rather than waiting for us to call in and say, well we don’t have anything. So, they’re certainly taking more ownership of that.” [Respondent B3], and

“What I’ve definitely noticed is that we have to get down to the staff because the staff are actually doing the job, who are feeling the brunt of the pressure to transfer patients around the hospital because of the target, and as you’d expect, they actually don’t know the context of the target, they just think it’s this thing that’s been imposed on them.” [Respondent B1].

6.3.7. Theme: Leadership

As indicated in the section 6.3.2. previous Chief Executives and Clinical Leaders placed a lot of stock on quality relationships and have created a climate for progressive development;

“I think people by and large do try to actually live up to those [organisation’s] values which is can do, you know a can do attitude, it’s the managers and
clinicians working in partnership. It’s things like trust, trusting each other, you
know stuff like that... I think this organisation’s lucky in that it has had a series
of good strong Chief Executive leaders.” [Respondent B1].

Leadership for the NQC project, which included Lean sub-projects, was provided for
the by the Chief Operating Officer (COO) as the chair of a steering group. The steering group
had a project co-ordinator who worked with ward managers and clinical leaders to forward
patient flow projects. This senior line leadership provided firm basis for constancy of
purpose;

“This was about the patient... as long as you’ve got the patient at the centre of
your thinking then there really is no argument. With [the COO’s] leadership,
[they] absolutely drove that... I don’t think it would have been nearly as
successful without that leadership” [Respondent B2],

“we try to dialogue rather than, and understand each other’s points of view
rather than sort of step on anyone’s toes if you know what I mean.”
[Respondent 1], and

“Sometimes you don’t get that buy in from staff and [managers have to] put it
in a way that puts it back on the patient focus to explain, we’re not telling you
to do this because we’re bossy, we’re telling you to do it because this is the
best way for patients. And we get buy in from people that way.” [Respondent
B5].

And with raised organisational expectations in this patient focussed environment, the
staff are encouraged to innovate;

“part of your job is to continue thinking of better ways to do things and if this
is the aim... So we’re not necessarily telling them how to do it, is this the
outcome we want, how can we do that with the same resources that you have”
[Respondent B5], and

“We were basically given a task and they chose teams based on their previous
skill sets and were expected to come out with an outcome. It wasn’t onerous, it
wasn’t over bearing, we reported back regularly to the steering group which we still do but to be fair they basically let us get on with what we needed to get on with having said that we were producing outcomes.” [Respondent B6].

However, even with a strong leadership framework the engagement of clinical personnel remains problematic;

“The nurses have driven [patient journeys and Lean Thinking] from day one and they continue to drive it. It has been my experience that many doctors pay lip service to it. Having said that there are one or two doctors who have definitely come on board now, especially since the 6 hour target has come up... If it’s seen as a success, in my experience, the doctors are quite happy with it. If it’s not seen to be a success, unfortunately some don’t care one way or another and I do think it is one area we need to look at is getting an engagement of those clinicians to actually become fully involved in these concepts because they have that age old hierarchical authority they can bring a lot to the table.” [Respondent B6], and

“sometimes it’s very hard to get like the physicians on board and, they’re very reluctant to make changes but... we’ve had some really good physicians who’ve come on board and encouraged it...” [Respondent B4], and

“And when you’re dealing with professionals, particularly doctors, you can’t always standardise something because, I’m doctor A and I like my patient to have his sutures out on the third day, I’m doctor B, I like to have my sutures out on the sixth day... what is the ideal for patients so we can streamline a process...” [Respondent B5].

6.3.8. Theme: Sustainability

This site had undergone a process of gradual learning and understanding of how patient flows and system thinking assisted the achievement in the ability of the hospital to deal better with the demands it was facing;

“I honestly think it’s going to be great for our hospital because I think it’s really making us look at our processes and our customer practice and I think that a lot of things that we’ve been doing just because not actually really
getting down to the nuts and bolts of that and finding, why are we doing this and why can’t we do things differently.” [Respondent B3].

The incremental nature of the change and adoption is typified by one respondent speaking of a colleague’s view of Lean;

“[they said] It’s not necessarily about moving the big dot, it’s about moving all the little dots in the same direction because sometimes the big dot is too hard to manage but if all the little dots are going forward in the right way you’re actually achieving change...” [Respondent B5].

And for themselves;

“Because you’ve got little PDCA cycles happening as you’re doing the overall process, you are learning and changing and amending.” [Respondent B5].

There is a commitment to progress from those interviewed; a commitment that has seen departments that have introduced Lean methods become role models for a workplace where change can take hold;

“The changes that we put in place in that ward through the project are continuing to this day. And they really have become a role model ward for what they’ve achieved. So it worked.” [Respondent B7], and

“So you know, you want the infrastructure there to go on supporting how you make change go through. And we’re not doing too badly, we’re getting good buy in from people out there and we certainly have done things that support people to do the job they do like coaching. We have coaching clinics here that encourage certainly the senior staff, clinical nurse managers and their leaders to go to coaching clinics.” [Respondent B5].

While comments were made regarding the difficulties of clinician engagement the respondents believe that there are emerging solutions or indicators for clinician involvement;
“In fact I do probably make a really big deal about using their language. And so I wouldn’t go and talk to doctors particularly about Lean Thinking, you know, but engaging with them on some of this ED wait-time stuff, clearly we’re using some of that methodology, but we know that doctors like evidence and have statistics and those sorts of things and so that incorporates Lean Thinking. You’ve just got to package it and I think we’ve got some really great examples here of real engaged clinicians that understand all of that, and then we’ve got some that just don’t want a bar of it...‖ [Respondent B7], and

“we’re capturing discharge time and we’re publishing graphs and putting them out for the medical team, it’s got to be a little bit of a competition so they are quite keen to get onboard...so one team hit 30 percent, the others are all between 20 and 30 so they want to be as good the one that got 30, so putting it out there and seeing well this team can do it.... The fact that we’re kind of not making it a competition but that we are publishing the results for them to see and compare with the other teams has made them get this right and get our patients up here.” [Respondent B4].

This site has a culture of new thinking in terms of solving problems and developing a co-operative workforce, the staff have received training through Lean healthcare courses and conferences and, some staff have been seconded to organisations who implement Lean Thinking in a health context. In effect, Site B was somewhat pre-prepared for the NQC project’s implementation;

“certainly moving people through the ED was one of them that was our high priority. Also knowing at that time that it was likely that the Ministry was probably going to come out with some standards for us to start to meet so we wanted to get on the front foot of that” [Respondent B2],

“So the approach we’ve taken here is a sort of a hybrid model, we don’t care what we call it as long as we apply the methodologies... I guess in terms of sustainability we are definitely continuing to use some of those [the NQC project’s] tools and find them really useful.” [Respondent B7], and

“And so I think the knowledge that there is... people now in the organisation that have valued expertise and people might not quite know what they mean but they’ve heard it’s quite good. And so we’re starting to see that people are
now actually phoning [the Lean facilitator] up to say, can you come and do that thing for me’ [Respondent B7].

Thus Site B’s view of Lean Thinking and Sustainability is seemingly somewhat positive, as an organisation it appears not to be sceptical or anxious of Lean Thinking in practice, “we have these basic principles of quality improvement, just renamed to be honest. It’s really just all renamed stuff.” [Respondent B7].

6.3.9. Theme: Activities

At Site B the NQC project’s primary focus was in a ward. However in line with the IPEP, Site B chose to implement an ED/Ward synchronisation sub-project.

6.3.10. Summary of Lean Activities - Site B

The following table summarises the Lean activities implemented at Site B’s Emergency Department, in terms of the activity or tool used against the situation encountered and results of the tool’s application.
Table 6.2: Table of Activities undertaken as part of Lean Implementation at Site B

<table>
<thead>
<tr>
<th>Lean Activity / (Tool)</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Stream Mapping / Pull patient based flow</td>
<td>Delays experienced in admission process.</td>
<td>New Bed management processes achieving the following results;</td>
</tr>
<tr>
<td>(VSM / Process Map/ PDSA)</td>
<td></td>
<td>- Average Bed acquisition time now 5 minutes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Average time for Bed availability 31 minutes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Bed Request to patient transfer is 36 minutes.</td>
</tr>
<tr>
<td>Patient Streaming - Minor Injury Clinic</td>
<td>Single queue for patient arrival to be seen by care teams,</td>
<td>Two streams, one a nurse led minor injury clinic, other standard ED practice,</td>
</tr>
<tr>
<td>(VSM, Standard Work / procedures)</td>
<td>- Some patients experience long wait-times.</td>
<td>- Anecdotal evidence implies the minor injury clinic assists patient flows and discharge times since its implementation in 2003.</td>
</tr>
<tr>
<td>Visual Work Control</td>
<td>Data collected mainly for reporting purposes,</td>
<td>Scorecard displayed containing new patient flow and performance metrics,</td>
</tr>
<tr>
<td></td>
<td>- Work team and patient flow data not readily available.</td>
<td>- New data sets defined and collected,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Discharge data collected and displayed (Wards).</td>
</tr>
</tbody>
</table>

6.3.11. Outcome Discussion

As summarised above the implementation resulted in some changes for the Emergency Department and the Wards to which patients are admitted. Firstly, the bed management process, which is a change from push to pull flow. PDSA processes were undertaken with Value Stream Mapping (VSM) exercises representing the current and futures states to develop a new patient journey. Actual patient journeys were mapped as part of the study phase where the bottlenecks were identified. A new set of standard work was developed that transferred receiving responsibilities from the ED to the wards. A significant part of the PDSA is identification of data and metrics that support the principles of an ‘evidenced’ based
organisation or processes. The data also aligns with what is required by the new 6 hour admission or wait-time targets set by the Ministry of Health (Ministry of Health, 2009a).

Secondly, the evolution of a nurse led minor injury clinic is an early example of patient streaming in an attempt to improve wait-times, access and admission. While there is no data that evidences the improvements made through wait-time or throughput volumes at the site, the literature reviewed for this thesis provides evidence that patient streaming has positive effects on patient flows through ED’s.

Thirdly, the pull process embodied in the bed management procedures relied on work undertaken by the wards to improve bed availability. This was achieved by beginning to orientate discharges towards the late / morning early afternoon, matching beds with the attendance (demand) profile from the ED - “We’re trying to push people out early so we can start taking them in because they hit their GP’s at 9 in the morning so they’re starting to come into ED by about 10 or 11 so we need to be having some beds for them.” [Respondent B4], creating an improvement for patient flows.

Site B undertook a number of simultaneous activities aligning with an organisation plan, the Improving the Patient Experience Project (IPEP). It also sought to leverage off the NQC Lean Thinking project by seeking to synchronise patient flow from ED to the receiving wards through a pull orientated standard set of procedures; flexible enough to ensure appropriate patient safety while minimising wait-times.
6.3.12. Conclusion of Case B

The theoretical effect of approaching improved flow, by simultaneously addressing bottlenecks across the value stream, should improve the overall average time in progress for a patient. There is a multiplier effect for those attending the ED and progressing through into the hospital. Through synchronisation and demand matched discharge times, there is the potential for an overall decrease of average bed days per patient. The reduced waste of waiting is the intended effect of Lean Thinking as part of patient flow management.

Site B also took the opportunity to view the services they provide as part of a system, acknowledging that there may be only so much the hospital itself can achieve;

“We’ve been working with some of the services within the hospital that take our patients and try to smooth the pathways already. But I guess it’s the things outside the hospital that we can’t control which just might be the problem.” [Respondent B4].

It is also cognisant of while it has a supportive culture for team-based process improvement, it is a 24/7 organisation where the patient comes first. This produces organisational cycles that become relevant in terms of short run and long term plans;

“clinical doctors have a certain amount of non-clinical time. It’s a matter of making sure that we try and get meetings when they have non-clinical time and not organise meetings in the middle of their surgery sessions.” [Respondent B5], and

“if I decide to do something now, which is the end of May, our budgets long been set for the 2010/2011 year. So if we agree to something now, it would go into the 2011/2012 budget but could have taken 6 months or a year to get to this point, so you can see the length of time it takes and then if it’s agreed within the budget and you’re not in time for the round of hiring junior doctors or the knowledge that it takes, at least six months, sometimes a year to get
senior doctors on board, those are the changes you have to make, if they involve staff anyway.” [Respondent B5].

The adoption and adaption of Lean Thinking by Site B’s staff remains ongoing. Language and Lean Thinking’s origins remain potential barriers to buy-in, with one respondent commenting:

“We need to find a language that’s comfortable particularly with clinical staff and I suppose the flip side of the coin is that some people will say, well you know, health needs to get over the fact that it’s not actually in some instances that different to a factory...” [Respondent B7].

Site B has undertaken a commitment to improve patient journeys. It has adopted Lean Thinking principles, taking on the problems solving techniques / tools that have seemed to have worked for them. The hospital has taken a somewhat slow, incremental and planned approach to change; an approach that is underpinned by a supportive organisational culture. The Site has also successfully involved clinicians across the hospital with Lean, and although not widespread some changed clinician practices have been observed.

In closing, Site B’s Lean Thinking implementation tends to remind a reader of transformative cases and literature rather than being indicative of point change and project based Lean executions.
6.4. Case Study C

6.4.1. Introduction

Site C is the main hospital of a District Health Board serving a population of approximately 102,000 providing a range of inpatient, outpatient and day services. Close to one third of its population is of Maori descent which is twice the national figure for New Zealand\(^4\). Site C provides services for approximately two thirds of the DHB population with the other third being serviced by a smaller facility approximately 80 kilometres or 1:15 hours travel away by road. Site C has 200 beds (Inpatient 178-beds with 22-day beds) with a staff of 1,200.

6.4.2. Lean Thinking and Site C

Site C identified Lean Thinking as its preferred method for quality and performance improvement circa 2006, introducing a change plan based on the ADKAR model (Hiatt, 2006). The adoption of Lean Thinking underscored the DHB’s wish to transform itself in terms of efficiency and waste reduction to meet future service and financial demands; moreover Lean Thinking aligns with a major capital development - the rebuilding of the hospital facility. The commitment to Lean Thinking has extended to the employment of a change manager, later titled Lean Thinking Manager to promote and support Lean throughout the DHB.

\(^4\) Population figures are derived from the New Zealand Census 2006. Numbers are rounded. Maori are a significant population in health terms as this ethnic group has worse health outcomes than the population as a whole.
Site C’s focus on Lean Thinking has also involved interactions with the Flinders Medical Centre in Adelaide, who visited Site C in August 2007, reciprocating a visit made by Site C personnel in May 2007. Flinders’ visit led to the introduction of flow / patient management projects and 5S work including Lean projects across Site C’s DHB facilities.

In October 2008 the building of a new facility began. Leading up to this the Lean Thinking Manager became increasingly involved with new facility work, redesigning models of care and identifying projects that have synergy with the physical layout of the new premises. Lean projects also re-emerged in the pharmacy and medical wards, through the installation of visual management boards, and 5S projects in the operating theatres.

The long term commitment and approach to Lean Thinking is demonstrated through in-house publications and in 2009, an industry training organisation began providing training for qualifications for staff in Lean Thinking. While the delivery organisation worked mainly in manufacturing, its operating in Site C offers the opportunity to develop additional healthcare educational resources. As the DHB prepares for the move into the new building in 2011 the Quality and Risk Unit has now become responsible for the development and delivery of Lean Thinking for the DHB, rolling out a programme of 5S projects in preparation for patient flow work when the new facility is operational.

6.4.3. The Emergency Department

Site C’s Emergency Department is a 14 bed facility with areas for adults, resuscitation and paediatrics. It experiences an annual demand of 28,000 attendances of which 30 percent require admission. Full staffing for the unit is 38.5 FTEs, however it is common for the
facility not to have a full staffing complement. Patient feedback revealed that patients are generally highly satisfied with the service with any dissatisfaction dominated by communication and wait-time issues. The ED has experienced seasonal peaks in demand in July 2008 and August 2007 where capacity was unable to meet ED attendances requiring admission resulting in high wait-times and hospital congestion.

6.4.4. Implementation Method

In 2008, an application was made to participate in a national quality improvement project through the National Quality Committee (NQC). Site C applied to follow through on the Lean work it had began in its medical wards and inpatient processes. However, this application was not successful and the organisation was offered an alternative option; that of a project to be conducted within the Emergency Department. This alternative option was accepted by Site C and preparations began to conduct the project within the ED.

While there are existing Lean resources and experience within the organisation, these resources were not orientated towards the ED project. A decision was made to place the project with the Quality and Risk Unit, from which Site C’s Lean facilitator was appointed. The Lean facilitator, who had a clinical role before joining Quality and Risk, received considerable support from an external consultant who also provided training and technical advice across the participating NQC project sites nationally.

The project experienced difficulties in working to the timelines and schedules set by the NQC project framework. The ‘second choice’ and sharp shift of focus for the Lean project’s endeavours appeared to return to haunt the project periodically both in terms of the overall
integration into Site C’s routines and the ability of the staff to engage with the Lean activities selected. As the ED has regular understaffing, it was not always possible to have key project and activity champions available when external resources were on site or timetabled. This appeared to amplify the effect of the Hobson’s choice of the acceptance of the alternative project whereby departmental preparedness for change had not occurred and the project’s plans were unable to account for the structural and demand patterns of the department. Significant lead in and project scoping work that would have occurred through the preparation of an application appeared to be absent, “the planning and the floor planning and what have you, wasn’t there” [Respondent C1]. This work would have involved and informed key representatives of the department. This lack of preparation was rapidly corrected in the early phase of the project, albeit creating a shortened productive implementation timeframe.

The project commenced in November 2008 and concluded slightly over the allotted timeframe, nevertheless achieving the activities it took on. The Lean facilitator’s scope and range of projects has been extended following the completion of this project.

6.4.5. Implementation Process

The project was focussed on the introduction of Lean processes into the ED and the equipping of staff with skills and experience required to improve quality. Initial observations found patients were concerned about wait-times and communication, the staff had little time or tools to generate improvements and there was an undercurrent of staff dissatisfaction. Furthermore there was not the collection or generation of data that would assist staff to focus on improvements from a positive standpoint.
The project was introduced through a Lean principles lecture followed by a ‘blue sky’ event - the name used for the NQC project’s multi disciplinary / site group meeting that introduces the Lean Thinking project to the organisation. The staff were encouraged to raise concerns at the event that became the foci of the subsequent Lean Thinking activities.

As described in the previous section, Implementation Method, this project was an alternative to the original proposed to the NQC, as such the ED staff had not been involved in its planning and development. It was the first some had heard of the project; there was resistance and a feeling of imposition; “The emergency department, it felt it was put upon them, they didn’t want to do it from the start” [Respondent C1]. This resistance was overcome with the facilitators re-approaching and gaining improved acceptance “the [facilitators] organised a step back and came in at a different angle and that worked a lot better, got a bit more buy in” [Respondent C3].

Following this re-engagement the project’s Lean activities were selected. They variously involved standard work in terms of processes for patient notes, blood testing and documentation, improvement in patient communication and admission patient flow from the ED into wards. Staff involved at the ‘brainstorming’ included clinical, nursing, clerical, allied and housekeeping functions.

The group identified the need to collect and analyse data to inform the Lean activities and tools and this data was considered important for solving any problems exposed. A scoreboard was developed to assist staff to focus on the improvement endeavours and staff were trained to be able to collect, present and analyse the data. This board was placed so to
be visible to staff in the ‘fishbowl’ - the centre rostrum of the ED where clinicians and nurses manage and co-ordinate the ED’s treatment activities.

5S and visual control projects were undertaken involving the ambulance bay / entrance area, the resuscitation room and stock rooms. These activities involved teams working to remove clutter to create visual displays for the treatment area’s instruments and collaborating to simplify and standardise checklists and procedures so that stocks and equipment can be better monitored.

Staff engaged with other sites across the country participating in the National Collaboratives, the centralised knowledge fora organised by the NQC project office, where staff could share their experiences and learn from international speakers and presentations.

The changes made at Site C were predominantly administrative or environmental. The focus on improved processes for patient notes is an example of a simple and effective way to give staff time and certainty in a somewhat uncertain environment. Similarly, stability was provided by the 5S activities with significant work achieved on the synchronisation project, whereby the wards pulled the patients from the ED through refined communication and procedures.

6.4.6. Theme: Team Development

Staff were generally wary of any intensification of their work through the introduction of this project. The project was seen as additional work from the floor of the ED with staff slotting Lean tasks and activities when they had time to complete them;
“finding time in their own routine. There probably wasn’t that many people doing it in their own time” [Respondent C3],

“all they saw was extra work in the beginning, ‘we don’t want extra work, when are we going to fit that in?’ because it was very difficult to get people to commit to spending time when they’re busy anyway and there was no resource for extra in our organisation, there was no resource to bring people on for extra hours” [Respondent C1], and

“I know [the project leaders] were trying to get us to have like a day where we could just come in and organise everything and get things that we need and you know, how we wanted to work but it was sort of done while we were having to work” [Respondent C4].

Coping with periodic understaffing or staff turnovers required shift changes and additional duties for ED staff, meaning people were often unavailable, chose not to attend sessions in their own time, or had discontinuous involvement with some project activities. These instances impacted on the meeting of project milestones / schedules, staff availability for training, clinician involvement in activities or attendances at project progress meetings;

“not [many] people showed interest and a lot of times [the external consultant] came to ask me especially for a reason” [Respondent C9],

“[the external consultant] would come expecting to have a day of interviews with people or a day working with them but the department had turned to custard overnight and we only had 5 staff, we don’t have 9 or 10, you take 3 of those staff away and you’re at 50 percent so it was very difficult to resource, to commit the time to it” [Respondent C1], and

“being a 24 hour service organisation you can’t clear everybody out and just go into it and put you know, a whole lot of time into it” [Respondent C4].

The activities that were undertaken did involve a cross section of staff, for example the patient records project involved nurses, clerical staff and clinicians to design, decide and implement the new standardised procedures.
However, some felt that the project’s training provided for the ED was a repetition for staff who had attended Flinders and other Lean Thinking events held by the organisation. The NQC project’s consultants used alternate approaches and terms than had been previously used at Site C. This led to comments regarding Site C’s Lean journey so far and the potential for fragmentation and confusion especially through the language being used;

“This we’ve got to adopt one kind of language so we all know we’re talking about the same thing. We have to develop our own, not our own methodology but our own language about what it means, what is blue sky, what is tracking... what is value stream mapping...’ [Respondent C5].

6.4.7. Theme: Leadership

The activities involved a range of staff with some taking a lead or champion type role. Some staff found the role in addition to their normal routine difficult to achieve within timeframes while other staff with more predictable routines or time allocations were able to make dedicated time to achieve completion targets;

“We had to do it on our own, like when we’re working and it’s just about impossible... so you get pulled away for you know five or ten minutes, you’d go back...” [Respondent C4], and

“In this specific role] I don’t have a patient load so I can most of the time, today I do, but I can just say, well I’ll do that for two hours or whatever, you know I can do that in my day]” [Respondent C3].

Champions and facilitators were, generally, unprepared for their roles. The project provided training and one to one support also, so those who attended the National Collaboratives found these provided them with confidence to continue. Some remarked that
they gained interpersonal and communication skills through learning by doing and now apply these skills throughout their work;

“So that was a good learning curve for me. I just had to step back and look what they’re saying, it’s probably quite a good idea. That was helpful.” [Respondent C3], and

“I could call myself a champion now because I have a lot more knowledge and I’m using the tools and I’m, well, much further down the track, so in terms of that I possibly wasn’t the best person to lead” [Respondent C1].

ED staff who undertook activity leadership roles were supported by the Lean facilitator and the external consultant. The leadership of the project was seen to be with the Quality and Risk team with some respondents verbalising their ongoing responsibility for the continuity for 5S type duties as a part the preparation to relocate the ED into new premises;

“So thinking about going into our new emergency department, how we’re going to work things and how we’re going to, you know, put the 5S’s into different areas” [Respondent C4], and

“The first principle of the whole building was focussed on patients so it is that smooth flow of patients” [Respondent C5].

6.4.8. Theme: Sustainability

The implementation of this project provided an opportunity for reflection on Site C’s Lean journey so far. The Lean implementation began in 2007, had created significant point change and this was remarked upon. However staff across the organisation held views of the linking of these point changes in a coherent way;
“There’s smatterings of work all around. There’s no strategic framework for those particular pieces of work... But from an organisational point of view, I don’t think we’ve sat down and said what does a pathway look like and, I don’t think a lot of staff understand what a pathway looks like and certainly doesn’t understand what an integrated pathway looks like” [Respondent C5], and

“It’s more than there’s not a cohesive strategy that everybody’s agreed upon and that sort of direction saying that this is what we’re going to do, these are the benefits and, and it’s this one thing, it’s just what you see is that these are sort of fragmented approach, this group’s doing this over here, this groups doing that over there and I think a lot of doctors think well yes OK it’s just another buzz word and another one of those things nothing’s ever going to go from it which becomes self perpetuating story, that you don’t see the benefit of because you haven’t finished the process to end” [Respondent C2].

A sense of ownership was not well developed for some staff, but when pressed, most respondents could detail the benefits accrued from the department’s Lean activities demonstrating a comprehension of Lean and a wish for those benefits to continue, including the recognition that for some Lean is simple and practical or ‘common sense’;

“new staff come through, it should be really focussed on [them], in their orientation... but they just seem to overlook the signs and take no notice of them” [Respondent C7],

“A lot of people comment. I mean, people from the cleaners to the ambulance people, to our locums, you know, they say it’s all set up really clearly and they know where things are and what to do” [Respondent C4],

“A lot is common sense anyway. 5S’s you know, tidying up and that” [Respondent C6], and

“For me, the Lean tools are common sense. You know it’s common sense, it’s a common language” [Respondent C2].

However, an undercurrent of fatalism was evident from some respondents, describing an organisational inertia when new ideas or changes are being introduced and embedded;
“you get consistently, getting comments, ‘Oh well we’ve tried that before and it never made a difference’, ‘No one would listen so why do I bother again’, you know and I had that all the time...” [Respondent C1].

Some respondents felt that improved knowledge of the project’s results and benefits would improve its chances for sustainability;

“if we don’t see a good end [to the] project and good results, we won’t feel that good” [Respondent C9],

“We haven’t had feedback from what’s happened in ED which is a real shame because it would have been good to get it out there” [Respondent C3], and

“I don’t think we actually got enough buy in from the clinical staff to make those fundamental changes... I think if you add, a good strategy, some good measures – and doctors are very particular for measures, they want to see some definite outcomes” [Respondent C2].

And a sense of relevance of the achievements are somewhat reduced by respondent’s remarks on the discontinuation of some of the activities at the ED boundary, as opposed to continuing them on through the hospital;

“It started in ED and stopped in ED in our hospital, it didn’t go further and that’s what I think, ah, it didn’t, it did make a difference at first but not that much” [Respondent C9], and

“I don’t think really feel that outside clinical people had much to do with it – it was mainly just in the emergency department. A lot of what I understand holds up a patients journey is when they get handed over because they’re handed over from emergency medicine to a speciality” [Respondent C6].

Further, some respondents felt a disconnect; an inability to perceive the initiatives linking as an organisational plan or strategy reduced their sense of sustainability or continuity in terms of improving a patient’s journey;
“as for project work, I mean, yeah the way it’s historically done is that it has been siloed, I’ll do this bit of work, I’ll do that bit of work and I don’t think that’s the answer and it just reinforces what’s happened, And it doesn’t make for good patient care either...” [Respondent C2],

6.4.9. Theme: Activities

While Site C’s ED was not the first choice for the NQC project, it did manage to engage staff and undertake a number of Lean activities.

6.4.10. Summary of Lean Activities - Site C

The following table summarises the Lean activities implemented at Site C’s Emergency Department, in terms of the activity or tool used against the situation encountered and results of the tool’s application.
## Table 6.3: Table of Activities undertaken as part of Lean Implementation at Site C

<table>
<thead>
<tr>
<th>Lean Activity / (Tool)</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workplace Control</td>
<td>- Ambulance Bay clutter,</td>
<td>- Ambulance Bay and Resuscitation areas re-configured – simplified and visual control of</td>
</tr>
<tr>
<td>(5S, Visual Control)</td>
<td>- Sundry and Main stores systems untidy,</td>
<td>equipment and work spaces,</td>
</tr>
<tr>
<td></td>
<td>- Incomplete and inconsistent standards,</td>
<td>- Stock rooms re-organised and consistent signage,</td>
</tr>
<tr>
<td></td>
<td>- Visual signage inconsistent,</td>
<td>- Documents re-designed for consistency.</td>
</tr>
<tr>
<td></td>
<td>- Documentation adhoc.</td>
<td></td>
</tr>
<tr>
<td>Patient Notes</td>
<td>- Notes regularly misplaced,</td>
<td>- Single folder for notes and placed in cubicle with patients,</td>
</tr>
<tr>
<td>(Standard Work, PDSA)</td>
<td>- Nurses care time taken up with notes searches,</td>
<td>- Decreased time to find notes,</td>
</tr>
<tr>
<td></td>
<td>- No procedures for notes management.</td>
<td>- Reduced misfiled pages,</td>
</tr>
<tr>
<td>Department documentation</td>
<td>- Multiple documents to record information,</td>
<td>- Reduced search times,</td>
</tr>
<tr>
<td>(Standard Work)</td>
<td>- Many departments want ‘their’ information included whether needed</td>
<td>- Improved patient clinician contact and communications.</td>
</tr>
<tr>
<td></td>
<td>or not.</td>
<td></td>
</tr>
<tr>
<td>(Standard Work)</td>
<td>- Rework through haemolysed samples.</td>
<td>- Contains all spaces for all relevant information</td>
</tr>
<tr>
<td>Time to Find Inpatient Bed</td>
<td>- Long waits for admission to wards up to 4 – 5 hours,</td>
<td>- New forms enable some nurse initiated testing – reduced wait times for some patients,</td>
</tr>
<tr>
<td>(VSM, Patient Flow, PDSA)</td>
<td>- Rework and inefficient handovers,</td>
<td>- Training initiated to reduce haemolysed samples.</td>
</tr>
<tr>
<td></td>
<td>- Process has many steps and communications.</td>
<td>- Average wait-times reduced by 2 hours,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- New procedures – pull system with reduced steps,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Direct communication,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Go See - improved awareness of demand and flow.</td>
</tr>
</tbody>
</table>

### 6.4.11. Outcome Discussion

As summarised above the implementation resulted in some changes for the Emergency Department. Firstly, the 5S projects resulted in significant reduction in clutter. Respondents and photographs testify to changes in layout, placement, and signage in order reduce waste through finding equipment, its ready availability, and reordering of supplies.
Secondly, a group of projects based on the principles of standard work, was endorsed by staff. The patient records activity provided a simple but orderly way to maintain patient records and reduce errors and missing documents. As a second standard work activity the documentation project delivered a single double sided single form regarding patient treatment information. The third standard work activity was initiating training and procedures for blood testing, including new documents, which improved flow and reduced sample rework.

Lastly, a synchronisation activity focussed on reduced wait-times for admission from ED into hospital wards. This project involved analysing patient flow and bed management processes akin to a PDSA cycle resulting in new procedures, responsibilities and expectations. Further, ward co-ordinators were tasked to ‘pull’ patients through cellular telephone communication, managed bookings and expected times for arrivals. This resulted in the wait-time for admission decreasing by 2 hours, to be within the suggested sub target of one hour for transfer from the ED to the admitting ward (Working Group for Achieving Quality in Emergency Departments, 2008).

The above changes are readily acknowledged by staff with overall effects against the objectives of improved patient flows being described by one respondent as;

“It has improved definitely...We’ve streamlined our documentation and just the process of getting patients up to the ward is a lot more easier” [Respondent C4],

Indicating the outcome for the project on ward transfers;

“It is standard procedure now and it works a lot better” [Respondent C3],
And on Lean tools;

“they help you look at things differently and the more people that you can actually get to use them the better... they’re really useful tools” [Respondent C2].

Of the sustainability of the outcomes and learning gained from the project, respondents reflect that while there is significant progress on point change, the “big issues like patient flows” [Respondent C2] or ideally to “start in the community and finish in the community – the overall journey” [Respondent C9], are still required to addressed by Site C and to activate these some fundamental changes can only be driven by clinicians.

While some respondents are more circumspect in their views;

“we have implemented about three or four things that we did and it’s been really good. It hasn’t really spun off into the wider hospital area...” [Respondent C3],

“[the work] it’s probably not a lot different. I mean it is different because everything is a lot more organised and set... [but] we still have to check our rooms everyday and make sure... things are away properly or they are where they should be” [Respondent C4].

With some reflecting on the organisation’s capacity for change;

“incremental change, I think we’re forgotten that. We go for wholesale change” [Respondent C5].
6.4.12. Conclusion of Case C

The NQC project was wound up in February 2010, leaving at Site C, the development of communication procedures between ED staff and patients as work outstanding from the initial list of activities.

It appears there is an issue that dominated the implementation of the project, which has its roots in the project being an alternative or ‘second’ choice for Site C. Two effects of this were revealed.

Firstly, the project became the responsibility of the Quality and Risk Unit, while ongoing Lean work continued to be with the Lean Thinking Manager. The Quality and Risk Unit may not have been fully prepared to undertake this project as it was required to develop its capabilities including facilitation competencies over the time of the project. Secondly, the ED staff were ill prepared for this project and through the ensuing changes, coupled with periodic shift shortages, the department seemed to be constantly trying to catch up on the externally set project milestones.

This lack of time or time resource pressure is a significant influence in terms of continuation of self directed Lean progress within the ED. For the ED staff to embed a continuous improvement culture, processes that afford the time and space to enable this will be required aligning with the organisation’s resource reality. As one respondent put it;

“I have to work with what I have, period. It’s the same for IT, the same with the ward... you have to solve it, to make it smooth. You can still run it but it’s a bumpy road” [Respondent C9].
In terms of ongoing sustainability of Lean in the ED there was evidence of the normalising of the Lean practices into the staff’s everyday routines; the natures of the activities undertaken being environmental or administrative. Engagement with clinical colleagues across the ED / Inpatient boundary did not seem to happen, and while clinical buy in was identified as important for patient flow, it remains a conundrum. The changes of standard work and patient admission procedures are sticking but the ED staff reported not having the time or the ability to implement significant further 5S work or undertake PDSAs; they are replicating the practice of making do or doing when they had a convenient moment experienced during the project.

Even so, the ED is committed to reducing wait-times by actively participating in the Ministry of Health ED 6 Hour target project (Ministry of Health, 2009a), having engaged as recently as March / April 2010.

Finally, through the project the department has reduced its wait times for admissions and provided staff with access to skills and experience in problem solving. 5S principles have been adopted and are to be taken across with the ED to the new premises. The Lean facilitators from the Quality and Risk Unit continue to provide 5S training across a range of inpatient departments in preparation for the move into the new facility.
7. Chapter Seven: Research Findings and Discussion

7.1. Cross Case Analysis

7.1.1. Introduction

This chapter presents the findings of the cases in terms of the two constructs outlined and utilised for this work’s research conceptualisation. The chapter is divided into two sections. The chapter begins by detailing the approach to the analysis and the reader is then returned to the theories and case themes. The chapter then offers a structured analysis of the cases organised firstly as tables, followed by a discussion. The case findings are subsequently compared with the findings from the exemplar cases by re-engaging with the exemplars; seeking to identify alignment or diversion from the common elements that were uncovered.

The process of analysis is iterative; examining the cases and then returning to the exemplars and indicators that were determined at this research’s conceptualisation. The iterative process is represented by the dash lines in the following diagram.

![Diagram of the Iterative Cross Case Analysis](image)

**Figure 7.1:** Diagram of the Iterative Cross Case Analysis
7.1.2. Constructs Elucidated

This thesis seeks to explore the introduction of Lean Thinking into Emergency Departments in New Zealand Hospitals. It has undertaken the case study as the research method and through the development of exemplar cases it has linked two constructs from the literature with themes apparent from the exemplars.

To remind the reader of the two constructs they are presented here again in summary form.

Radnor and Boaden (2008) offered three challenges to the introduction of Lean principles and practices in public services. Specifically they proposed that further research was required to assess aspects dealing with processes, people and sustainability.

Øvretveit (2009) provides the following equation to summarise current thinking about effective improvement enablement.

\[
\text{Evidence of an effective change} + \text{Effective implementation} + \text{Supportive environment} = \text{Improvement method}
\]

\[(\text{Øvretveit, 2009, p. x})\]

Thus combining the themes from the exemplars and the two constructs a framework for analysis has been developed;
Table 7.1: Conceptualisation Framework: selected Literature positions with Exemplar Themes

<table>
<thead>
<tr>
<th>Framework</th>
<th>Indicators / Components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Activities for Process Improvement</td>
</tr>
<tr>
<td></td>
<td>• Team development</td>
</tr>
<tr>
<td>Themes from the Exemplar Cases</td>
<td>Evidence of an effective change</td>
</tr>
<tr>
<td>(Øvretveit, 2009)</td>
<td></td>
</tr>
</tbody>
</table>

The above framework is used to analyse the site data and to answer the research questions. The following cross-case analysis is presented in three parts. Firstly, a demographic comparison of the sites, followed by an analysis of the Lean tools and processes utilised and the outcomes of their applications. The analysis concludes with a cross case analysis of the themes of Leadership, Team development and Sustainability.

7.1.3. Analysis - Site Comparison

The sites were chosen through similarity of population served and for the recent implementation of a Lean Thinking event or project within the site’s ED.

The hospitals investigated are similar in size and scale with some of the sites providing services for a regional population. The following table presents the demographic data of each hospital site.
Table 7.2: Demographics of the Hospital Sites

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Site A</th>
<th>Site B</th>
<th>Site C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td>A 388 bed hospital providing secondary and tertiary services.</td>
<td>A 260 bed hospital providing secondary and tertiary services.</td>
<td>A 200 bed regional hospital providing secondary services.</td>
</tr>
<tr>
<td>Population</td>
<td>125,000 Local urban (300,000 region total)</td>
<td>136,000 (Local Urban)</td>
<td>102,000 (Region total)</td>
</tr>
<tr>
<td>Staffing</td>
<td>3,100</td>
<td>1,500</td>
<td>1,200</td>
</tr>
<tr>
<td>Geography</td>
<td>Urban location with rural attendances for specialities</td>
<td>Urban with some rural attendances</td>
<td>Regional Urban / Rural</td>
</tr>
<tr>
<td>Maori Population</td>
<td>14.6 %</td>
<td>16 %</td>
<td>32 %</td>
</tr>
</tbody>
</table>

Each hospital has an onsite Emergency Department. The following table presents summarised data of the Emergency Departments studied.

Table 7.3: Demographics of the ED Sites

<table>
<thead>
<tr>
<th>ED Unit</th>
<th>Site A</th>
<th>Site B</th>
<th>Site C</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED Beds</td>
<td>21</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>ED Volume</td>
<td>37,000 per annum with a 25 – 30 % admission rate (11,100)</td>
<td>40,000 per annum with a 23 % admission rate (9,200)</td>
<td>28,000 with 30 % admission rate (8,400)</td>
</tr>
<tr>
<td>Staffing (FTE)</td>
<td>41.5</td>
<td>68.2</td>
<td>38.5</td>
</tr>
<tr>
<td>Staffing stability</td>
<td>Moderate turnover: key role in transition absent</td>
<td>Stable</td>
<td>Volatile</td>
</tr>
</tbody>
</table>

The EDs of these hospitals vary in size, but are similar in terms of admissions. The provision of Tertiary medical services at two sites may account for increased attendances as these sites will receive transfers from other facilities. Staffing stability varies across the sites.

Site C is rural in orientation and therefore finds having a continuous full complement staffing.

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5 Definition of Tertiary Care: Specialized consultative care, usually on referral from primary or secondary medical care personnel, by specialists working in a center that has personnel and facilities for special investigation and treatment from Johns Hopkins Medicine Website (2010) accessed 10/09/2010 from http://www.hopkinsmedicine.org/patient_care/pay_bill/insurance_footnotes.html
difficult with high number of locum doctors used to maintain minimum numbers. Further, Site A, is a teaching hospital so it experiences variable stability as professional qualifications and credentialing require some staff absences to attend examinations.

While there are physical layout and demographic variations in the hospitals, the only factor in the above tables that seem to have any influence on the implementation of Lean Thinking is the stability of staffing. Where staffing was less stable, there were reduced training and engagement opportunities and staff seemed to prioritise the time for patients rather than for the Lean project. The stability of key roles at Site A affected the implementation in terms of leadership ambiguity. All sites experienced some variability adhering to project timeframes when ED attendances peaked or sites were more busy than normal. However on the whole this was managed at the sites by the project facilitators through managing the project cycle or by reprioritising activities.

The following sub section is the analysis of the themes used to code the cases. The first theme are the tangible results - Lean activities and tools, followed by discussion on the remaining three intangible results in terms of, Leadership, Team development and Sustainability.

7.1.4. Analysis - Lean Activities and Tools

Across all three sites a consistency of the project’s progress was observed. This is due to each site following the implementation methodology of the NQC project. Thus all of the sites had a project management facility and selected Lean or project facilitators. As this
process is relatively uniform the following table only summarises the sites actual implementation activities and the outcomes achieved.
### Table 7.4: Results of Lean Activities undertaken

<table>
<thead>
<tr>
<th>Lean Activity and Tool</th>
<th>Outcome / Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blue Sky / Problem Identification</strong></td>
<td><strong>Site A</strong>  \nMulti-disciplinary participation  \n<strong>Site B</strong>  \nSteering Group / Team-based  \n<strong>Site C</strong>  \nMulti-disciplinary participation</td>
</tr>
<tr>
<td><strong>VSM (pathways and patient streaming, PDSA)</strong></td>
<td><strong>Site A</strong>  \nX-ray pathway:  \nBefore 0:44 hrs  \nAfter 0:26 hrs  \nFast Track low acuity stream:  \nBefore 3:20 hrs  \nAfter (Nov 2008) 2:16 hrs  \n(May 2010) 1:56 hrs  \n<strong>Site B</strong>  \nAdmission / Transfer times  \nBefore &gt;1:00 hrs  \nAfter Bed acquisition 0:05 hrs  \nBed availability 0:31 hrs  \nBed request 0:36 hrs  \nAverage &lt;1:00 hr  \n<strong>Site C</strong>  \nAdmission / Transfer times  \nBefore up to 4-5:00 hrs  \nAfter reduced by 2:00 hrs</td>
</tr>
<tr>
<td><strong>A3 Problem Solving</strong></td>
<td><strong>Site A</strong>  \nReduced non-urgent and unnecessary attendances  \nReduced Rework  \n<strong>Site B</strong>  \nCoaching undertaken  \n<strong>Site C</strong></td>
</tr>
</tbody>
</table>
The table reveals that all of the sites addressed the issue of patient flow, with two sites also engaging substantively in workplace control.

Beginning all of the Lean implementations was an initial problem identification phase that followed the proscribed NQC project implementation methodology. One site, B, chose to internalise it into their existing organisational framework. In effect for Site B the Lean Thinking project became a sub set of their hospital improvement project (IPEP) and was governed and managed through existing processes. The other two sites conducted blue sky problem solving events independently within their EDs, with other affected department’s staff also attending.

The patient flow activities involved Value Stream Mapping (VSM) and in two cases PDSA experiments were conducted. Site A conducted a one month trial of the proposed patient streaming. This created PDSA data, which was then used to create a business case for the deployment of additional resources. At Site B, a walk through or patient shadowing was used to test the devised future state map for its workability and representation of reality before the trial was allowed to proceed. Site C used PDSA techniques to prescribe new procedures that changed the patient flow orientation from push to pull. The results of the PDSA trials provided evidence of new pathways or procedures that improved wait-times at all of the sites.

The above results and applications indicate that the technique of VSM is relevant to order and sequence work tasks for patient journeys. All sites experienced significant benefits through reducing patient stays in the ED and the PDSA technique provided a sound method to progress flow experiments.
Similarly, sites that used PDSA also contemplated or used A3 problem-solving. This indicates a high level of skill being utilised as A3 is a relatively complex sequence of Lean methodologies and concepts, merging problem identification, root cause analysis, PDSA, and statistical process control techniques into a single process improvement tool. The mastery of A3 and its independent use by workplace teams could be a marker of successful transference of Lean methodologies and skill. In this study no site reported any such mastery, so it is reasonable to conclude that further support may be required to develop the work teams’ competencies working with this tool.

All sites to a greater or lesser degree initiated visual workplace activities, with two sites making significant commitment to the 5S tool. This involved the training, leadership of process by local champion, and conducting small Rapid Improvement Events (RIE) to order and configure previously cluttered or unmanageable spaces. The spaces were typically store or work areas, with specialist treatment rooms being undertaken in two sites.

The last part of the activity implementation was the identification of relevant information for performance and monitoring (Walley, Silvester, Steyn, et al., 2006). In all three sites the current measures being collected were inadequate or irrelevant to inform Lean Thinking activities or PDSAs. All of the sites were required to devise, collect, store and analyse new data sets to inform the chosen improvement processes. Some sites also developed visual charts or scoreboards. Sites that had a longer association with Lean had experience using visual display or ‘Flinders’ boards.

Overall the results show that the Lean projects provided levels of quality improvement. At Site A significant wait time reductions for low acuity patients were achieved, with
workplace morale and patient flow improved in some measure across all of the sites. Standard work and 5S contributed to reduced errors in such areas as expired stock, patient records and diagnostic testing requisitions.

It is noteworthy that at only one site, and not as a direct result of the NQC project, were clinical processes being addressed. At this site, B, changes to discharge and assessments from a ward were undertaken and while mainly administrative in nature, they do require clinical judgement and as such, require clinician leadership and acceptance. Many of the other changes observed and reported in this study were non-clinical or environmental in nature and none involved a change in clinical procedure or practice.

In summary, the Lean tools utilised are typical of those implemented by other health care Lean implementations. Moreover, Lean methods such as PDSA cycles and collaboratives are cited by Øvretveit (2009) as being effective in implementing proven changes and PDSAs are used by a significant number of US hospitals undertaking quality improvement initiatives (Cohen, et al., 2008). Value Stream or Process Mapping has been identified as effective in Kim, et al. (2009), Ben-Tovim, et al.(2007), Smith (2009) and Jones & Mitchell (2006). The tools implemented on non-clinical processes and visual management activities, such as 5S, signs and boards (Ballé & Regnier, 2007; Esain, et al., 2008) have assisted the workforce to be better able to complete tasks, reduce rework and focus on the patient.
7.1.5. Analysis of Intangible Themes

The framework for analysis identifies three more themes, Leadership, Team development, and Sustainability, as relevant for the implementation of Lean improvements. The following table summarises the findings with respect to the remaining Themes, with the attendant sub codes that were identified through the content analysis process.
Table 7.5: Site Comparison of Themes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Hospital Site A</th>
<th>Hospital Site B</th>
<th>Hospital Site C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leadership</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top leadership</td>
<td>Absent</td>
<td>Present</td>
<td>Not Visible</td>
</tr>
<tr>
<td>Site Leadership</td>
<td>Confused</td>
<td>Clear</td>
<td>Clear</td>
</tr>
<tr>
<td>Site Participation</td>
<td>Active</td>
<td>Active</td>
<td>Limited</td>
</tr>
<tr>
<td>Organisation Strategy</td>
<td>No Lean Strategy</td>
<td>Continuous Improvement culture</td>
<td>Lean Strategy</td>
</tr>
<tr>
<td>Implementation Method</td>
<td>Independent Project</td>
<td>Organisation wide approach</td>
<td>Quality led Project</td>
</tr>
<tr>
<td>Organisational Ownership</td>
<td>Little evidence</td>
<td>Good evidence</td>
<td>Moderate evidence</td>
</tr>
<tr>
<td><strong>Team Development</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Involvement</td>
<td>Mixed : Dr + Nurse</td>
<td>Nurse led</td>
<td>Nurse led</td>
</tr>
<tr>
<td>Skill development</td>
<td>Analysis and Process</td>
<td>Analysis and Process</td>
<td>Process and Interpersonal</td>
</tr>
<tr>
<td>Communication</td>
<td>Fragmented</td>
<td>Co-ordinated</td>
<td>Inconsistent</td>
</tr>
<tr>
<td>Co-operation</td>
<td>Improved</td>
<td>Organisation focussed</td>
<td>Improved</td>
</tr>
<tr>
<td>Work intensification</td>
<td>Additional to work routines</td>
<td>Accommodated within work routines</td>
<td>Additional within work routines</td>
</tr>
<tr>
<td><strong>Sustainability</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stickiness / Workplace Ownership</td>
<td>Little</td>
<td>Moderate</td>
<td>Little</td>
</tr>
<tr>
<td>Preparedness - Site</td>
<td>Little</td>
<td>Evident</td>
<td>Little</td>
</tr>
<tr>
<td>Preparedness - Organisation</td>
<td>Little</td>
<td>Evident</td>
<td>Moderate</td>
</tr>
<tr>
<td>Comprehension - Site</td>
<td>Evident</td>
<td>Evident</td>
<td>Limited</td>
</tr>
<tr>
<td>Comprehension - Organisation</td>
<td>Limited</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Clinical Buy in</td>
<td>Moderate</td>
<td>Evident</td>
<td>Little</td>
</tr>
<tr>
<td>Resistance</td>
<td>Moderate</td>
<td>Little</td>
<td>Moderate</td>
</tr>
<tr>
<td>Change outcome</td>
<td>Significant Point Change and isolated from wider organisation</td>
<td>Synchronised change</td>
<td>Limited Point Change – somewhat isolated from wider organisation</td>
</tr>
</tbody>
</table>
7.1.6. Analysis – Leadership

Significant change is engendered by top management through creating climate and groundswell for change or improvement (Kotter, 2007; Øvretveit, 2005). In the research cases there is an absence of top management influence in all but one. The evidence of management’s leadership in this single case, B, is represented in two ways; firstly by the enduring presence of previous CEO’s and CMO’s cultural contributions, and secondly by the structural hardwiring of the COO into the decision making and project monitoring process as chair of the IPEP steering group.

While at the other sites top management’s influence is detected e.g. through the approval of projects, additional resources or through policy announcements or documents, the leadership presence is in itself passive rather than active, with top management being reported by some respondents as being silent or absent throughout the process. Secondary data was used to verify and inform the responses received, and while top management was not closely aligned with the Lean ED project in Site C, there is significant evidence that the organisation has a commitment to Lean Thinking.

However, as the hierarchy of the organisations are examined layer by layer, an improved clarity of purpose and involvement is revealed by those directly and intimately involved with the progress of Lean. Active leadership is indicated by all site’s staff, with the champions and activity team leaders being able to demonstrate reasonable comprehension of Lean in terms of philosophy, how the activities and tools link to quality improvement, and through the challenges they faced leading and facilitating Lean activities in their workspaces.
Site A’s case study adequately outlines their unique ambiguity of leadership problem and as a special cause it reinforces the need for leadership clarity and commitment when implementing new and potentially contentious programmes (Brandao de Souza & Pidd, in press). Similarly, across the cases there was a reasonable level of participation by the ED staff, except for that of Site C, whose implementation was initially impacted by being a second choice project and the volatility of its staffing. Further, the credibility and domain knowledge of the facilitators and champions was found to be influential in terms of attention being paid to the Lean techniques being introduced.

Simply, while the projects achieved some improvement outcomes there is evidence of leadership impeding the creation of a supportive environment. The sites at whose organisations had a strategy seemed to have had a higher level of ownership of Lean activities than that of Site A, which had no organisational strategy or policy for Lean. Interestingly Site C, who espoused Lean as its improvement methodology, was where respondents reported incongruence or an inability to detect a whole of organisation approach to its Lean investments in patient flow. While Site B, which had a cultural orientation rather than a strategy per se, provides somewhat more evidence of ownership of results and demonstrates an organisation approach or management orientation that the other sites were unable to achieve.

This highlights the differences in project implementation methods undertaken by each site, which Boaden et al. (2008) concludes is a significant issue for the success of an endeavour and for realising the dangers of the piecemeal approach that Bicheno (2008) warns of. The knowledge or awareness gap between the implementing layer and that of the top
management has implications for Lean Thinking sustainability in terms of the adequate understanding of the ‘shop floor issues’ when management sets strategy and improvement criteria.

7.1.7. Analysis – Team development

The development and role of teams in a Lean environment is somewhat different from traditional workplaces and hierarchical healthcare institutions and as such Lean teams somewhat disturb the natural hierarchy in the hospital (Brandao de Souza & Pidd, in press; Olivella, et al., 2008). Most of the reported Lean activities used multi disciplinary teams and engagements to further their chosen Lean activities. Across the research cases comprehensive clinical involvement in the Lean activities is somewhat limited. Nurses, as a rule, took the most leadership and activity roles across the sites. The predominance of nurse or allied health worker engagement is suggested as somewhat natural by some respondents; that nurses may be more predisposed to the concept of flow through their professional orientation and existing workplace activities, a position also taken by Hellström et al. (2009) and Laursen et al. (2003).

The ED staff reported opportunities to learn and apply new skills. Many of these skills were the Lean tools themselves but others were interpersonal and communication, facilitation and group or team management, for which some staff stated they continue to use and benefit from.

The ED is also an active place where good communication and information handling is important, being critical to patient care. While there were Lean projects undertaken to reduce
errors based on written and procedural information management, in some of the cases the communication for the project itself was referred to as problematic. Project communication issues that were identified were the use of unfamiliar or confusing language and ensuring a continuity of contact across a 24/7 shift work environment. Furthermore, there were allusions to interpersonal communication and power issues that are resultant of the structures and hierarchies of the professional bureaucracy (Brandao de Souza & Pidd, in press; Mintzberg, 1997).

The context of communication within Lean implementations is that of a multidisciplinary project team. These teams, which formed to address the Lean activities, were not necessarily like the care teams that operate under a doctor. The project teams may have been led by a nurse or other care worker who was to work across shifts and other care teams. Gaining consensus, adequate responses and having staff who may not have attended training or previous meetings was a challenge for Lean team leaders. Discontinuities brought about by staff stability and demand peaks made team working difficult. While the hospitals in the study operated in silo or functionalist orientations, all of the sites reported positive experiences dealing with a flow or improvement activity. This may have been from the staff further understanding the whole patient experience or journey rather than the previous piecemeal view of services they held before the awareness Lean activities and interactions bring (Bamford & Griffin, 2008).

Cross boundary team working was evidenced between ED staff and Wards, X-ray and ED and for one project had ED staff referring patients to community based practitioners. These instances illustrate multidisciplinary teamwork and while cross silo co-operation was
improved, concerns were raised as to the isolated nature of the changes at sites A and C. These initiatives present a scenario where there is cross silo co-operation at the operational level, but this has not affected the higher order inter-relations of the functional based silos that potentially lead to fragmented care (Brandao de Souza & Pidd, in press).

Lean production has been criticised for its use of control and intensifying work (Gee, et al., 1996; O’Donnell, 1994; T. Smith, 2000; Willis, 2005). In two cases evidence of work intensification for nurses was apparent. At Site A, nursing staff felt compelled to complete Lean activity tasks in their own time, and even though there were directives from managers to seek additional project based time or be paid for overtime the uptake of this offer was modest. At Site C, nursing staff identified the potential for further tasks to be added to their work routines and as such coped by self-prioritising the Lean activities, ranking them below the normal care functions; or staff relegated Lean activities to be undertaken in quiet times. The reaction at Site C fits a pattern of departmental resistance (Pardo del Val & Fuentes, 2003), but is also indicative of the problems Site C had in attempting to rectify the reallocation of the project into the ED at short notice. Site B seems to have taken the everyday tasks or changes and accommodated them within existing work routines. From the results, it could be perceived that a project based approach lends itself to the isolation of results and practices, with initiatives being regarded as additional and not normalised within existing work routines. Hospitals in the US, which have higher perceived quality also have lower nursing staff to patient ratios, suggesting that when introducing Quality Improvement initiatives, work patterns and loads require attention (Cohen, et al., 2008); a consideration given limited attention at the project based implementation sites, but seemingly addressed at the continuous improvement environment of Site B.
People can view Lean as threatening their work (Radnor & Boaden, 2008) and are confronted by the language of Lean borrowed from other discourses (Gee, et al., 1996). These situations cannot be simply addressed through team working. Rather, solutions link more closely to aspects of leadership and management practices. Mostly being related to constancy of purpose and adherence to the philosophies of Lean – to respect and involve people (Deming, 1986; Radnor, et al., 2006).

The development of the Lean Thinking teams, while different in composition and nature of the doctor lead care teams, did lead to some effective change. New skills were acquired by team members and by those who consented to undertake champion or leader roles, more of whom were nurses than clinicians. The affinity nurses displayed for Lean may be due to their professional orientation and their ability to perceive a care journey as a result of their work. Even though there was development of the work team’s knowledge of Lean and flow principles, little changed in terms of crossing functional silos within the hospitals. Lastly, in any work place where roles and hierarchies are challenged, some workers will experience negative effects of change or work intensification (O’Donnell, 1994; Willis, 2005). Levels of work intensification were dealt with in different ways by the affected workers; with some conceding to undertake additional duties while others resisted.

In conclusion, one site that sought to integrate Lean work or changes in work cycles into existing routines had top management involvement and the project was part of an existing strategy or continuum of improvement. The two sites that implemented the Lean tools and tasks without significant changes in management practices found the improvement
benefits somewhat unconnected to the organisation as a whole (Seddon, 2005; Bichino, 2008).

7.1.8. Analysis – Sustainability

The sustainability of an initiative is contingent on the organisation being able to retain and continue to utilise new knowledge or practices (Szulanski, 1996) and have methods to transfer the knowledge within the organisation (Bate & Robert, 2002; Ferdows, 2006). While one site reported independent implementations by motivated staff – possibly ‘enthusiast converters’ (Esain, et al., 2008, p. 25) – in only one of the cases was there substantive evidence of the retention of knowledge and its independent use.

At Site B, this was likely due to pre-exposure to Lean practices through projects and conference attendances by a wide range of staff. A key informant revealed the extent of commitment to knowledge development within the organisation and evidence of the range of personnel educated in Lean methodology was gained from other respondents at the site. This preparedness for change or for new initiatives corresponds with UK evidence on the sustainability of Lean initiatives (Radnor, et al., 2006) While another site had a strategy commitment and staffing dedicated to Lean, pre-exposure to Lean and uptake by ED staff was limited. Furthermore, the external consultants who provided support for the NQC project were not experienced in health related Lean implementations, and while they seemed to adequately transfer knowledge to facilitators, their comprehension in one site did not translate well across to the ED staff. Furthermore the language of manufacturing presents a barrier for the uptake of Lean. Across the sites healthcare workers wished for more accessible language and terms they could identify with.
Comprehension of the ED staff of Lean principles and practices was variable. Good comprehension of Lean and its purpose was found at sites that either had a longer involvement in Lean type activities or operated a greater number of activities over the implementation period. This result aligns with US experience where staff engagement results rise with the number of Lean activities undertaken by staff members (Gurnee reported in Toussaint & Gerard, 2010).

The lack of clinician buy in or physician resistance to Lean Thinking in a healthcare context is recognised as an obstacle for its sustainability (Langabeer, et al., 2009; Toussaint & Gerard, 2010; Waring & Bishop, 2010). Respondents across the sites indicated that initially garnering the attention of the clinicians so they may create some time and space to consider the Lean Thinking and then deal with any negative perceptions are two realities of engaging clinicians. Respondents gave opinions on how they felt clinician involvement could be improved or incentivised, including that presenting Lean in a scientific or quantitative frame could prove attractive (Edmondson, 2003; Toussaint & Gerard, 2010).

Clinicians believe that Lean Thinking can, in their opinions, provide improved organisational and quality results, but more so when clinician involvement is active. Clinicians considered having or securing the time to be involved as important and it was found that staff stability and turnover can inhibit doctors taking part.

At Site B, where there was evidence of independent clinical participation, a competitive element was found. This had been also regarded by a key informant at another site as a motivating factor for clinical involvement. Competition is based on meeting scores or care teams out performing others; also supporting respondent’s contentions that doctors like
statistics and measurable results. Site A had consistent clinical participation in the design, participation for the flow, and patient management activities within the ED; however resistance was observed when Lean activities began to impact on their personal spaces.

Across all of the sites the cross functional or boundary spanning initiatives were limited. Clinicians and staff alike commented on the seeming inability of patient flow initiatives to move out of the ED locality. Interestingly, at Site B, where the culture permits some independent activity, while being co-ordinated at the higher level as the IPEP project, it was possible for discharge improvements to synchronise with the ED patient admission and disposition processes. This result may indicate that an improvement culture supports clinician buy in, with processes improving in an emergent fashion supported by a change framework leading to actual system change (Esain, et al., 2008).

The lack of progress on whole of patient journey improvement is not unsurprising, due to the nature of the organisation which is under study, the hospital (Bate, 2000; Langabeer, et al., 2009; Mintzberg, 1997). The tribalism and warring factions which are described in these author’s works is evident within the cases - the resistance to procedural change, the perceived impacts on professional autonomy and resistance of moves towards industrialisation; the “patients are not cars” refrain. However, respondents could link improved patient outcomes with less waiting and access to treatment signalling an acknowledgement of a potential for an improved future status even if they perceive themselves unable or impeded to achieve it at present.

Resistance, apart from those staff who sensed work intensification, was more cultural. Common catchphrases related to negativity, a general suspicion or cynicism of the
organisation to complete improvements, a lack of traction of previous change or stagnation; a feature that poorly implemented Lean will exacerbate.

However respondents who reflected on the Lean implementation revealed that the ability to make decisions and effect localised change in terms of their work environment was more than they first credited. They were able to actively improve patient experiences, they felt empowered or involved with the result; it would seem they gained a sense of ownership. However as described previously, many of these experiences were isolated and not leveraged in terms of staff sharing experiences across the wider organisation. Staff who worked on teams with staff from other departments remarked that improved knowledge of their colleague’s work helped their own work and supported patient handovers.

Only one site would be considered to have achieved a synchronised change with factors that give a probability for long term sustainability for end-to-end flow. Evidence for sustainability exists at Site B where it has embedded knowledge broadly across the organisation (Radnor, et al., 2006; Toussaint & Gerard, 2010).

The other sites have achieved changes that are largely isolated from the rest of the hospital and as such the results that have been achieved are unable to be leveraged from. The changes accrued by Sites A and C in terms of flow depend on the other parts of the hospital now improving their performances. However, Site C with its relocation into a new building in 2011 may achieve enough stability from an organisation wide 5S programme to embark on next step Lean interventions (Ballé & Regnier, 2007).
7.1.9. **Research and Exemplar Case Comparison**

A case study finding’s generalisability relies not on statistical generalisation but on analytic generalisability (Yin, 2008). As part of the conceptualisation of this research the best practices of some Lean healthcare implementations were summarised as exemplar cases. These exemplars infer that by applying best practices a sustainable Lean Thinking implementation is obtained. Therefore it is reasonable to expect to find the evidence of some or all of the indicators in the research cases. As outlined earlier in Chapter 5, the case study design expects that positive implementation experiences observed at a research case site will have alignment with the best practice indicators and any counter results can be explained by localised events. Following a comparative analysis to identify the existence of best practice indicators within each of the research cases, a comparison table has been developed.

The list of indicators sourced from the three exemplar cases grouped by the four themes is first presented as Table 4.1. This table’s format has been modified to incorporate site data, where the existence of the indicator is signalled through the use of symbols. The following table contains the key for the symbols used in the case and exemplar analysis tables.

**Table 7.6:** Key for the symbols used Case and Exemplar Existence table

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>presence of the indicator</td>
</tr>
<tr>
<td>=</td>
<td>limited existence of the indicator</td>
</tr>
<tr>
<td>✗</td>
<td>absence of the indicator</td>
</tr>
</tbody>
</table>
The following table consists of the exemplar themes signifying relevant indicator’s status for each research case.
Table 7.7: Existence of Exemplar Indicators in the Research Cases

<table>
<thead>
<tr>
<th>Theme</th>
<th>Commonalities or Indicator from Exemplar Cases</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activities</strong></td>
<td>• Lean tools used across the sites, PDSA cycles, value stream mapping, 5S, std work, etc</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• Some adjustment or resetting of measures was needed.</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Leadership</strong></td>
<td>• There was an identified problem and an agreed commitment to have it addressed by not using or continuing to use the tools and techniques that were failing to deliver.</td>
<td>=</td>
</tr>
<tr>
<td></td>
<td>• The changes were led from the top and once agreed upon were implemented</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• Visible affirmation by senior leadership was a case feature as was the acknowledgement that to improve work or processes is achieved by those who do the work and know it best.</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>• The requirement for new skills and knowledge coupled with new orientations for managers or supervisors was also alluded to.</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Team development</strong></td>
<td>• Outside support and technical input assisted the initial stages of implementation.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• An internal team was tasked with facilitating and developing staff awareness and understanding assisting with training and dissemination across the organisation.</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>• Teamwork and the involvement of all staff to redesign processes and provide insights into waste and improved flow.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• Improved acceptance of the change and optimise interpersonal and professional relationships.</td>
<td>=</td>
</tr>
<tr>
<td></td>
<td>• It is acknowledged that organisational change is not easy to achieve.</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Sustainability</strong></td>
<td>• Implementation to effect continuous improvement, by either setting a cycle or programming the next unit on the patient journey to undertake Lean activities.</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>• Progressing Lean across the organisation to capture the patient journey end to end.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• Units undertaking Lean activities as part of their daily work.</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>• The importance of a new culture, with all of the cases branding ‘their’ improvement methodology.</td>
<td>x</td>
</tr>
</tbody>
</table>
Table 7.7 presents the research case study sites with the presence of the exemplar indicators. Upon viewing the tables and relying on the assumption that the exemplars are successful implementations of Lean Thinking into healthcare, the above analysis suggests that the more the site aligns with the exemplar indicators the more likely that Lean Thinking’s outcomes of improved flow and waste reduction will become apparent. The following sub-section explores a practical application of this finding.

7.1.10. Practical Application of the Findings

By reviewing the research case versus exemplar tables it is evident from the symbols that a suggestion of alignment can be made.

The preparedness of the organisation (Radnor, et al., 2006) and how the improvement is implemented (Boaden, et al., 2008) have been identified as key success factors for Lean Thinking’s application that can primarily improve services, and secondarily affect costs.

The researcher considers the data and findings from the cases able to be confirmed by what has been found throughout the literature. Thus, following the assumption made at the conceptualisation of this research when defining the exemplar case indicators, it follows that the presence of these indicators can be used as a marker for successful outcomes. In consideration of this suggestion the above table could indicate the basis for developing a preparedness tool for an organisation to use when considering Lean Thinking. The use of such a tool would signal to an organisation the areas for focus to ensure the intended outcomes of end-to-end flow and waste reduction is realised and embed self sustaining quality improvement within the organisation.
7.1.11. Chapter Conclusion

In conclusion, the sustainability of the implementation of Lean Thinking into the sites seems to be greatest at Site B. It seems to have the elements that constitute a supportive environment – a continuous improvement culture, organisational commitment and planning for quality development, investment in staff knowledge, and a long-term orientation. Site C, that had a range of implementation difficulties to contend with, exhibited the least in terms of projects and change, but expresses a policy and strategy commitment to Lean Thinking, even if this is limited by low comprehension. By their own admission Site C feel at the start of a Lean journey, and the trajectory of Lean Thinking development may have been interrupted by the hospital’s physical relocation as well as a phase of unstable staffing. Lastly, Site A achieved possibly the most in terms of point changes and wait-time reductions but exhibits the least likelihood for implementation sustainability. Organisational preparation and a knowledge strategy are absent and the project was isolated from the wider organisation reducing the effects for the patient for gains in ED based flow, leading to the conclusion that Site A has the least supportive environment for the sustainability of Lean Thinking.
8. Chapter Eight: Discussion and Conclusion

8.1. Introduction

This chapter concludes this research by way of a discussion and a closing passage. The chapter reintroduces the research questions posed in Chapter Four and summarises the decisions of research method and appropriateness to these questions and methods undertaken. The discussion then considers the questions respectively linking across the how and why frames of reference with the theme based sub-questions and their influence on the happenings being investigated. The discussion section ends with summary. The chapter then considers the limitations of the research and ends with a suggestion for further research. The concluding passage reflects on the cases and the learning that may be taken from this research.

8.2. The Research Questions Revisited

Chapter Four provides a summary of the development and framing of the research questions for this thesis. As a reminder for the reader, they are reproduced below.

The research questions for this thesis are,

1. How are Emergency Departments in New Zealand introducing Lean Thinking and its attendant philosophies and methods?

2. Why are they the same or different? and,

3. Why have they achieved the outcomes that they did?
The research questions for this thesis are of the why and how type, which are appropriate for the case study method that is used for this work (Yin, 2008). The research questions translated into a set of interview questions and enabled the search of secondary data to build a picture of what happened, and to seek to reveal the interactions of the ‘how and why’ of what occurred at each site.

The cross case data and the comparisons with exemplar cases provide a rich environment to discern differences and similarities of how the introduction of Lean Thinking occurred at each site. The data enables comparative analysis to seek answers to what particular issues were site related and which general observations carry across the sites and align with the experiences documented in the exemplar cases.

The following discussions, headed by the research questions, endeavour to answer the key revelations from the research and provide signals for the reasons for the existence of the outcomes encountered by each of the sites.

8.3. Research Question One

How are Emergency Departments in New Zealand introducing Lean Thinking and its attendant philosophies and methods?

The Emergency Departments all undertook ED focussed projects as a result of the NQC project (Ministry of Health, 2009b). The NQC project provided for a scripted method and approach that led to the implementations having similar patterns, activities, and timelines. However, this simplistic answer belies the complexity of the interactions and realities that the
departments faced during this programme. While the NQC project did provide benefits in terms of external expertise, opportunities for knowledge sharing at national collaborative, and training for site facilitators – factors that certainly were beneficial – it does not provide enough depth to explain the resultant variations in volumes of activities, variations of actual activities undertaken and the relative levels of success and sustainability that the cross case and exemplar analysis’s reveal.

The ED implementations themselves encountered variable environments. In general two types of introductions were observed; the coordinated implementation and the project implementation. Site B could be classified as coordinated; Site C as a hybrid and Site A is as an independent project.

Site B coordinates its improvement activities through a central point, the Improving the Patient Experience Programme (IPEP) steering group, which provides cohesion for the implementation of many PDSA experiments or patient experience innovations; all of which contribute to the IPEP’s goal of improved patient experiences. The philosophy of Site B is one of Continuous Improvement, although the organisation discounts the business discourse of Lean and prefers to use its own naturalised language. Staff at Site B believe the use of common language reduces resistance. The introduction of Lean Thinking into the ED at Site B came from an amalgam of flow needs and was latterly adopted into the NQC project. Site B’s IPEP programme is chaired by the organisation’s Chief Operating Officer. This is the only site that had direct influence from top operations management of the hospital and while Quality Managers were variously involved across the ED sites, this site provides an example
of how the coordination of strategy and presence of top management creates a productive climate for quality enhancement.

The flexibility provided for by a strategy or policy is also shown by the conduct at Site C. This site is somewhat out of step from the other two, having features of a system change and project method, but this mix assists to enunciate the importance of having a policy or strategy. As its case reveals, Site C was affected by the discontinuity of planning through having to change the priority implementation focus to the ED. The lack of preparation and resultant resistance from ED staff is documented in Site C’s research case. However, Site C had an existing policy promoting Lean Thinking as its method of choice for quality improvement. The existence of this policy seemed to be influential; it allowed the organisation to be somewhat prepared for the implementation of the supplanted activities and leveraged off the organisation’s previous investment. The policy more than likely contributed to the organisation reorienting its Lean programme through the decision to embed Lean diffusion with the Quality and Risk Team, subsequently preparing this team to embark on an organisation wide preparation exercise using the 5S tool in anticipation of relocation.

At the other end of the spectrum is the project management approach that was undertaken by Site A. An extensive amount of output was achieved, but the key elements of sustainability and leadership clarity were found lacking. A well managed project with competent implementation can achieve outputs; for that is what the project management technique and method was developed to do. However, with regard to the introduction, diffusion and embedding of Lean Thinking and its techniques, an organisation would do better than to place its reliance only on the project methodology with which to provide the
skills and knowledge required for the philosophical and methodological sustainability of Lean. While considerable knowledge and skills were accrued by Site A’s facilitation staff and champions, some of whom attended National Collaborative events, there was less evidence of ownership and embedding of the skills across the wider staff of this ED. The intensification of work that was found has the potential to further undermine sustainability, as the continuity of quality activities will rely on staff goodwill and stability rather than being normalised into work schedules.

Additionally, the Lean facilitators at Site A were deemed to be project-based workers and therefore relatively insecure in terms of the ongoing utilisation of their skills across the organisation. At the other two sites the Lean facilitators were based either in their respective quality units or linked to improvement structures responsible for the progression, the knowledge retention and any new project facilitation.

In summary, in answer to the primary research question, Emergency Departments in New Zealand are using a mix of implementation methods to introduce Lean Thinking. Those that have a Quality Improvement policy or strategy seem to be able to secure more sustainable outcomes, including results that synchronise with the rest of the hospital. The site that implemented a project approach undertook the most activities and achieved significantly reduced wait times for low acuity patients. However, this ED has found itself isolated within its own organisation, with the Lean improvements remaining localised and future suggestions of a piecemeal approach to a Lean roll out in the future.
8.4. **Research Question Two**

Why are they same or different?

Emergency Departments exist within a complex organisation. The cases reinforced what authors have published in the literature - that professional bureaucracies possess structures and practices that contribute to fragmentation, silos, and the isolation of services and staff from each other (Bate, 2000; Mintzberg, 1997). The cases all demonstrated a concern by staff over the difficulty of engagement in a patient journey when the hospital continues to be organised into functional hierarchies. However, the effect of team building and problem solving and PDSA experiments revealed improvements to morale and mutual respect.

The stability of staffing in terms of full components and continuity of leadership roles was an influential factor in the cases. The one site that was almost consistently understaffed found it difficult to adhere to the NQC project timeframe. Clinical involvement was also compromised as many doctors were short-term locums. Moreover, where key leadership roles were not replaced or reallocated promptly an ambiguity of Lean leadership became apparent. While there is probably no good time to begin a quality improvement initiative, as it is just as likely that one day or another will present new barriers or changing conditions, it is acknowledged that quality improvement processes such as Lean can improve staffing stability through retention and morale.

Changing work patterns and normalising quality activity requires attention to routines and workloads. At Site B the integrative nature and loose collaboration across the
organisation from the coordination of the central point seemed to lessen work intensification practices, although this is assumed, rather than being a research focus. Site C’s resistance to the Lean project led to staff moderating the implication of work intensification. This behaviour, while adding pressure to the project timelines, provides a signal of the unit’s natural capacity to absorb new projects and initiatives; knowledge that could be leveraged in the future. At Site A there was evidence of staff completing tasks in their own time and at this site, this is considered to be a normal behaviour. This type of unconscious or expectant work intensification has implications for Lean sustainability and the gains made in morale.

An organisation’s culture develops through shared norms and attitudes of its constituents. All of the sites reported a level of negativity to change. Respondents reported that this negativity was a barrier to do anything new, to the point where institutionalised negativity is a barrier to the implementation of any form of change.

However, looking deeper into the cases, we find that Lean change did occur; evidenced by new patient streams, tidying and ordering campaigns, and reviewed admission protocols. But within these ‘negative cultures’ the change did not seem to permeate deeply or took longer to embed. At Site B, where the culture had attributes of being more open, there were reports of immediate resistance to the procedural changes, but overall there was more diffusion of improvements. Site B also operated training, coaching and leadership development as a matter of course and had the emergence of independent clinical buy in, something that was not greatly in evidence across the sites.

The journey to improve quality throughout a hospital is a long one (Cohen, et al., 2008; Toussaint & Gerard, 2010), it is a series of improvement events based on the PDSA cycle
(Deming, 1986; Graban, 2008) and is not a quick fix. A key marker of successful and sustainable quality improvement in healthcare is the adoption of the improvement initiatives by and with the involvement of clinicians. A number of clinicians who were interviewed for this study remarked on what they saw as incentives for participation. They identified; the organisation having a good strategy and measures, a genuine consensus to change, and working with the psychologies of clinicians and their motivators. Barriers noted were; having the time to engage, stability of staffing to permit involvement, and the professional pathway for clinicians that promoted independence. Respondents offered various solutions to clinician involvement such as, clinicians being involved from the beginning of endeavours, that hospital finances should be less of a dimension in the quality, and improvement decision making and attention be made to the role and selection of clinical leaders, specifically that these appointments are complimentary to the organisation’s goal of quality improvement.

Where clinicians were engaging independently from the ED projects with the processes and activities of Lean, this was attributed to an existing awareness of Lean methodologies, the numbers of team members that had attended Lean conferences and leverage from what one respondent referred to as a competitive streak in doctors. Across the sites practically all of the implementations of the activities in the EDs were in terms of non-clinical activities e.g. workplace control, documentation refinements or new procedures or methods of managing patient queues or streams. The range of clinical engagements to achieve an end-to-end flow requires the conceptualisation and agreement on patient treatments and care – something that the Lean Healthcare literature explores (Ben-Tovim, Bassham, et al., 2008; Toussaint & Gerard, 2010), and which requires some form of strategy and framework to engage all levels of hospital staff who participate in the patient’s journey. This plan or strategy provides for an
increasing number of opportunities for clinicians to participate, something Gurnee (reported in Toussaint & Gerard, 2010) found influential for engagement. Capturing clinical interest to consider Lean methods and philosophies will be a key element for an organisation to begin the shift from a functional treatment pathway to a more integrated patient journey.

In summary to the secondary research question, why were they the same or different? – The main reason of why the implementations were different is the interpersonal and professional relationships within the organisations. Lean has a philosophy to respect people. Structures that reduce functional barriers and engage key staff will always be more useful than structures that do not. For the research cases, organisations that viewed Lean as a long term continuous process and were prepared to invest in dedicated team to underpin improvement activities, seemed to be able to gain cross functional boundary achievement. Attention should be paid to the consequence that Lean may result in work intensification for some workers as work intensification has the potential to reduce gains made by Lean activities. While immediate responses were put into place the cultural aspects of the organisations concerned and the worker’s expectations seemed to be as important. Lastly the involvement of clinicians is required for any end-to-end patient pathway to be implemented. While ED clinician participation was visible at the sites, there was generally a lack of interdisciplinary clinician involvement. This reduces the ability for any gains made by the ED to be accrued to the hospital as a whole. Only one site seemed to be addressing the complexities of this issue by using a central coordination committee that included quality, clinical and operations personnel.
8.5. **Research Question Three**

Why have they achieved the outcomes they did?

At the unit of analysis level the best performer in terms of the number of activities undertaken was Site A, followed closely by Site C the other project method implementer. Site A’s project was well managed and outside the organisation’s chain of command providing a sole focus on the ED implementation.

Site C shifted Lean responsibility from the Operations function in the hospital to the Quality Unit. The Unit implemented the project and used it as a learning and development opportunity to gain experience and competencies for future engagement across organisation. Site C also had its implementation issues that limited the efficacy of the project.

Site B integrated the ED NQC project into its patient quality mechanism - the IPEP – and operated the ED implementations as part of the larger drive for improvement within the organisation.

The actual outputs or results of the sites, all being relatively similar, provide a contrast to the probability of enduring outcomes to improved flow or reduced waste. Site B sought to improve admission times and link these to other initiatives occurring concurrently in the hospital. The point changes in terms of reduced wait-time for admission can be leveraged across the patient journey, being enabled by the simultaneous improvement in discharge. These concurrent improvements of flow assist to create a natural rhythm that is a feature of a
workplace utilising Lean production. Staff and personnel at Site B seemed to understand the relationship of flow, continuous improvement and its contribution to patient care.

Site C achieved a similar linkage to Site B in terms of the reduction in wait times for admission into the wards, but the site does not exhibit a similar level of synchronisation and demand matching as Site B. This is evidenced by clinicians expressing the need for more of their engagement in patient journey analysis and development, as well as the sense that Site C’s improvements remained isolated in the ED.

Lastly Site A’s project approach let it efficiently convert the NQC project resources into a number of successful ED orientated achievements in terms of low acuity patient flow and workplace control. However the investments made through the Fast Track stream were not able to be recovered, as of yet, in terms of any end-to-end patient flow or wait time reductions for admissions. Further, Site A exhibited a lack of interest of Lean Thinking outside of the ED. Top management did not undertake the NQC sponsored Lean Thinking awareness training.

The reflections above highlight what Burgess and Radnor (2010) signal as an emerging research issue for Lean in healthcare; the paradox of the short term needs concerning costs and efficiency and a longer term orientation that aims to embed a culture of continuous improvement. Site A’s interviews provided comments and responses that indicate that costs and their reduction or elimination is an important issue for the organisation, demanding the attention of many staff. At Site B, while budgets and costs were referred to, these were in the context of timelines and more for synchronising planning goals with operational cycles. At Site C, resource constraints were identified simultaneously as the benefits of a commitment
to Lean being the organisation’s quality method of choice, suggesting that while resources are an issue for Site C, the organisation has a commitment to the long-term success of Lean Thinking.

In summary, in answer to the third research question, why have they achieved the outcomes they did? – The study reveals that there is an effect of the organisational environment, implementation method, and the rationale for change. Most of those interviewed had reasonable comprehension of what they had learned and could identify how Lean methods could improve work, quality and patient experiences. At Site B, the legacy of previous leaders was apparent and this demonstrates what Deming (1986) termed constancy of purpose. For while all the sites were at different stages of Lean understandings, two of the sites seemed to be structurally more prepared for Lean type quality improvement; by having patients at the centre of quality decisions, an improvement policy or strategy and a longer term view of continuous improvement rather than a short run cost elimination focus.

This closes the discussion on the study. The following sections deal with the limitations of the research for providing the answers and then offers future research opportunities that could be considered to further develop knowledge of this area. The thesis now concludes with a passage summarising the conduct and outcomes of this research endeavour.
8.6. Limitations of this Research

The limitations of the research lie with three primary causes; the small number of cases studied, the focus of the investigation limited to the introduction of Lean Thinking to a single unit of analysis – the Emergency Department of each hospital – and lastly, the type of research method itself.

Firstly, the small number of sites provides variation in the organisations, culture and strategies for quality. These elements are important as they govern the organisation’s behaviour in terms of the processes and decisions as to what and how activities will occur influencing generalisability. However, this limitation is somewhat mitigated due to the similarity of the project trajectories as they were all part of a national project.

Secondly, for two of the sites this was not the first endeavour to implement Lean Thinking to assist with quality improvement within their hospital. An embedded multi-unit of analysis study (Yin, 2008, p. 46) could better reveal factors that synchronisation efforts as Lean Thinking’s aim is to act on the whole flow end-to-end not on points of change exclusively.

Lastly, the choice of the case study method for this research provides for a limitation. Much of the literature is seeking more empirical or ‘as Young and McLean (2008), reflect a move from a belief that it works to proof [that it works]’ (Burgess & Radnor, 2010, p. 12). However, the research cases studies are seeking to understand the processes by which events took place and the contexts in which the participants acted rather than providing quantifiable
data on improvement. The cases also evidence change in a moment of time rather than being over time, and do not return to consider whether any of the improvements are enduring.

Therefore the study is ultimately unable, as Øvretveit (2009) seeks, to ascertain that costs are concurrently positively affected along with an improvement of quality. To achieve this, a research approach may need to be a mixed method thereby achieving an examination of the sociotechnical aspects of Lean that Joosten et al (2009) refer to with respect to the industrialisation of healthcare and its effect on people, but also incorporate collection of measures such as throughput, wait times, and length of stay to reflect evidence of sustainable improvement. Further, a research design to assess the efficacy of Lean Thinking in healthcare will need to consider indicators of failure demand or waste such as unplanned readmissions, medical and procedural errors, and ultimately the marker of a health system’s quality, its mortality rates. This type of research will require appropriate length of time and engagement.

This section has identified limitations of the study. The following section offers further research directions that may add to the knowledge of this theme in operations management.

8.7. **Future Research Opportunities**

Taking into consideration the above limitations of this research and the findings, further studies are indicated. In particular, the issue of clinical engagement in Lean or quality improvement in general could be addressed. There is a body of literature becoming available that is focussing on Lean Thinking in healthcare, some which is typified by what Gee et al (1996) describe as fast capitalist texts; publications that forward Lean Thinking as a solution to previously intractable problems with little empirical evidence or generalisability, with
healthcare examples being Graban (2008) and Toussaint & Gerard (2010). Some other authors, in contrast, are seeking to contextualise Lean Thinking’s introduction into healthcare examining the social aspects of organisational change and resistance e.g. Waring & Bishop (2010). For New Zealand, it would be refreshing to have some local stories told and examinations of phenomena based on the New Zealand’s healthcare environment, reflecting its adaptation of international experiences and reporting on an implementation agenda that informs managers and clinicians alike.

In particular an examination of clinician’s views of engagement with new forms of quality perspectives could be valuable. Throughout the Lean Healthcare literature clinician engagement is indicated to be a marker for successful implementation of quality improvement initiatives. The research cases found that some clinicians have a natural affinity to Lean Thinking and process improvement, the metrics associated with statistical quality control and the evidence that PDSA cycles provide. However, there are also examples of scepticism and suspicion of this attempt to introduce Lean Thinking. An examination that provides evidence of professional dispositions or an assessment of factors that are regarded important by clinicians may assist with the planning and introduction of process improvement methodologies in the health sector. As the culture of the organisation was found to be an influence on the implementation of Lean, further exploration of New Zealand hospital’s or clinicians readiness for change and their cultural orientations, (see Weber & Joshi, (2000)) may also provide useful data for managers and clinicians.

Studies that assist to provide empirical evidence on costs and Lean would add to the international literature. While modelling has been undertaken to assist with flow planning,
the economic modelling of cost and quality relationships remain at the national rather than institutional level. This is understandable as underpinning national policy drivers are the notions of budget management and control of rising healthcare costs. Lean is an attractive solution for policy makers (Radnor & Walley, 2006) but is it an effective solution when government budgets are further under pressure due to the slow recovery from the 2008 credit crunch? Ultimately, will short term cost orientations by governments further aggravate the ‘tension between the need to demonstrate efficiency savings and Lean implementation in order to sustain and embed a culture of continuous improvement?’ (Burgess & Radnor, 2010, p. 12).

Finally, the nature of the knowledge gained from the Lean implementations and how it is distributed throughout the organisation requires some attention. The cultural and professional orientations of the actors within hospitals view quality and improvement differently. The collaborative and team methods introduced are so far informational and evidence based, however Lean also relies on tacit and experiential knowledge being able to be accessed and utilised. Further work on knowledge management with respect to learning networks, their composition and facilitation within transformative or system type Lean institutions, could provide New Zealand hospitals with improved expectations regarding their decisions for Lean implementations.

The research undertaken for this thesis revealed further avenues for research that can contribute to the literature and provide data that assists healthcare administrators improve their effective delivery of healthcare. The following passage summarises the preceding discussions and provides a closing for this thesis.
8.8. Conclusion

Lean Thinking has been used to improve service industries but is relatively new to health care and is even more recent for New Zealand hospitals.

Lean Thinking focuses on the reduction of waste in a value stream, through the removal of non value adding elements with the production process. In the context of healthcare, examples of waste can be waiting, excess inventory, walking or unnecessary travel and non essential processes or procedures. To enable the identification and elimination of this waste, Lean Thinking employs techniques and tools such as process mapping, visual workplace activities and standardised procedures. Data collection and statistical analysis are also features of Lean production control and problem solving.

This study undertook to investigate three hospital EDs that had recently completed a Lean Thinking introduction. The sites embarked on the implementations using similar processes and methods as they were involved with a National Quality Committee project that aimed to introduce Lean Thinking into the New Zealand healthcare system. The researcher used the case study as the research method. Three comprehensive cases were developed and compared with themselves and exemplar cases derived from the literature.

The research results show that Lean can result in new configurations and practices that improve patient flows and wait times within New Zealand EDs. The study reveals that workplace control through methods such as 5S assisted the ED’s to tidy, identify waste, and reduce inventory without reducing access to needed equipment and impede the work.
All of the sites achieved some form of improved patient flows. These outcomes required a study or pilot to be undertaken in line with the PDSA technique, which developed and sorted data and used this data to inform decisions of resource and process distributions; in effect, resulting in process redesign. What was not clear or able to be suitably analysed were the cost implications and the overall effectiveness of the improvement in terms of ongoing benefits.

Lean production is not without its detractors. It has been linked to work intensification, increased management control and worker exploitation. Work intensification was discovered at two of the sites, where at one site the workers complied by completing the additional duties; seemingly normal behaviour in this organisation. While at another site the workers relegated Lean tasks until they felt they had time to complete them; a resistance that somewhat undermined the process of Lean implementation.

The most likely long term or end-to-end patient flow improvement was found to happen in sites that had a strategy or policy regarding quality improvement, had engaged visible senior management, and undertook the quality improvement role in terms of organisational development, rather than isolated point changes. The site that had a history or culture conducive to improvement seemed to be the most successful in implementing the ED part of an end-to-end flow, while the other sites either provided an isolated change or what Bicheno (2008, p. 68) terms Lean Light – a piecemeal approach with suboptimal synchronisation, little impact on the bottom line, and sustainability issues when staff realise the pitfalls of this superficial, but quick gains implementation.
The site case results were compared with the international research literature that variously determines that Lean implementations should be:

- Part of organisation’s strategy and be driven by local needs,
- Owned by the organisation,
- Focused on patient flow rather than functionally determined,
- Visibly supported by top management,
- Long term – as Lean change takes time,
- Able to involve and educate staff at all levels, and lastly
- Facilitative of teams and system thinking.

This list and the best practice indicators provided for case analysis can provide the contents for a preparatory assessment that an organisation can use to understand their readiness for a Lean Thinking deployment.

Lastly, the study found that the organisations that had a quality culture or orientation found it easier to integrate Lean and patient flow initiatives. These hospitals were somewhat more prepared for change and already had structures or processes in place that facilitated the Lean implementation.

The hospital is an organisation that consists of a number of actors who must collaborate to achieve the goals of patient care and welfare. These actors have different professional orientations and cultures. The uptake of Lean is variable possibly due to professional orientation, as evidenced through the cases where nurses led many of the Lean initiatives across the sites. However due to the power and status of clinicians, any fundamental Lean
improvement that completes end-to-end patient journeys is unlikely to succeed without doctors cooperating across their functional specialities. The role that management can play is by providing supportive environments and facilitating the knowledge and awareness of Lean techniques and philosophies such that if and when the organisation adopts it, there is a fertile culture and basis for the implementations to succeed.

In conclusion, the study found that each organisation produced waste reduction and changes to the flow dynamics for patients. Each had to deal with their own circumstances and develop responses in their own manner, but on the whole the research case sites that hold a longer term quality orientation seemed to be able to utilise Lean Thinking more effectively than research case sites that were influenced by cost pressures or implemented Lean Thinking as an independent project.
References


Appendix
Glossary of Lean Terms used in the Thesis

All definitions are sourced from (Marchwinski, Shook, & Schroeder, 2008) unless otherwise referenced.

3P (Production, Preparation, Process)

A disciplined method for designing a lean production process for a new product or for fundamentally redesigning the production process for an existing product when the design or customer demand change substantially.

5S

Five related Japanese terms beginning with an S sound, describing workplace practices conducive to visual control and lean production. The English translations are Sort, Straighten, Shine, Standardise, and Sustain.

A3 Problem Solving Sheet

A Toyota-pioneered practice of getting the problem, the analysis, the corrective actions, and the action plan down on to a single sheet of large (A3) paper, often with the use of graphics. At Toyota, A3 reports have evolved into a standard method for summarizing problem-solving exercises, status reports, and planning exercises like value-stream mapping. A3 paper is the international term for paper 297 millimetres wide and 420 millimetres long. The closest U.S. paper size is the 11-by-17 inch tabloid sheet.
**Ford Production System**

A pioneer method of industrial production, which introduced sequencing the assembly tasks in a continuous flow replacing batch and queue methods. This achieved productivity increases but for special circumstances i.e. when volumes were high and used product and component standardisation, e.g. for the Model T. *Source (Womack & Jones, 1996)*

**Kaizen**

Continuous improvement of an entire value stream or an individual process to create more value with less waste.

**Kaizen Event**

A group kaizen activity, commonly lasting five days, in which a team identifies and implements a significant improvement in a process. Also termed rapid Improvement Event (RIE).

**Lean Production**

Also referred to as Heijunka. The levelling of the type and quantity of production over a fixed period of time. This enables production to efficiently meet customer demands while avoiding batching and results in minimum inventories, capital costs, manpower, and production lead time through the whole value stream.

**Lean Thinking**

A five-step thought process proposed by Womack and Jones in 1996 to guide managers through a lean transformation.
PDCA / PDSA cycle

An improvement cycle based on the scientific method of proposing a change in a process by implementing the change, measuring the results, and taking appropriate action. It also is known as the Deming Cycle or Deming Wheel after W. Edwards Deming, who introduced the concept in Japan in the 1950s.

Standardised Work

Establishing precise procedures for each operator’s work in a production process, based on three elements:

1. Takt time
2. The precise work sequence in which an operator performs tasks within takt time.
3. The standard inventory, including units in machine

Statistical Control Charting or Statistical Process Control (SPC)

A graphic tool used in process control. The frequent charting of data assists operators to monitor the process and signal the existence of process variation. Source (The Executive Committee of SMMT, 1994)

Takt Time

The available production time divided by customer demand.
Team Leaders in Lean Production

Team leaders in the Toyota Production System form the first line of support for workers, who — unlike their counterparts in traditional mass production organizations — are at the heart of improvement activities with responsibility for problem solving, quality assurance, and basic preventive maintenance.

Total Quality Management (TQM)

A management approach in which all departments, employees, and managers are responsible for continuously improving quality so that products and services meet or exceed customer expectations.

Toyota Production System (TPS)

The production system developed by Toyota Motor Corporation to provide best quality, lowest cost, and shortest lead time through the elimination of waste.

Value Stream

All of the actions, both value-creating and non value-creating, required to bring a product from concept to launch (also known as the development value stream) and from order to delivery (also known as the operational value stream).

Value Stream Mapping (VSM)

A simple diagram of every step involved in the material and information flows needed to bring a product from order to delivery.
Visual control

The placement in plain view of all tools, parts, production activities, and indicators of production system performance, so the status of the system can be understood at a glance by everyone involved.

Waste

Any activity that consumes resources but creates no value for the customer.
Participant Information and Consents

22 April 2010

Lean Principles and Practices in New Zealand Emergency Departments.
INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this research project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you of any kind and we thank you for considering our request.

What is the Aim of the Project?

The aim of this project is to gather information and interview participants involved in lean thinking projects. The information gained will be reviewed and used to inform a Master of Commerce thesis in Management. In this context the project is data gathering on a non-clinical process improvement project set in a clinical environment.

The interviews are to be conducted in order to record participant’s experiences, thoughts and perspectives on the progress of the OPJ project they participated on.

What Type of Participants are being sought?

This project will involve people who have worked in the Emergency Department and have participated in an OPJ project. It is hoped that a full range of staff occupying a wide range of roles will make themselves available to be interviewed.

What will Participants be Asked to Do?

Should you agree to take part in this project, you will be asked to make yourself available for an interview at a convenient time. The interviews should take no longer than 30 minutes.

Please be aware that you may decide not to take part in the project without any disadvantage.

You may withdraw from participation in the project at any time and without any disadvantage to yourself of any kind.

What Data or Information will be Collected and What Use will be Made of it?

The researchers will be asking questions about your experiences, perceptions and opinions of the OPJ project. The interviews will be conducted one to one. For most interviews there will be 6 pre written open-ended questions, however the interviewer may follow-up on particular points you make during or at the end of the interview, or with a few focussed questions if you had a particular role in the project.

The interviews will be taped and these recordings will be transcribed. The responses will be analysed and themes from the answers will be identified. These themes will be reported, not individual person’s opinions or comments. It is possible that some quotations may appear in the text of the thesis. Every attempt will be made to ensure anonymity of the respondents in the thesis.
The results of the research may be published and will be available in the University of Otago Library (Dunedin, New Zealand) and every attempt will be made to preserve your anonymity. You are most welcome to request a copy of the results of the research should you wish.

The data collected will be securely stored in such a way that only the researcher will be seen or be able to gain access to it. At the end of the project any personal information will be destroyed immediately except that, as required by the University’s research policy, any raw data on which the results of the project depend will be retained in secure storage for ten years, after which it will be destroyed.

Reasonable precautions will be taken to protect and destroy data gathered by email. However, the security of electronically transmitted information cannot be guaranteed. Caution is advised in the electronic transmission of sensitive material.

**What if Participants have any Questions?**

If you have any questions about our project, either now or in the future, please feel free to contact either:-

Gareth Rees
Department of Management
University Telephone Number:- 479 8410

or

Dr Richard Greatbanks
Department of Management
University Telephone Number:- 479 8658

**Note:-**

This project involves in part an open-questioning technique where the precise nature of the any questions which maybe be asked have not been determined in advance, but will depend on the way in which the interview develops. Consequently, although the University of Otago Human Ethics Committee is aware of the general areas to be explored in the interview, the Committee has not been able to review the precise questions to be used.

In the event that the line of questioning does develop in such a way that you feel hesitant or uncomfortable you are reminded of your right to decline to answer any particular question(s) and also that you may withdraw from the project at any stage without any disadvantage to yourself of any kind.
Lean Principles and Practices in the New Zealand Emergency Departments.
CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:-

1. My participation in the project is entirely voluntary;

2. I am free to withdraw from the project at any time without any disadvantage;

3. The data [MP3 files] will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for ten years, after which it will be destroyed;

4. This project involves an open-questioning technique where the precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops and that in the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.

7. The results of the research may be published and available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve my anonymity.

I agree to take part in this project.

.........................................................................................................................  ........................................
(Signature of participant)                                  (Date)
Research Instrument

OPJ Generic Interview Questions

Interview begins with the researcher introducing themselves and explaining the purpose of the interview. They then ask the participant to introduce themselves including their Title, Role and Responsibilities.

1/ Describe your involvement in the OPJ project?

2a/ What is your understanding of the objective of the OPJ project?

2b/ How would you describe the results of the project?

2c/ Describe your view of Leadership, Continuity, Sustainability of the OPJ project?

3/ How much of the OPJ project is integrated into your own routine – What do you do differently now?

4/ What could have been done differently?